ACER
European Union Agency for the Cooperation of Energy Regulators

PUBLIC

DECISION No 29/2020
OF THE EUROPEAN UNION AGENCY
FOR THE COOPERATION OF ENERGY REGULATORS

of 24 November 2020

on the methodology and assumptions that are to be used in the bidding zone review process and for the alternative bidding zone configurations to be considered

THE EUROPEAN UNION AGENCY FOR THE COOPERATION OF ENERGY REGULATORS,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators[1], and, in particular, Article 3(2) and Article 5(7) thereof,

Having regard to Regulation (EU) 2019/943 of The European Parliament and of the Council of 5 June 2019 on the internal market for electricity[2] and, in particular, Article 14(5) thereof,

Having regard to the outcome of the consultation with the transmission system operators and ('TSOs') and regulatory authorities,

Having regard to the outcome of the consultation with ACER's Electricity Working Group ('AEWG'),

Having regard to the favourable opinion of the Board of Regulators of 18 November 2020, delivered pursuant to Article 22(5)(a) of Regulation (EU) 2019/942,

Whereas:

1. INTRODUCTION

(1) Regulation (EU) 2019/943 on the internal market for electricity (the 'Electricity Regulation') laid down a range of requirements to address congestions and, in

[1] OJ L 158, 14.6.2019, p. 22.
[2] OJ L 158, 14.6.2019, p. 54.

particular, to ensure an optimal configuration of bidding zones (BZs). These requirements include the need to carry out a BZ review (BZR), following the development of a methodology and assumptions that are to be used in such a BZR and for the alternative BZ configurations to be considered in accordance with Article 14(5) of the Electricity Regulation.

(2) Pursuant to Article 14(5) of the Electricity Regulation, all relevant TSOs shall submit a proposal for the methodology and assumptions that are to be used in the BZR process and for the alternative BZ configurations to be considered ('BZR proposal') to the relevant regulatory authorities for approval. The relevant regulatory authorities shall take a unanimous decision on the proposal within 3 months of its submission. Where the regulatory authorities are unable to do so, ACER shall, within an additional three months, decide on the methodology and assumptions and the alternative BZ configurations to be considered.

(3) The present Decision follows from the letter of 13 July 2020 of all regulatory authorities informing ACER that they were unable to reach a unanimous decision on the BZR proposal submitted by TSOs' for approval, and requesting ACER to decide on that proposal.

(4) The Decision includes the following annexes:

(a) Annex I, which sets out the BZR methodology and assumptions, as amended by ACER.

(b) Annex Ia, which includes the list of minimum data to be published in accordance with Article 16 of the BZR methodology and assumptions.

(c) Annex Ib, which includes a template which may be used by TSOs to consolidate the results of the BZR, for each Bidding Zone Review Region (BZRR) in accordance with Article 13(1)(d) of the BZR methodology.

(d) Annex II, which describes the detailed requirements, including submission deadlines, of the data request issued to TSOs as part of the present Decision.

(e) Annex III, which includes a summary and evaluation of the responses received in the context of the public consultation launched by ACER on 1 April 2020 with a view to support the approval of the BZR proposal.

2. PROCEDURE

2.1. Proceedings before regulatory authorities

(5) On 5 October 2019, all TSOs submitted a BZR proposal ('initial BZR proposal') to all regulatory authorities for approval, pursuant to Article 14(5) of the Electricity Regulation.

(6) On 17 December 2019, in view of the lack of alternative BZ configurations for the BZRR Central Europe in the initial BZR proposal, all regulatory authorities decided the following:

(a) Request TSOs to complete the initial BZR proposal within two months.

(b) Request TSOs to provide a set of three data items, namely data on historical congestions, on Common Grid Models (CGMs) and results derived from Locational Marginal Pricing (LMP) simulations, with a view to support the approval of the BZR proposal, or to develop additional alternative BZ configurations in case TSOs failed to provide them, including in the case of referral to ACER. The data was requested to be delivered to regulatory authorities and ACER within two months.

(7) By 7 April 2020, the TSOs submitted an updated version of the initial BZR proposal ('updated BZR proposal') to their respective regulatory authorities.

2.2. Proceedings before ACER

(8) Prior to the submission of the initial BZR proposal, on 5 October 2019, ACER had been regularly involved in the discussions among TSOs and regulatory authorities on the matter, with a view to support the approval process.

(9) On 5 November 2019, ACER launched a study to suggest methodologies and indicators to evaluate the potential impact of a BZ reconfiguration on market liquidity and transaction costs. The study was also commissioned with a view to support the regulatory discussions leading to the approval of the BZR proposal. In order to discuss the findings of the study and to receive stakeholder's feedback, ACER organised, in close cooperation with the consultants, a set of teleconferences and meetings. In particular, the following discussions were held:

(a) on 16 December 2019, a teleconference call with regulatory authorities;

(b) on 18 December 2019, a discussion with market stakeholders in the framework of the Market European Stakeholders Committee (MESC) meeting;

(c) on 11 March 2020, a discussion with market stakeholders in the framework of the MESC meeting; and

(d) on 12 March 2020, a teleconference call with regulatory authorities;

On 28 April 2020, the study was published[3].

(10) In January 2020, regulatory authorities, anticipating a possible referral of the BZR proposal to ACER, invited ACER to be more intensively involved in the discussions with TSOs, and in the regulatory discussions for the approval of the BZR proposal.

[3] The study is available at https://www.acer.europa.eu/en/Electricity/MARKET-CODES/CAPACITY-ALLOCATION-AND-CONGESTION-MANAGEMENT/Documents/200406%20DNV%20GL%20report_final.pdf

(11) On 1 April 2020, ACER launched, in coordination with regulatory authorities, a public consultation which aimed to collect views from stakeholders to identify improvements to the BZR proposal. The summary and evaluation of the responses received are included in Annex III to this Decision.

(12) On 23 April 2020, regulatory authorities and ACER discussed a referral of the updated BZR proposal to ACER. With regard to such referral, ACER proposed to split its decision on the BZR proposal into two decisions (hereinafter 'two steps approach'), in light of the lack of alternative BZ configurations proposed for a large part of the EU:

(a) a first decision on the pan-European BZR methodology and, potentially, on alternative BZ configurations for those regions that adequately submitted alternative BZ configurations in light of the existent structural congestions; and

(b) a second decision on alternative BZ configurations for regions that failed to submit sufficient alternative BZ configurations in light of the existent structural congestions, to be taken at a later stage.

The AEWG supported the proposal of ACER to split the decision into two decisions.

(13) On 17 June 2020, ACER discussed with stakeholders, in the framework of the MESC, a list of improvements to the BZR methodology, to be potentially introduced in case of referral of the BZR proposal to ACER. Such amendments took into consideration the results of the above-mentioned public consultation.

(14) By letter of 13 July 2020, the Chair of the Energy Regulators' Forum (ERF), on behalf of all regulatory authorities, informed ACER that they were unable to reach a unanimous decision on all TSOs' updated BZR proposal and that the updated BZR proposal was considered as referred to ACER as of 7 July 2020, pursuant to Article 14(5) of the Electricity Regulation.

(15) The above-mentioned letter included a document titled 'Non-paper by all regulatory authorities on the methodology and assumptions that are to be used in the BZR process and for the alternative BZ configurations in accordance with article 14(5) of the Electricity Regulation' where regulatory authorities pointed to the following two main aspects that would need to be addressed during the approval of the updated BZR proposal:

(a) With regard to the BZR methodology, all regulatory authorities reiterated previous concerns on a number of issues of the BZR proposal, including the definition of the target year, and aspects of the capacity calculation and the market and redispatching simulations. In this context, all regulatory authorities acknowledged the relevance of taking into account previous discussions on the BZR methodology among regulatory authorities, TSOs and ACER.

(b) With regard to the alternative BZ configurations, regulatory authorities expressed the need for ACER to perform a legal assessment about the possibility of splitting ACER's decision into two decisions.

(16) On 30 June 2020, ACER sent a letter to the EC requesting its views on the possibility of splitting the decision on the BZ methodology in two separate procedures.

(17) On 10 July 2020:

(a) A conference call among regulatory authorities and ACER in the framework of the regulatory authorities and ACER BZR expert group was held.

(b) A conference call among regulatory authorities, TSOs and ACER was held.

(18) By letter of 30 July 2020, the EC replied to ACER's inquiry on the possibility of splitting the BZR decision into two separate procedures. In essence, the EC confirmed ACER's view that splitting the BZR decision into two decisions is legally possible. In particular, such a splitting is justifiable if additional information is needed for ACER to make an informed decision related to alternative configurations, which would be the matter of the second of the decisions.

(19) On 14 July:

(a) ACER issued a public notice announcing the commencement of the procedure ref. ACER-ELE-2020-001 to decide on the updated BZR proposal pursuant to Article 14(5) of the Electricity Regulation. Amongst other procedural aspects, ACER announced that in issuing its decision, it will consider stakeholders' feedback to the above-mentioned public consultation held between 1 and 24 April 2020 and other stakeholders' feedback provided at the MESC meetings or via a functional email box.

(b) ACER also notified all regulatory authorities and all TSOs on the commencement of the procedure.

(20) On 14 August 2020, a teleconference call among regulatory authorities, TSOs and ACER was held.

(21) On 20 August 2020, a discussion among regulatory authorities and ACER in the framework of ACER's capacity allocation and congestion management taskforce (CACM TF) was held.

(22) On 3 September 2020, TSOs made a request to simplify the two steps approach as envisaged by ACER. In particular, TSOs suggested to follow the two steps approach while ensuring that the BZRs would start simultaneously for all regions, rather than at different points in time. They explained that this simplification would lead to increased consistency and coordination and would reduce the risk of not delivering the BZR on time. They also requested to use 2025 (instead of 2023 or 2024) as the target year for the BZR as this would increase consistency and would avoid to analyse configurations that would become obsolete before their implementation.

(23) On 3 September 2020, a discussion among regulatory authorities and ACER in the framework of the AEWG was held. ACER informed about its intention to accept TSOs' request aiming at ensuring that the BZRs are performed simultaneously for the

various regions. No objections were raised by regulatory authorities, although one regulatory authority invited ACER to consider simplifications in the data request to ensure its timely delivery.

(24) On 9 September 2020, a discussion among regulatory authorities and ACER in the framework of the CACM TF was held. ACER provided a legal justification for the two steps approach to decide on the methodology and configurations.

(25) On 10 September 2020, a teleconference call among TSOs and ACER was held whereby ACER provided its feedback on the concerns raised by TSOs by email on 3 September.

(26) On 21 September 2020, a discussion among regulatory authorities and ACER was held. ACER provided an update on the main changes incorporated in the BZR methodology following the written feedback received from regulatory authorities by 21 August and from TSOs on 27 August 2020.

(27) On 22 September 2020, ACER provided an update on the BZR process and ACER's upcoming decision on the matter at the Electricity Coordination Group (ECG) meeting.

(28) On 23 September 2020, ACER discussed with stakeholders, in the framework of the MESC, the recent developments on the BZR methodology and the next steps towards issuing the decision. Several concerns and questions were raised by stakeholders, mostly related to the focus on monetised criteria, as envisaged in the BZR methodology, the need to ensure pan-European consistency and the potential challenges of a LMP analysis.

(29) On 24 September 2020, a discussion among regulatory authorities and ACER in the framework of the AEWG was held. ACER presented the main changes that were incorporated in the BZR methodology following previous feedback from TSOs and regulatory authorities. Overall, regulatory authorities welcomed the amendments made, whereas only one regulatory authority raised concerns few aspects of the updated version.

(30) On 25 September 2020, a workshop among TSOs, regulatory authorities and ACER was held. The workshop focused on the request for a LMP analysis to enable ACER to decide on alternative BZ configurations, and also as an analysis to be part of the BZR methodology.

(31) On 28 September 2020, a teleconference call among TSOs and ACER was held. ACER provided an update on the main changes incorporated in the BZR methodology following the written feedback received from TSOs on 27 August.

(32) On 29 September 2020, a discussion among TSOs and ACER was held. It aimed to discuss a number of general concerns raised by TSOs with regard to the BZR process.

(33) On 1 October 2020, ACER sent a preliminary draft of the amended BZR methodology to TSOs and regulatory authorities for their feedback.

(34) On 6 October 2020:

(a) Upon request, a call between ACER and a number of stakeholders was held. It aimed to clarify and discuss a number of aspects of the BZR methodology and the BZR process in general.

(b) A call between ACER and TSOs was held. It aimed to clarify some aspects of the BZR methodology, including the request for a LMP analysis.

(35) By 9 October 2020:

(a) ACER received feedback on the preliminary draft of the BZR methodology from two regulatory authorities.

(b) ACER received feedback on the preliminary draft of the BZR methodology from TSOs.

(36) On 23 and 28 October, complementary feedback on the BZR methodology was provided by TSOs.

3. ACER'S COMPETENCE TO DECIDE ON THE BZR PROPOSAL

(37) Pursuant to Article 5(7) of Regulation (EU) 2019/942, ACER shall carry out its tasks as regards the bidding zone review pursuant to Article 14(5) of Regulation (EU) 2019/943.

(38) Pursuant to Article 14(5) of the Electricity Regulation, by 5 October 2019, all relevant TSOs shall submit a proposal for the methodology and assumptions that are to be used in the BZR process and for the alternative BZ configurations to be considered to the relevant regulatory authorities for approval. The relevant regulatory authorities shall take a unanimous decision on the proposal within 3 months of submission of the proposal and, where they are unable to reach a unanimous decision on the proposal within that time frame, ACER shall, within an additional three months, decide on the methodology and assumptions and the alternative BZ configurations to be considered.

(39) Since the relevant TSOs submitted an updated BZR proposal to the regulatory authorities concerned by 7 April 2020 and the latter were unable to reach a unanimous decision on the proposal by 7 July 2020, referring it to ACER with effect of that date, ACER has become competent to decide on this proposal according to Article 5(7) of Regulation (EU) 2019/942 and Article 14(5) of the Electricity Regulation.

4. SUMMARY OF THE UPDATED BZR PROPOSAL

(40) The updated BZR proposal consists of the following elements:

(a) the main document, which describes the BZR methodology and assumptions that are to be used in the BZR process;

(b) annexes to the main document 1 to 8 describing the proposed alternative BZ configurations for the different BZR regions (BZRRs);

(c) an explanatory document (for information only), which provides additional background information and explains the rationale behind the choices made in the proposal for the BZR methodology and assumptions; and

(d) annexes to the explanatory document 1 to 8 (for information only), justifying the proposal for alternative BZ configurations for the different BZRRs.

(41) The main document of the updated BZR proposal document is structured as follows:

(a) 'Whereas' section and Articles 1 and 2, which include general provisions on the subject matter and scope and definitions and interpretation;

(b) Article 3, which provides an overview of the BZR process;

(c) Article 4, which lists the BZRRs to be used in the BZR process. The article also refers to the alternative configurations to be used for the BZR process which are described in the above-mentioned annex;

(d) Article 5, which describes the process to determine scenarios and assumptions to be used in the BZR process;

(e) Article 6, which provides an overview of the modelling chain to be used in the BZR process;

(f) Article 7, which describes the requirements for the calculation of cross-zonal capacities within the modelling chain;

(g) Article 8, which describes the process to derive the dispatch resulting from the market within the modelling chain;

(h) Article 9, which describes the process to perform an operational security analysis (OSA) within the modelling chain;

(i) Article 10, which describes the process to simulate the remedial actions to address the congestions resulting from the OSA, within the modelling chain;

(j) Article 11, which describes the process to estimate the flows not induced by cross-zonal trade;

(k) Article 12, which describes the process to perform a LMP simulation as part of the BZR process;

(l) Article 13, which describes the process to evaluate the criteria envisaged for the BZR process, including:

i. an overview of the evaluation criteria to be used;

ii. the general approach to perform the evaluations;

iii. how to determine the geographical scope for each criterion; and

iv. the specific approach to perform the evaluation for each criterion.

(m) Articles 14 to 16, which address the implementation of the methodology, its publication, the language and other aspects not covered in previous articles.

5. SUMMARY OF THE OBSERVATIONS RECEIVED BY ACER

5.1. Public consultation

(42) The responses to the public consultation (see paragraphs (11) and (19)) are compiled and evaluated in Annex III.

5.2. Consultation of TSOs

(43) ACER consulted TSOs on its preliminary position on the BZR methodology and assumptions and on the request to perform a LMP simulations, the latter to enable ACER to decide on alternative BZ configurations. In their feedback, TSOs acknowledged that many of the concerns raised by the TSOs had already been taken into account in the preliminary ACER's draft of the BZR methodology. Moreover, TSOs highlighted a number of remaining concerns that can be summarised as follows:

(a) The need to consider, in addition to the LMP simulations, a number of qualitative aspects in order to propose alternative configurations to be considered for the BZR process.

(b) Challenges associated to the LMP simulations, despite TSOs' willingness to perform LMP simulations to the best of their ability.

(c) Challenges to perform the BZR within the deadlines envisaged in the Regulation if a high number of alternative BZ configurations, including all possible combinations, are required to be studied.

(d) The fact that several of the modelling requirements remain, in the TSOs' view, overly prescriptive and explicit, leaving limited flexibility to TSOs.

(e) Challenges to publish all the data required in the methodology, in light of the envisaged publication deadlines and related confidentiality issues that may arise.

(f) Concerns regarding the process to be followed, and the feasibility of modelling implicit demand response.

5.3. Consultation of regulatory authorities and the AEWG

(44) ACER consulted regulatory authorities on its preliminary position on the BZR methodology and assumptions. Two regulatory authorities provided feedback. In their feedback, the following observations were made:

(a) One regulatory authority highlighted the need to mainly consider the following aspects:

i. the need to clarify the envisaged process and the role for LMP simulations in defining alternative configurations, as this was not easily inferable from the BZR methodology;

ii. the need to further clarify some concepts including:

1. the addressees of the requirements, e.g. when referring to "TSOs";
2. the difference between scenarios, single scenario and sensitivities;
3. the need to keep the number of scenarios limited;
4. the role of climate years; and
5. the definition of the target year.

(b) Another regulatory authority highlighted the need to mainly consider the following aspects:

i. the need to include further analysis on the impact on CO2 emissions and renewable energy sources (RES) infeed;

ii. the need to further clarify the meaning of 'availability costs for redispatching purposes' and the fact that the proposed methodology to estimate them is imperfect;

iii. the fact that the BZR methodology overemphasises the importance of some criteria while this is not envisaged in the CACM Regulation;

iv. the fact that the robustness of price signals, including price risks, is not sufficiently analysed;

v. the need to reflect that a certain amount of loop flows is legally acceptable, in line with the CACM and Electricity Regulations, and the fact that loop flows can lead to negative and positive effects;

vi. the need to consider the location of congestions over time; and

vii. the need to expand the analysis envisaged to evaluate the integration of RES, e.g. by considering the negative impacts of price volatility on RES integration.

(45) The AEWG was consulted from 21 October until 30 October. While no comments were submitted during the formal AEWG consultation period, the following AEWG comments were received, in the framework of the 28 October AEWG meeting:

(a) The request from one regulatory authority to include an additional option to model the costs of network reserves in proportion to the peak need for redispatching energy. ACER agreed to introduce this change, which was not objected by any regulatory authority during the meeting.

(b) One regulatory authority expressed concerns related to the risks that RES investors may face due to changes in bidding zone configurations and to the absence of indicators assessing the impacts on the volumes of CO_2 emissions. Regulatory authorities and ACER agreed to include, for transparency, an indicator on CO_2

emissions and a link to the criterion on long-term price signals for efficient low-carbon investments, including RES.

(c) One regulatory authority suggested to introduce an additional indicator on loop flows. No objections were raised in the course of the meeting, although not all regulatory authorities were yet able to express their views during the meeting.

(46) A separate consultation process was set up for Ofgem, to take into account its particular situation following BREXIT and to enable it to provide views.

5.4. Other observations from stakeholders received by ACER

(47) In addition to stakeholder's feedback received through the public consultation, ACER also received feedback directly from one stakeholder. This feedback referred to the following aspects:

(a) the need to consider the effects of a BZ reconfiguration on forward and balancing markets, in addition to the short-term physical markets (day-ahead and intraday);

(b) the need to perform a thorough assessment of market liquidity impacts as part of a broader market efficiency analysis;

(c) the need for harmonising certain aspects of the methodology, such as network congestion and market efficiency, to avoid a fragmented regional approach;

(d) the added value of a LMP simulation to assess alternative BZ configurations;

(e) the need to include an adequate modelling of Demand-Side Response (DSR) and, more broadly, any other upcoming developments with regard to market-based flexibility in the power market;

(f) concerns about limited stakeholder engagement, which is key to ensure a robust and transparent analysis.

6. ASSESSMENT OF THE UPDATED BZR PROPOSAL

6.1. Legal framework

(48) Article 14(5) of the Electricity Regulation sets out the key requirements of the BZR proposal.

(49) In terms of process, it requires all relevant TSOs to submit, by 5 October 2019, a proposal for the methodology and assumptions that are to be used in the BZR process and for the alternative BZ configurations to be considered to the relevant regulatory authorities for approval.

(50) In terms of substantive provisions, it prescribes that the BZR methodology shall be based on structural congestions which are not expected to be overcome within the following three years, taking due account of tangible progress on infrastructure development projects that are expected to be realised within the following three years.

(51) In that context, Article 14(1) and Article 14(3) of the Electricity Regulation describe how the configurations of BZs in the Union are to be designed and how the analysis of different configurations of BZs is to be performed, including the need to perform such an analysis in accordance with Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management[4] ('the CACM Regulation'). In this regard, Article 33 of the CACM Regulation includes a list of minimum criteria that shall be considered for a BZR.

(52) With regard to the process to propose alternative BZ configurations, the following provisions are relevant in order to determine the jurisdictions and BZs for which alternative BZ configurations shall be proposed:

(a) First, Article 14(1) of the Electricity Regulation prescribes that 'Bidding zones shall not contain such structural congestions unless they have no impact on neighbouring bidding zones, or, as a temporary exemption, their impact on neighbouring bidding zones is mitigated through the use of remedial actions and those structural congestions do not lead to reductions of cross-zonal trading capacity in accordance with the requirements of Article 16' of the Electricity Regulation.

(b) Second, Article 14(3) of the Electricity Regulation prescribes that the BZR 'shall identify all structural congestions…', which implies the need for performing a BZR involving all BZs containing structural congestions, even if those structural congestions have no impact on neighbouring BZs.

(c) Third, Recital 31 of the Electricity Regulation states that 'For Member States which adopt an action plan to address congestion, a phase-in period in the form of a linear trajectory for the opening of interconnectors should apply. At the end of the implementation of such an action plan, Member States should have a possibility to choose whether to opt for a reconfiguration of the BZ(s) or whether to opt for addressing remaining congestion through remedial actions for which they bear the costs. In the latter case their BZ should not be reconfigured against the will of that Member State, provided that the minimum capacity is reached'.

6.2. Submission of the updated BZR proposal

(53) The updated BZR proposal included a methodology and assumptions for the BZR and alternative BZ configurations for the Nordic Region and Greece. Contrary to the regulatory authorities' request, it did not include alternative configurations for the other BZs in the Union, nor did it include relevant information with regard to the alternative BZ configurations.

(54) In that regard it is first to note that ACER needs to take its decision on the updated BZR proposal based on relevant facts. The inquiry of those facts may require

[4] OJ L 197, 25.7.2015, p. 24.

cooperation by and information from other parties. In particular, in case of insufficient technical information, it can be justified to ask for additional data so that ACER can take an informed decision, and to defer the decision until the required information is available.

(55) While for the methodology and assumptions the relevant facts are clear and the relevant information has been provided, this is not yet the case for the alternative configurations: Alternative configurations were provided for some regions only, and the information requested by the regulatory authorities to justify the proposed alternative configurations, or for ACER to assess and decide on alternative configurations, was not provided or only partly.

(56) Moreover, in general, a decision covering two areas may be split also into two decisions that are issued not simultaneously but one after the other, provided that the two areas are not intrinsically linked and the relevant part is actually ready to be decided. Article 14(5) of the Electricity Regulation does not require to decide by a single act on the proposed methodology and assumptions as well as on the proposed alternative configuration; nor does it prohibit taking a decision on the proposed methodology and assumptions and a separate decision on the proposed alternative configuration.

(57) Indeed, the methodology and assumptions, on the one hand, and the alternative configurations, on the other hand, can be considered as not intrinsically linked in the sense that the methodology and assumptions can be assessed and decided regardless of the configurations.

(58) Therefore, ACER considers it justified to take a bipartite approach for the updated BZR proposal and decide on the separable elements of this proposal if and once they allow for a decision, resulting in the following two decisions:

(a) a first decision (i.e. the present Decision) on the BZR methodology and assumptions, in the context of which TSOs are requested to provide additional information on LMP simulations to enable ACER to assess and decide upon the proposed alternative BZ configurations; and

(b) a second decision on alternative BZ configurations.

(59) Section 6.3 details the information missing for ACER to take a decision on the alternative BZ configurations and explains its relevance, and Annex II sets out detailed requirements, including submission deadlines, of the request concerning the missing information.

6.3. Compliance of the updated BZR proposal with the requirements of the Electricity Regulation and the CACM Regulation

(60) With regard to the submitted methodology and assumptions for the BZR process, ACER observes the following:

(a) The updated BZR proposal defines a regional governance of the BZR process. Such a definition is not in line with the governance of the BZR process set out in Article 14(3) to Article 14(5) of the Electricity Regulation, which envisages Pan-European governance involving TSOs, regulatory authorities and Member States (MSs) at Union level. Therefore, the methodology needs to be adapted to reflect that:

i. TSOs are jointly responsible for carrying out the BZR, while some tasks, which do not affect the governance of the BZR process itself, may be conducted at the regional level; and

ii. adequate coordination among the different regions, defined for the purpose of the BZR, is needed. The necessary amendments in that respect are discussed in sub-section 6.4.4 and 6.4.20 of this Decision.

(b) The updated BZR proposal partly meets the requirements of Article 14(5) of the Electricity Regulation. While the BZR methodology refers to this article, it fails to clarify whether the methodology is based on structural congestions which are not expected to be overcome within the following three years. In particular, it fails to clarify whether and how the data set used as a basis for the BZR accounts for tangible progress on infrastructure development projects that are expected to be realised within the following three years. The necessary amendments in that respect are discussed in sub-section 6.4.6 of this Decision.

(c) The updated BZR proposal formally meets the requirement of considering the list of minimum criteria to be considered for a BZR, as set forth in Article 33 of the CACM Regulation. However, the description on how these criteria are to be assessed is often very general, which either does not allow to sufficiently understand the actual analysis to be done or jeopardises its robustness. This shortcoming affects both the overall modelling chain and the specific analyses for the list of minimum criteria, described in the BZR methodology. The necessary amendments in that respect are discussed in sub-sections 6.4.7 to 6.4.15 of this Decision.

(d) The BZR proposal partly meets the requirements of Article 14(3) of the Electricity Regulation that require the BZR to be performed in a coordinated manner with the involvement of affected stakeholders in accordance with the CACM Regulation. The latter further specifies, in its Articles 12 and 32(4)(b)(ii), the need to consult stakeholders, including the relevant authorities. While elements of interaction with stakeholders and regulatory authorities are mentioned in the updated BZR proposal, this is limited to the collection of input via an expert workshop, which do not fully reflect the requirements specified in the above-mentioned legal provisions. The necessary amendments in that respect are discussed in sub-sections 6.4.15 and 6.4.19 of this Decision.

(e) The BZR proposal only partially meets the general regulatory principle of acting with transparency. In particular, Article 16.2 of the updated BZR proposal, that considers that all information handled during the BZR is, by default, market sensitive and therefore needs to be treated as confidential is in conflict with the objective set out in Recital 30 of the Electricity Regulation, which envisages ‘a

coherent, objective and reliable determination of BZs via a transparent process'. The necessary amendments in that respect are discussed in sub-section 6.4.19.

(61) With regard to the alternative BZ configurations that are to be studied in the BZR process, ACER observes the following:

(a) As set out in Section 6.2 (paragraph (53)), the updated BZR proposal failed to include alternative BZ configurations for the EU, except for the Nordic Region and Greece.

(b) Anticipating this outcome, regulatory authorities had previously requested TSOs to provide information on historical congestions, common grid models and the results of LMP simulations to assess and decide on the updated BZR proposal, or to enable ACER to do so in case of referral.

(c) To date, the above mentioned information was neither completely delivered to regulatory authorities, nor to ACER, in particular LMP simulations are missing.

(62) In fact LMP simulations are necessary for ACER to take an informed decision on alternative BZ configurations, for the following reasons:

(63) First, in line with Article 14(1) of the Electricity Regulation, structural congestions shall be identified in order to make a meaningful proposal of alternative BZ configurations to be studied.

(64) Second, in this context, the relevant following definitions of congestions apply:

(a) Pursuant to Article 2(4) of the Electricity Regulation, 'congestion' represents a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate these flows.

(b) Pursuant to Article 2(6) of the Electricity Regulation, 'structural congestion' means congestion in the transmission system that is capable of being unambiguously defined, is predictable, is geographically stable over time, and frequently reoccurs under normal electricity system conditions.

(c) Pursuant to Article 2(18) of CACM Regulation, a 'physical congestion' corresponds to any network situation where forecasted or realised power flows violate the thermal limits of the elements of the grid and voltage stability or the angle stability limits of the power system.

(65) Third, in view of the above mentioned definitions, and in line with previous work of ACER in this matter[5], the border between two network areas (including areas between and within existing BZs) has to be considered structurally congested when the commercial exchanges between these two areas significantly affect structurally (and physically) congested network elements.

(66) Fourth, the practical consequence of this conclusion is that, when seeking alternative BZ configurations, two dimensions need to be considered:

(a) the physical dimension, i.e. the existence and location of structural physical congestions in network elements (in the following referred to as 'structural physical congestion'); and

(b) the commercial dimension, i.e. the commercial exchanges between network areas (across or within BZs) that significantly affect structural physical congestions (in the following referred to as a 'structural commercial congestion').

(67) Fifth, in order to consider the two dimensions mentioned in paragraph (66), the following information is thus required:

(a) frequency and location of structurally physically congested network elements; and

(b) structurally commercially congested network areas i.e. those areas whose exchanges significantly contribute to structural physical congestions.

(68) Sixth, whereas the information collected under the regulatory authorities' data request provides sufficient evidence on point (67)(a), information to identify commercially congested network areas pursuant to point (67)(b) is missing. In this respect, a LMP analysis is an adequate tool to identify commercially congested areas. The LMP analysis deliver prices at each node that reflect both the cost of the energy and the cost of delivering it, including congestion costs, thus identifying the areas of the network contributing the most to network congestions.

(69) As a consequence, in the absence of LMP simulations, ACER is unable to take an informed decision on alternative BZ configurations, because ACER cannot:

i. evaluate the relevance of the proposed alternative BZ configurations, for regions where those configurations were submitted; and

ii. evaluate the need to propose alternative BZ configurations where such BZ configurations were not submitted.

[5] For example, ACER concluded in its opinion 09/2015 and Decision 06/2016 that 'an interconnection linking national transmission networks has to be considered as "structurally congested" when the exchanges between these two areas significantly affect structurally physically congested network elements'. As the definition of 'congestion' was updated in the Electricity Regulation to refer to 'network areas' and not only to 'interconnections', the conclusions of previous ACER's work was upgraded as described in paragraph (65).

(70) Therefore, ACER needs to request TSOs to provide data resulting from a LMP analysis as specified in section 7 below.

6.4. Amendments to the BZR methodology

(71) Further to assessing the compliance of the BZR methodology with the legal framework as detailed above and making the necessary amendments to ensure such compliance, ACER also assessed the BZR proposal for consistency, robustness and completeness, taking into consideration stakeholders' views. All this resulted in substantive amendments which are described in paragraphs (73) to (145) .

(72) Any reference to articles and paragraphs of the BZR methodology in the following sub-sections relate to the amended version of the BZR methodology, as approved by ACER, provided in Annex I to this Decision.

6.4.1. Amendments to the 'Whereas' section

(73) ACER found it necessary to add Recital (2) of the 'Whereas' section to clarify that the BZR methodology document does not deal with alternative BZ configurations. In fact, the alternative BZ configurations will be dealt with in a separate decision, at a later stage, as described in section 6.2.

(74) ACER found it necessary to amend Recital (3) to better reflect the requirement of the Electricity Regulation that the methodology shall be based on structural congestions which are not expected to be overcome within the following three years, while other considerations (including the necessary efforts to collect input data) should not affect such a requirement.

(75) ACER found it necessary to enlarge the scope of Recital (5) to fully reflect the multiple objectives that an efficient BZ configuration is expected to meet, as envisaged in the Electricity Regulation.

(76) ACER found it necessary to add Recital (6) to reflect the objective for BZs to avoid reductions of cross-zonal capacity due to internal congestions, in relation with the objective of finding a common solution to best address congestions, as envisaged in Recital 30 and Recital 31 of the Electricity Regulation.

(77) ACER found it necessary to add Recital (8) to reflect the need for stakeholders' and regulatory authorities' involvement and consultation, as envisaged in Article 14(3) of the Electricity Regulation, and Article 12 and Article 32(4)(b) of the CACM Regulation.

(78) ACER found it necessary to add Recital (9) to reflect the need to ensure transparency during the BZR process, including the need to provide sufficient information for MS to make an informed decision on any change resulting from the BZR, pursuant to Article 14(10) of the Electricity Regulation.

(79) ACER found it necessary to add Recital (10) to recognise the need to protect confidential information in accordance with Article 13 of the CACM Regulation.

(80) ACER did not find it appropriate to keep a recital on the need of 'taking due consideration of regional specificities'. While various articles of the BZR methodology allow for considering regional specificities to a certain degree, ACER considers that the need to ensure pan-European consistency throughout the BZR methodology should prevail, in line with the BZR process described in Article 14 of the Electricity Regulation, which does not envisage a regional approach.

6.4.2. Amendments to Article 1 Subject matter and scope

(81) ACER found it necessary to amend Article 1 to clarify that the scope of the document is limited to the BZR methodology and assumptions used in the BZR process.

6.4.3. Amendments to Article 2 Definitions and interpretation

(82) ACER found it necessary, for the sake of completeness, to amend Article 2(1) to refer to Regulations, other than the ones included in the updated BZR proposal, which contain definitions that are relevant for the BZR methodology.

(83) ACER found it necessary to clarify that, in case of inconsistency between a definition included in the BZR methodology and a definition provided in Regulations listed in Article 2(1), the latter should prevail.

(84) ACER found it necessary, for the sake of clarity to refine a number of definitions in Article 2(2).

(85) ACER found it necessary, for reasons of completeness and consistency with other amendments made by ACER to the BZR methodology, to introduce, Article 2(2), a number of additional definitions.

6.4.4. Amendments to Article 3 Overview of the BZR process

(86) ACER considers that prescribing a regional governance for the BZR, including responsibilities at regional level, is not in line with the requirements laid down in Article 14(3) to Article 14(5) of the Electricity Regulation. ACER thus found it necessary to clarify that TSOs are jointly responsible for carrying out the BZR, while some tasks, which do not affect the governance of the BZR process itself, may be conducted at the regional level. ACER also found it necessary to clarify the specific tasks that may be conducted at the regional level.

6.4.5. Removal of the Article 4 of the updated BZR proposal

(87) ACER found it necessary to remove Article 4 describing the alternative BZ configurations, as the alternative BZ configurations for the BZR process will be established in a separate decision, to be issued at a later stage, as described in section 6.2. The provisions describing the BZRRs, included in this article, were merged with Article 3.

6.4.6. Amendments to Article 4 Scenarios, sensitivities and assumptions

(88) ACER found it necessary to update significantly this Article to improve the robustness and reliability of the assumptions underlying the BZR process. ACER made the following main changes:

(a) A single year ('target year') is used for the main scenario to avoid confusion induced by the use of 'base year' on top of target year. The definition of the target year has been improved to fully align with Article 14(5) of the Electricity Regulation.

(b) The network description was amended to:

i. Ensure consistency and thus comparability between the studies run by the various BZRRs, by requesting the use of the same network model across BZRRs. In order to ensure feasibility of the study, a simplified grid model may be introduced for neighbouring BZRRs, provided that this simplification preserves the key properties of the neighbouring network as seen from the considered BZRRs.

ii. Request that, by default, only network elements (and related operational security limits and contingencies) with nominal voltage greater than or equal to 380 kV must be included, because network elements with voltage below 380 kV are usually less sensitive to cross-zonal trade (and thus to a change in BZ configuration). The amendment allows introducing additional elements related to lower nominal voltages, if properly justified.

iii. Clarify how to handle non-costly remedial actions to ensure a robust and realistic modelling of these remedial actions while ensuring feasibility of the BZR. Non-costly remedial actions may be reflected either:

1. by updating the contingencies and operational security limits considered within the BZR; or

2. by fully modelling them within the capacity calculation and consideration of remedial action steps

iv. Detail how to reflect new network investments in the grid model, to ensure a realistic assessment of their impact on alternative BZ configurations.

v. Clarify that the network topology must reflect the best forecast of expected operational practices for the target year, to ensure a realistic network topology.

vi. Specify which minimum information must be included in the model, to ensure feasibility of the capacity calculation and consideration of remedial action steps.

vii. Ensure that deviations from the grid model used in the ten year network development plan (TYNDP) are properly justified, e.g. regarding how the grid model was adapted to reflect a target year different from the one used for the TYNDP.

viii. Prescribe a modelling of reserve requirements in line with the applicable regulatory framework, to ensure a robust modelling of this aspect.

(c) The description of climate years was amended to ensure minimum comparability among the BZRRs. Additional climate years may also be considered within specific BZRRs if properly justified. Finally, the description highlights how to ensure that all climate years are considered on an equal footing.

(d) The description of load data was amended to:

i. Describe how to build a load curve ensuring a realistic representation of implicit demand response, at least for the day-ahead timeframe. To that end, the methodology defines preferred calculation approaches, but allows alternatives approaches if properly justified. Furthermore, the methodology defines a fall-back value for implicit demand response based on recent credible studies[6], but leaves freedom to follow alternative approaches if refined data is available.

ii. Explicitly request that implicit demand response be modelled, because it may significantly impact the welfare change under alternative BZ configurations[7].

iii. Describe how to value load-shedding in a realistic manner, as load-shedding may significantly impact the welfare change under alternative BZ configurations.

(e) The description of generation was amended to describe a minimum set of technical constraints required to ensure robust modelling of generation units. This description also explains how the modelling of technical constraints may be simplified, to ensure a feasible BZR.

(f) A description of storage was added to ensure realistic modelling of this technology in line with expected operational practices for the target year.

(g) The description of disaggregation of data to nodal level was clarified to explain that alternative disaggregation methodologies may be used, as long as they lead to a level of detail at least as good as the standard (TYNDP) disaggregation approach.

(h) The description of sensitivities was updated, to introduce a mandatory sensitivity to enable the assessment of the 'robustness of BZs over time' criterion. The description also specifies that all sensitivities must reflect appropriate and foreseeable variations and clarifies how to present the results from sensitivities to clearly differentiate them from the results of the 'main study'.

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[6] See https://ec.europa.eu/energy/sites/ener/files/documents/demand_response_ia_study_final_report_12-08-2016.pdf, p.27 and 63.

[7] Implicit demand response may participate in the market and contribute to resolve congestions, but is unlikely to participate in the remedial action mechanisms, which reduces efficiency, as described in previous work of ACER, e.g. see https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/acer%20market%20report%20on%20bidding%20zones%202014.pdf, p.10.

6.4.7. Amendments to Article 5 Modelling chain

(89) ACER found it necessary to update this Article to clarify the main steps of the BZR process. ACER made the following main changes:

(a) The description of cross-zonal exchanges was refined to ensure that electricity flows with third countries are properly modelled, thereby ensuring a realistic assessment while enabling a feasible BZR.

(b) The market time unit was set to one hour to strike a balance between accuracy and feasibility of the BZR.

(c) A request to make results available for each modelling step was included to ensure proper validation of the results and understanding of the final results.

6.4.8. Amendments to Article 6 Capacity calculation

(90) ACER found it necessary to update this Article to increase robustness and consistency. The updates strike a balance between ensuring a robust approach (mainly based on expected capacity calculation practices for the target year), a transparent calculation, and a feasible BZR process. ACER made the following main changes:

(a) The scope of coordination and governance among TSOs was aligned with the operational coordination scope of capacity calculation, i.e. the methodology requests to reflect coordination and governance within Capacity Calculation Regions (CCRs).

(b) To ensure consistency and comparability of results, it was specified that the same cross-zonal capacities should, as much as possible, apply across all BZRRs for a given BZ border. Moreover, to ensure feasibility of studies between different synchronous areas, an option to simplify cross-zonal capacities outside the considered synchronous area was introduced, consistently with the use of a simplified grid model.

(c) The potential simplifications to be applied have been described in more detail to ensure consistent simplification approaches among BZRRs.

(d) The requirement pursuant to Article 16(8) of the Electricity Regulation has been described in more details to improve consistency among BZRRs. The scope of derogations pursuant to Article 16(9) has also been included to ensure a realistic modelling of such derogations (if any).

(e) A requirement to use at least two sets of cross-zonal capacities was introduced, because cross-zonal capacities often significantly differ between winter and summer. It was also specified that TSOs need to refine cross-zonal capacities when these are expected to vary significantly within a season, to ensure a realistic modelling.

(f) To ensure a robust and feasible approach, further details on the capacity calculation approach were included, taking ACER Recommendation no 01/2019 of 8 August 2019[8] into account. Those details include the following:

i. To ensure feasibility of the BZR, a simplified approach to Flow Reliability Margin (FRM) calculation has been introduced to complement the detailed FRM calculation, in case the latter is not technically possible. This simplified approach requires the FRM to be set to 10% of Fmax for all CNECs (except High Voltage Direct Current (HVDC) lines), or any other fixed value if agreed by all TSOs of the relevant CCR (in line with currently adopted operational practices) to ensure a feasible yet realistic approach. A similar approach is allowed when no CNECs are defined in capacity calculation. To ensure comparability among alternative BZ configurations it is required that the simplified FRM consistently applies across all alternative BZ configurations.

   In practice, BZ configurations that are based on structural network congestion may reduce FRMs; however, based on the discussions between ACER and TSOs, accurately calculating FRMs in a BZR context seems technically difficult. ACER thus considered the simplified approach, above described, as an acceptable 'second best'.

ii. To ensure efficient congestion management principles, and given that:

   1. it is difficult to predict how the definition of CNECs may evolve when BZs change; and

   2. BZ configurations should be designed to maximise economic efficiency and cross-zonal trading opportunities pursuant to Article 14(1) of the Electricity Regulation,

   A requirement to perform a generic economic efficiency test for the selection of CNECs test was introduced. In this respect, the possibility to simplify the definition of internal CNECs based on a fixed Power Transfer Distribution Factor (PTDF) threshold was introduced. In this case, a default PTDF threshold was set to 10%, in order to approximate current operational practices as well as likely future developments (e.g. resulting from Article 16(8) of the Electricity Regulation) in capacity calculation. To reflect local specificities while ensuring efficiency at EU level, the possibility of using other fixed thresholds was envisaged, if appropriately justified.

[8] ACER Recommendation No 01/2019 of 8 August 2019 on the implementation of the minimum margin available for cross-zonal trade pursuant to Article 16(8) of Regulation (EU) 2019/943, available at: https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2001-2019.pdf

iii. To ensure realistic cross-zonal capacities, the maximum flow on a critical network element (Fmax) has to reflect expected operational practices for the target year.

iv. To enable robust comparison of welfare between alternative BZ configurations, only the coordinated Net Transfer Capacity (cNTC) approaches which allow to reflect the impact of alternative BZ configurations on cNTC values are allowed on BZ borders which are impacted by a change in BZ configuration.

v. To ensure a transparent and reliable modelling of how cross-zonal capacity is impacted by alternative BZ configurations (and consistent modelling with the consideration of remedial actions), some requirements related to the calculation of allocation constraints were introduced.

(g) In line with point (89)(c), ACER found it necessary to list the outputs that TSOs should provide following the capacity calculation simulation described in Article 6.

6.4.9. Amendments to Article 7 Day-ahead market dispatch

(91) ACER found it necessary to update this Article to increase robustness and consistency. ACER made the following main changes:

(a) The objective function was clarified to properly reflect the impact of demand response, in line with point (88)(d). Therefore, the day-ahead market dispatch maximises welfare, rather than minimising cost.

(b) To ensure realistic results when many units have similar marginal costs, in particular to reflect the different impact on the network of units with similar marginal cost, a small random mark-up has been introduced to differentiate units with similar marginal costs.

(c) To ensure realistic results, modelling a minimum set of technical constraints was required, e.g. regarding start-up and shutdown of power plants. Furthermore, additional requirements to ensure a realistic modelling of technical constraints and optimisation objectives underlying hydro power plants, were introduced. Similarly, to properly reflect intertemporal constraints, the market dispatch was required to jointly optimise market time units within a week.

(d) The modelling of reserves was clarified to properly reflect their impact on the market dispatch.

(e) To ensure meaningful comparisons between alternative BZ configurations, a requirement to deliver market dispatch results for the EU, was added.

(f) In line with point (89)(c), ACER found it necessary to list the outputs that TSOs should provide following the day-ahead market dispatch simulation described in Article 7.

6.4.10. Amendments to Article 8 Operational security analysis

(92) ACER found it necessary to update this Article to increase robustness and relevance. ACER made the following main changes:

(a) To ensure realistic results, detailed load-flow approaches (such as AC load-flow or DC load-flow accounting for losses) were specified as the preferred approach. As a fall-back, a simple DC load-flow was allowed to ensure feasibility of the BZR. To ensure consistency, a harmonised approach was required within a BZRR.

(b) To ensure consistency with capacity calculation and allocation, consistency between the contingencies considered in capacity calculation and in operational security analysis was requested. Similarly, a consistency requirement related to contingencies among alternative BZ configurations and climate years was introduced, to ensure comparability of the welfare results among alternative BZ configurations.

(c) Because many uncertainties which could happen between day-ahead capacity calculation and real time operations (such as unplanned outages, changes in weather conditions, etc.) are not explicitly modelled within the BZR, and to ensure that they are reflected in an approximate manner, a requirement to correct thermal ratings was introduced, to take into account that the FRM is intended to cope with these uncertainties. To avoid ambiguity, a list of operational security limits to monitor was introduced.

(d) In line with point (89)(c), ACER found it necessary to list the outputs that TSOs should provide following the operational security analysis described in Article 8.

6.4.11. Amendments to Article 9 Consideration of remedial actions

(93) ACER found it necessary to update this Article to increase robustness and relevance. ACER made the following main changes:

(a) As the amount of activated remedial actions may significantly differ among alternative BZ configurations, the cost to ensure availability of the units providing remedial actions also changes9. Therefore, ACER found it necessary to include a requirement to estimate this cost. As a simplification, the requirement assumes that, by default, the costs of ensuring availability are proportional to the volume of activated remedial actions. In addition, TSOs and one regulatory authority suggested that the cost of ensuring the availability of the units providing remedial actions should be proportional to the peak needs for remedial actions within a given MS. Additionally, TSOs considered that the peak needs for remedial actions

[9] See e.g. a relevant example of the effects of a BZ change in the costs to ensure availability for remedial actions, in recital 69 of the state aid case No. SA.42955 (2016/N-2), available at https://ec.europa.eu/competition/state_aid/cases/265043/265043_1872192_91_2.pdf .

in a given MS should be equal to the sum of the individual peak needs for each BZ within the MS. In this respect, ACER found it adequate:

i. To incorporate, as an alternative method, the possibility of considering the cost of ensuring availability to be proportional to the peak needs for remedial actions within a given MS. In ACER's view, the peak needs for remedial actions may differ among alternative BZ configurations and the costs to ensure the availability of the units providing remedial actions may indeed be related to the peak needs for remedial actions.

ii. Not to consider that the peak need for remedial actions in a MS is equal to the sum of the individual peak needs for each BZ within the MS. In ACER's view, for a given fixed amount of congestions that need to be addressed through remedial actions, the peak need for remedial actions in a given MS does not depend on the number of bidding zones in that MS.

(b) The cost of remedial actions may be higher than the cost of the same unit for the day-ahead dispatch, due to, inter alia, additional readiness costs and opportunity costs reflecting lost opportunity on other markets. This effect relates to the additional costs induced in other processes (e.g. in intraday and/or balancing markets) which are not explicitly modelled within the BZR; they thus do not lead to a transfer between parties, but rather to an increase in overall system costs. The Article now describes how to estimate the additional cost in a realistic and feasible manner, based on:

i. empirical information about costs from market-based redispatching; and/or

ii. additional costs considered on top of short-run marginal cost in non-market-based redispatching.

To ensure feasibility of the BZR, TSOs which lack relevant data may rely on data from neighbouring BZs (or from the EU as a whole).

(c) To ensure feasibility of the optimisation of remedial actions, the optimisation time window is set to one day (i.e. less than for the day-ahead market dispatch). Similarly, the optimisation of remedial actions may only be fully simulated for a representative reduced sample of days.

(d) To ensure consistency with the day-ahead market dispatch, the same technical constraints should be considered. However, given the additional complexity introduced by the detailed network modelling, constraints related to start-up and shutdown may be modelled in a simplified manner.

(e) The level of coordination of the optimisation of remedial actions must reflect the expected coordination of remedial actions for the target year, to ensure that the impact of imperfect coordination on the available and costs of remedial actions is properly reflected (if applicable).

(f) To ensure realistic cost estimates, non-costly remedial actions which are fully modelled must reflect expected operational practices for the target year (other non-costly remedial actions are modelled in line with point (88)(b)iii.1).

(g) To ensure realistic results, TSOs may calibrate the model to ensure that it leads to realistic costs of remedial actions.

(h) In line with point (89)(c), ACER found it necessary to list the outputs that TSOs should provide following the simulation of remedial actions described in Article 9.

6.4.12. Amendments to Article 10 Estimate of flows not induced by cross-zonal trade

(94) ACER found it necessary to specify an additional possibility to calculate the flows not induced by cross-zonal trade. TSOs may thus either apply the flow decomposition methodology applicable for cost-sharing of redispatching and countertrading costs in line with Article 74 of the CACM Regulation, if adopted, or alternatively the flow calculation methodology set forth in ACER Recommendation no 01/2019.

(95) ACER found it necessary to clarify for which CNECs and based on which CGMs the calculation has to be performed, for reasons of consistency with capacity calculation and operational security analysis processes.

(96) ACER found it necessary to calculate only the contribution of flows not induced by cross-zonal trade that are loading the CNEC, in line with the principle that only those flows effectively limit the capacity available for cross-zonal trade at the capacity calculation stage and bring a detrimental contribution to the violation of Operational Security Limits (OSLs) at the operational security analysis stage. In particular, this change enables a better assessment of the 'effects of internal transactions on other BZs' criterion.

6.4.13. Amendments to Article 11 LMP analysis

(97) ACER found it necessary to make the LMP analysis mandatory to identify commercially congested network areas, in line with paragraph (68), to support the delineation of bidding zones, and to enable the assessment of certain criteria.

(98) ACER considers that the objective function of the LMP analysis should be the maximization of socio-economic welfare rather than the minimization of total system costs for reasons of consistency with the day-ahead market dispatch.

(99) ACER found it adequate, compared to the day-ahead market dispatch, to allow TSOs to reduce the optimization period of the LMP analysis to one day so as to strive for feasible computational efforts, while ensuring realistic and robust results.

(100) ACER found it necessary to include DSR, storage, reserves and balancing requirements for reasons of consistency with the day-ahead market dispatch.

(101) ACER found it necessary to allow the modelling of technical constraints of generating units in a simplified manner, with some conditions, in order to strike a balance between computational complexity and accuracy of the results.

(102) ACER found it necessary to include at least Phase Shifting Transformers (PSTs) taps and HVDCs active power flows as optimization variables in the LMP analysis as, based on already-implemented operational practices, these optimization variables can be linearized, thus not causing any additional significant computational burden to the LMP analysis.

(103) ACER found it necessary to require the LMP analysis to be performed for all Market Time Units (MTUs) of the target year or, in case of technical limitations, for a minimum of eight weeks, ensuring that this limited time horizon is representative of the entire target year. This change strikes a balance between computational complexity and accuracy of the results.

(104) ACER found it necessary to include a list of the expected results of the LMP analysis, which would be subject to publication pursuant to Article 16 of the BZR methodology. This list ensures transparency and understanding of the LMP results by all interested stakeholders.

6.4.14. Amendments to Article 12 List of evaluation criteria

(105) ACER found the enumeration of the criteria included in this article in line with the minimum list of criteria set out in Article 33 of the CACM Regulation. However, ACER found it necessary, for the sake of legal certainty, to specify that the set of criteria to be used for the BZR are those listed in Article 12 of the BZR methodology so that it is ensured that additional criteria may only be used after their regulatory approval.

(106) ACER found it necessary, for the sake of robustness, to split a number of criteria into sub-criteria, to enable differentiated conclusions for each of the identified aspects within the scope of the said criteria. This includes the following criteria:

(a) The market concentration and market power criterion: ACER found it necessary to split this criterion into sub-criteria related to the various market timeframes, from long-term to day-ahead markets, on the one hand; and related to the TSOs' mechanism to resolve physical congestions on the other hand. More details on the split of this criterion into sub-criteria is provided in sub-section 6.4.17.

(b) The effective competition criterion: ACER found it necessary to split this criterion into three sub-criteria related to: i) short-term competition, ii) long-term competition and iii) competition in the access to cross-zonal capacity. More details on the split of this criterion into sub-criteria is provided in sub-section 6.4.17.

(c) The impact on the operation and efficiency of the balancing mechanisms and imbalance settlement processes criterion: ACER found it necessary to split this criterion into two criteria, as follows: i) the operation and efficiency of the balancing mechanisms and ii) the imbalance settlement process.

(d) The criteria related to energy transition. In line with the greenhouse gas emission reduction targets for the period from 2021 to 2030[10] and the feedback received from regulatory authorities and the AEWG, ACER found it necessary to split the analysis of the impacts on energy transition into three criteria related to i) short-term effects on CO_2 emissions; ii) short-term effects on RES integration; and iii) long-term effects on low-carbon investments.

(107) ACER found it necessary, for the sake of consistency, to combine the analysis of liquidity and transaction costs into one criterion, as these two aspects are intrinsically related, while in the updated BZR proposal the analysis of transaction costs was combined with transition costs, which are only relevant when estimating the cost of amending existing contractual obligations incurred by market participants.

6.4.15. Amendments to Article 13 Evaluation: General approach and outcome of the BZR

(108) The article includes a set of general guidelines to be followed, together with the description of the steps to be taken when evaluating of alternative BZ configurations.

(109) With regard to the general guidelines:

(a) ACER found that the option envisaged in the updated BZR proposal for TSOs to deviate, 'in case of technical limitations', from the assessment envisaged for each of the individual criterion does not contribute to the robustness of the methodology. ACER thus found it necessary to remove this provision. However, to address TSOs' concerns about the complexity of some requirements, ACER introduced the option for TSOs to assume, exceptionally and only until the relevant modelling tools are developed, that the alternative BZ configurations perform the same as the status quo BZ configuration. This exception applies exclusively to the analysis of the 'security of supply' and the 'efficiency of the balancing mechanisms sub-criterion', as both require the use of complex modelling tools that are not currently available.

(b) ACER found that the possibility, included in the updated BZR proposal, to perform sensitivity analysis, without specifying how those results would be combined with the results related to the 'main scenario' does not contribute to the robustness of the methodology. ACER thus found it necessary to clarify that the results derived from sensitivity analyses are to be presented in the final report, although clearly separated from the results of the 'main scenario' of the BZR (i.e. the 'main study'). This amendment is included in Article 13(2)(c).

(c) ACER found that the inclusion of a provision to estimate 'uncertainties' of the study without specifying how to estimate those 'uncertainties' and whether or how they would be combined with the results of the BZR does not contribute to the robustness of the BZR methodology. Instead, ACER included a requirement to

[10] For information on these targets, see https://ec.europa.eu/clima/policies/strategies/2030_en.

perform a minimum number of sensitivity analyses, which should aim to study appropriate and foreseeable deviations from the 'single' scenario. This amendment is included in Article 4.

(d) ACER found that limiting the scope of the assessment to the BZRR is not in line with the principle of maximising economic efficiency at the EU level, envisaged in the Electricity Regulation. ACER thus found it necessary to include a number of provisions describing the following principles:

i. In order to ensure consistency across BZRRs, TSOs are expected to jointly agree on the scope and the granularity of the assessment for each criterion. This has been defined in Article 14 'Evaluation criteria: Geographical delimitation'.

ii. In line with the objective of maximising EU welfare, the scope of the assessment for each criterion is required to be the EU, by default, or the BZRR, if an alternative BZ configuration is deemed not to have significant impacts outside the BZRR. For the 'Economic efficiency' criterion, which reflects monetised welfare impacts, the geographical scope is thus required to be the EU. These aspects have been described in Article 14(1).

(e) In ACER's view, including the breakdown of results per MS would allow MSs to be better informed when taking a decision on whether to amend or maintain the status-quo BZ configuration. ACER thus found it necessary to envisage the provision of results per MSs, subject to technical limitations. The necessary amendment is introduced in Article 13 and Article 15.

(110) The updated BZR proposal envisages three different steps to be taken when proceeding with the evaluation of alternative BZ configurations. ACER's views on each of the steps and the necessary amendments are described in the following paragraphs (111) to (119).

(111) ACER considered the evaluation approach described in Step 1 of the updated BZR proposal, to be appropriate; in particular, ACER considers that analysing certain criteria, in a first step, is in line with both the Electricity Regulation and the CACM Regulation, for the following reasons:

(a) In terms of substance, Article 14(1) of the Electricity Regulation establishes the overriding principle that BZs should be based on long-term, structural congestions in the transmission network and should be designed in such a way as to maximise economic efficiency and to maximise cross-zonal trading opportunities (in accordance with Article 16 of that Regulation), while maintaining security of supply. Moreover, Article 14(5) of the Electricity Regulation prescribes that the BZR methodology should be based on structural congestions which are not expected to be overcome within the following three years. In ACER's view, these principles are best addressed by the criteria included in Step 1, namely the

'Economic efficiency' and the 'Market outcomes in comparison to corrective measures' criteria[11], given that:

i. those criteria relate to structural congestions, because such criteria assess the extent to which the various alternative BZ configurations effectively deal with structural congestions in the market; and

ii. those criteria can be monetised in terms of socio-economic welfare, therefore aiming at identifying which alternative BZ configuration maximises economic efficiency.

In view of this, ACER finds it adequate that a certain alternative BZ configuration may be disregarded, even without further analysis, if such configuration fails to meet the basic principles of addressing structural congestions more efficiently than the status-quo configuration. In sum, Step 1 ensures that the prerequisites for defining BZs are met and, consequently, establishes a basis to determine, in subsequent steps, the alternative BZ configuration that performs the 'best', through the criteria listed in Article 33 of the CACM Regulation.

(b) In terms of procedural efficiency, it is also legitimate and reasonable in a complex economic and/or technical assessment to start with assessing those criteria that can be more easily quantified (monetised) and, as such, more efficiently compared. The criteria to be considered for monetised benefits in Step 1 refer to criteria listed in Article 33 of the CACM Regulation that, on the one hand meet the objectives described in point (111)(a) and, on the other hand, can be monetised.

(c) In terms of overall inclusiveness, Step 1 does not preclude the possibility, already included in the updated BZR proposal, for TSOs to proceed with the next steps of the assessment and consider also other criteria even if the monetised benefits of a given alternative BZ configuration, compared to the status quo, are negative in Step 1. Therefore, all criteria listed in Article 12 of the BZR methodology, and accordingly all of Article 33 of the CACM Regulation, can be considered effectively for the evaluation under Article 13 of the BZR methodology.

(112) ACER found it necessary, for the sake of completeness, to include in Step 1 other criteria that can be potentially monetised and thus contribute to the assessment of the two above mentioned requirements: i) the need to address structural congestions, and ii) the need of maximising economic efficiency. This includes the security of supply criterion and the sub-criterion related to the operation and efficiency of the balancing

[11] The 'Firmness cost' and 'Degree of uncertainty in cross-zonal capacity calculation' criteria are also implicitly included in Step 1, as they are considered to be monetised as part of the 'Economic efficiency' criterion. Additionally the criteria described in paragraph (112) are also included in Step 1; however, the monetisation of these criteria is subject to technical feasibility.

mechanisms. ACER thus amended Article 13 to envisage the possibility of monetising these additional criteria, subject to technical feasibility.

(113) ACER found it necessary to amend Article 13 to annualise 'transition costs' in a more robust manner. In particular, ACER considers that instead of annualising the transition costs over an assumed lifetime period of three years, the minimum lifetime of a given BZ configuration should be estimated. Such an estimation should be the lifetime needed for a given alternative BZ configuration to pay back the transition costs in light of the monetised benefits that it may render compared to the status quo configuration. This approach avoids predetermining the expected lifetime of a BZ configuration as it would be up to MSs to determine it. ACER thus introduced the corresponding amendment in Article 13(1)(a)(ii) and Article 13(1)(d)(v).

(114) ACER found it necessary to amend Article 13 to envisage the possibility of 'generating' additional alternative BZ configurations which simultaneously reflect multiple approved alternative BZ configurations, in order to consider the option of assessing the impact of multiple simultaneous changes of BZ configurations. ACER thus introduced this possibility, which is optional for TSOs, in Article 13(1)(a)(iii)(3).

(115) ACER found it necessary to introduce the following amendments to the Step 2 of the evaluation process to refine the granularity of the assessment of non-monetised criteria: First, ACER amended Article 13(1)(b)(ii) to envisage a more granular scale (other than "+", "0", "-") when qualifying the performance of alternative BZ configurations compared to the status quo; second, ACER amended Article 13(1)(d)(v)(4) to require TSOs to provide a more detailed outcome of the assessments performed pursuant to this second step.

(116) ACER found it necessary to split the third step of the updated BZR proposal into Step 3 and Step 4, to ensure a more detailed description of the process to reach a conclusion within the BZR.

(117) With regard to Step 3, ACER found it necessary to introduce the following amendments, aiming to ensure a more robust identification of alternative BZ configurations that perform below 'acceptable' levels:

(a) First, ACER introduced some general principles on how TSOs should make a preliminary identification of configurations performing below 'acceptable' levels. This is reflected in Article 13(1)(c)(ii)(1).

(b) Second, ACER found it necessary to ensure that both stakeholders' and regulatory authorities' views are adequately considered for TSOs to conclude on the 'acceptability' of the various alternative BZ configurations. ACER found that considering these views through consultation was a more transparent method than through an 'expert workshop', while the latter is not necessarily excluded. Thus, ACER replaced the expert workshop with a requirement to consult stakeholders on a set of minimum aspects, followed by a requirement to subsequently consult the relevant authorities. ACER finds this approach in line with the requirements of Articles 14(3) of the Electricity Regulation which requires performing the BZR

in a coordinated manner with the involvement of affected stakeholders in accordance with the CACM Regulation, while the latter further specifies, in its Article 12 and Article 32(4)(b)(ii), the need to consult stakeholders, including the relevant authorities. The corresponding amendments are described in Article 13(1)(c)(ii)(3) and Article 13(1)(c)(ii)(4) and in Article 17(4).

(c) Third, ACER found it necessary that stakeholders and relevant authorities are specifically consulted on measures that could mitigate negative impacts related to certain criteria, in case of a BZ change. This aims to more robustly consider possible market design improvements and other regulatory measures, including enhanced oversight, that would be beneficial in case of a BZ change. The corresponding amendments are included in Article 13(1)(c)(ii)(3).

(d) Fourth, ACER found it necessary that stakeholders are specifically consulted on practical considerations which may need to be considered in case of a possible BZ configuration change as set forth in Article 14(10) of the Electricity Regulation, including possible timescales for implementation of alternative BZ configurations. The corresponding amendments are included in Article 13(1)(c)(ii)(4) and Article 13(2)(a).

(118) To address TSOs' concerns about the possibility to refine the final recommendation in view of aspects that could not have been fully considered in the BZR methodology, otherwise potentially leading to an inconsistent outcome, ACER found it adequate to introduce the option for TSOs:

(a) to recommend an alternative BZ configuration that is not the one ranking first in terms of monetised benefits compared to the status quo, if TSOs can justify the recommendation; or

(b) to recommend maintaining the status quo configuration, if they can duly justify that this is a better option than any of the 'acceptable' alternative BZ configurations.

(119) Finally, ACER found it adequate to suggest a template to display the final results of the study, to ensure a harmonised and consistent consolidation and presentation of the results of the BZR. The corresponding amendment is described in Article 13(1)(d)(v).

6.4.16. Amendments to Article 14 Evaluation criteria: Geographical delimitation

(120) ACER found it necessary to amend this article to:

(a) Differentiate the requirements with regard to the geographical scope of the assessments from the ones with regard to the geographical granularity of the assessments.

(b) Require TSOs to ensure a consistent approach, with regard to the above-mentioned requirements, across BZRRs. This is in line with the view, expressed by a majority of stakeholders during the public consultation, that there is a need for further pan-European consistency in the updated BZR proposal.

(c) Specify when the geographical scope of the analysis has to be the EU and when it may be limited to the BZRR; and require that, specifically for the 'Economic efficiency' criterion, the geographical scope of the analysis must be the EU. This is in line with the objective of maximising welfare at the EU level, rather than only at the BZRR level.

(d) Include, for the sake of completeness, a wider range of options regarding the geographical granularity of the assessments.

6.4.17. Amendments to Article 15 Evaluation approach per criterion

(121) ACER found it necessary to amend Article 15(1) related to the 'Operational security' criterion, in order to:

(a) Explicitly require the use of the proposed indicators, instead of an optional analysis, for the sake of certainty and robustness.

(b) Include an additional indicator, 'congestion index', to assess the severity of the congestions identified following the day-ahead market dispatch. The indicator measures the extent to which the various BZ configurations contribute to keep the system within operational security limits by dealing with congestions in the market rather than at a later stage.

(122) ACER found it necessary to amend Article 15(2) related to the 'Security of supply' criterion, in order to:

(a) Replace the deterministic approach to assess security of supply, as envisaged in the updated BZR proposal, by a probabilistic approach in line with the updated framework to assess resource adequacy set forth in Article 23 of the Electricity Regulation.

(b) Add a requirement to consider the network within BZs rather than only the network between BZs, as the former is particularly relevant when assessing security of supply in the framework of a BZR.

(c) Include, as a transitional option, the possibility of considering that alternative configurations perform the same as the status quo with regard to the security of supply criterion, until the approach to assess security of supply described in Article 15(2) is technically feasible for TSOs.

(123) ACER found it necessary to amend Article 15(3) related to the 'Degree of uncertainty in cross-zonal capacity calculation' criterion, in order to:

(a) Ensure consistency between the analysis performed to assess this criterion and the flow reliability margins (FRMs) used in capacity calculation pursuant to Article 6 of the BZR methodology. Thus, a link between Article 15 (3) and Article 6 was reflected in the methodology.

(b) Reflect that this criterion is implicitly modelled and monetised as part of the 'Economic Efficiency' criterion.

(124) ACER found it necessary to amend Article 15(4) related to the 'Economic efficiency' criterion, in order to:

(a) Clarify the scope of the 'Economic efficiency' criterion. In particular, aspects related to the energy transition are either internalised as part of the market and redispatch simulations, i.e. CO_2 emissions costs, or analysed separately in a dedicated criterion, i.e. the effects on RES integration.

(b) Require a more detailed breakdown of socio-economic welfare, as an output of the assessment of this criterion.

(125) ACER found it necessary to amend Article 15(6) related to the 'Market liquidity and transaction costs' criterion, to ensure that: i) the assessment reflects liquidity impacts for both the long-term and the short-term market timeframes, rather than only on the latter; and ii) the assessment is made, as much as possible in a holistic manner, considering interdependences with other criteria, such as those related to the level of market competition and iii) the assessment duly takes stakeholders' feedback into account. In line with these objectives, ACER introduced the following changes, in order to:

(a) Request that the assessment includes an analysis of liquidity for both the long-term and the short-term market timeframes.

(b) Reflect that the analysis of liquidity and transaction costs in long-term timeframes should be based on a study conducted at EU level, and that it should aim to capture the impacts of long-term markets liquidity on the existence of sufficient hedging opportunities for market participants, in order to ensure a robust assessment of this topic.

(c) Describe a minimum set of analysis and indicators that must be performed to analyse liquidity and transaction costs in long-term timeframes, to ensure a robust and complete analysis. The indicators include traded volumes and bid-ask spreads. More specifically the lowest bid-ask spread per period that is relevant for market participants with hedging needs is required, because this is a relevant measure when assessing hedging opportunities[12].

(d) Require that the analysis for long-term timeframes is performed in a holistic manner, including the consideration of elements related to expected changes in competition.

(e) Require that the analysis for long-term timeframes identify practical considerations to consider in case of a BZ configuration change as set forth in Article 14(10) of the Electricity Regulation, including possible timescales for implementation of alternative BZ configurations.

[12] More information can be found in the consultancy study referenced in footnote 3.

(f) Require that the analysis for long-term timeframes considers the outcome of the public consultation conducted pursuant to Article 17(4) of the BZR methodology.

(g) Reflect that the analysis of liquidity and transaction costs in short-term timeframes should be based on a study conducted at EU level, to ensure consistency among BZRRs.

(h) Describe a minimum set of analysis and indicators that have to be considered to assess liquidity and transaction costs in short-term timeframes.

(i) Require that the analysis considers, where relevant, the possible effect of intra-company transactions on short-term liquidity following a BZ configuration change.

(j) Include the possibility that the analysis of liquidity and transaction costs in short-term timeframes incorporates timeframes beyond the day-ahead market timeframe.

(k) Include the possibility for TSOs to consult regulatory authorities on market liquidity and transaction costs, in which case TSOs must duly take regulatory authorities' opinion into account.

(126) ACER found it necessary to amend Article 15(7) related to the 'Market concentration and market power' criterion, in order to:

(a) Split the criterion into two sub-criteria to enable differentiated conclusions for each of the identified aspects within the scope of the said criterion. This includes the following aspects and sub-criteria: i) related to 'market concentration and market power' in the various market timeframes, including long-term to short-term markets; and ii) related to 'market concentration and market power' in the TSOs' mechanism to resolve physical congestions. Such a differentiation is important in order to reflect the fact that a higher (respectively lower) level of market concentration may potentially increase (respectively reduce) the scope for exerting market power in the markets spanning from the long-term to short-term, but it would in turn potentially decrease (respectively increase) the need for TSOs' to apply remedial actions, and thereby the scope for exerting market power in the TSOs' mechanism to resolve physical congestions.

(b) Clarify that the analysis must rely on at least one of the two proposed indicators.

(c) Include the calculation formulas for the proposed indicators, to avoid ambiguity.

(d) Adapt the Herfindal-Hirschman-Index (HHI) to better identify the relevant market areas, which may be different for each market time unit based on the geographical scope of price convergence.

(e) Describe specifically how the results of the analyses should be interpreted, differently for each of the sub-criteria, in view of the possible values obtained for the required indicators.

(127) ACER found it necessary to amend Article 15(8) related to the 'Facilitation of effective competition' criterion to:

(a) Split the criterion into sub-criteria, to enable differentiated conclusions for each of the identified aspects within the scope of the said criteria. This includes the following aspects and related sub-criteria: i) short-term competition, ii) long-term competition and iii) competition for cross-zonal capacity.

(b) Clarify how to perform a differentiated analysis for the short-term and long-term competition sub-criteria.

(c) Describe and request a specific analysis for the assessment of the 'Competition in the access to cross-zonal capacity' sub-criterion. This analysis aims to identify the extent to which some BZs, e.g. due to their relative smaller size, face structural disadvantages when competing for cross-zonal capacity with other BZs. This effect has been recognised by e.g. all Central Western Europe (CWE) regulatory authorities in a 'Position Paper of CWE regulatory authorities on Flow-Based Market Coupling'[13]. The paper acknowledged that, in the absence of interventions in the market coupling algorithm, which likely lead to sub-optimal outcomes[14], welfare may be 'lost in the smaller areas in favour of the bigger areas in a structural manner'. Such an effect can be mathematically related to systematic differences in the average PTDFs among BZs competing for the same cross-zonal capacity. ACER thus found it necessary to introduce an indicator which quantifies this effect.

(128) ACER found it necessary to amend Article 15(9) related to the 'Price signals for building infrastructure' criterion, in order to:

(a) Consider the concept of 'infrastructure' more broadly, including: i) generation or demand assets and ii) network infrastructure.

(b) Relate the assessment of price signals to build generation or demand assets, to the assessment of the 'Accuracy and robustness of price signals' criterion, pursuant to Article 15(10), because accurate and robust price signals are crucial to ensure efficient assets investment decisions.

(c) Remove the indicators which refer to the magnitude of the price differentials and congestion revenues. In ACER's view, the price differentials and congestion revenues do not always inform whether and where network infrastructure should be built. In particular, price differentials (and the related congestion revenues) on a given BZ border may suggest that network infrastructure is needed on the

[13] See page 13 of the position paper available at https://www.cre.fr/content/download/13078/file/150326_position_paper_flow_based.pdf.

[14] The paper also acknowledges that interventions in the market coupling algorithm to address structural differences in BZ sizes, such as the so-called flow-based intuitive (FBI) method, may lead to reduce global welfare.

physical border, while the physical congestions may occur somewhere else, e.g. within the BZ. ACER thus found it necessary to propose an alternative indicator, as described and justified in point (128)(d).

(d) Include, in line with point (128)(c) above, an indicator aiming to assess the extent to which market congestions and physical congestions are aligned, indicating whether the market provides relevant signals to build network infrastructure, because this better pursues the objectives, in Recital 30 of the Electricity Regulation, of providing effective price signals and steering efficiently necessary investments .

(129) ACER found it necessary to amend Article 15(10) related to the 'Accuracy and robustness of price signals' criterion, in order to:

(a) Include an adequate definition of ‘accuracy and robustness’. In particular, ‘robustness’ should not be interpreted in a way that two opposing objectives are pursued under the same criterion. In this respect, the updated BZR proposal interprets ‘robustness’ as a situation where prices are not sensitive to changes in the surrounding ‘political or economic conditions’, which would be in conflict with the definition of ‘accuracy’. ACER thus found it necessary to provide compatible definitions for these terms and that are in line with the objective of ensuring effective price by means of BZs that reflect structural congestion, as envisaged in Recital 30 of the Electricity Regulation. ACER thus provided updated definitions in Article 15(10) of the BZR methodology.

In line with the paragraph (128) and contrary to the observation of TSOs and one regulatory authority, ACER considers that the ‘higher occurrence of low or negative prices’ does not imply that price signals are less robust and thus ACER did not incorporate such observation in the BZR methodology.

(b) Replace the indicators included in the updated BZR proposal by an indicator better reflecting the accuracy and robustness of price signals, in line with point (129)(a).

(130) ACER found it necessary to amend Article 15(11) related to the 'Transition costs' criterion, in order to:

(a) Decouple ‘transition costs’ from ‘transaction costs’ because these two type of costs are conceptually different, in line with paragraph 6.4.15 of the present Decision.

(b) Refine the scope of ‘transition costs’, considering that these costs may be impacted by the fact that MSs are required, when deciding on the implementation date of an eventual bidding zone change, to balance the need for expeditiousness with practical considerations, including forward trade of electricity, in line with Article 14(5) of the Electricity Regulation.

(c) Describe how the estimated ‘transition costs’ should be used to calculate the minimum lifetime of a BZ configuration in line with paragraph (113) of the present Decision.

(131) ACER found it necessary to amend Article 15(12) related to the 'Infrastructure cost' criterion, in order to:

(a) Reflect the need to consider ‘infrastructure costs’ as a criterion which is sensitive to alternative BZ configurations, because BZ configurations reflecting structural congestions steer investments in a cost-efficient manner, as described in Recital 30 of the Electricity Regulation.

(b) Relate, for consistency reasons, the assessment of this criterion to two other criteria related to price signals to attract investments in the ‘right’ locations, i.e. i) ‘Accuracy and robustness of price signals’ and ii) ‘Price signals for building infrastructure’.

(132) ACER found it necessary to amend Article 15(14) related to the 'Adverse effects of internal transactions on other BZs' criterion, in order to:

(a) Describe the specific indicators to be used, aiming to quantify both average loop flow values and the number of occurrences of loop flows values above a given threshold, in line with applicable redispatching and countertrading cost sharing methodologies, pursuant to Article 74 of the CACM Regulation.

(b) Specify that the network elements where the loop flows indicator should be quantified is: i) network elements with congestions identified following the day-ahead market dispatch, and ii) network elements with congestions identified following the operational security analysis.

(c) Request an assessment of impacts derived from inaccurate price signals, potentially leading to inefficient investments in other BZs. These impacts are assessed through the 'Accuracy and robustness of price signals' and the 'Price signals for building infrastructure' criteria. ACER found that the additions included in this paragraph and in point (132)(b) above allow for a more comprehensive assessment of the adverse effects of internal transactions.

(133) ACER found it necessary to amend Article 15(15) related to the 'Impact on the operation and efficiency of the balancing mechanisms and imbalance settlement processes' criterion, in order to:

(a) Split the criterion into two sub-criteria, to enable differentiated conclusions for each of the identified aspects within the scope of the criterion. This includes the following aspects and sub-criteria: i) the operation and efficiency of the balancing mechanisms and ii) the imbalance settlement process.

(b) With regard to the sub-criterion i), request a comprehensive analysis, subject to technical limitations, of the welfare impacts in the balancing timeframe for the alternative BZ configurations, compared to the status-quo configuration. ACER found that analysing only ‘reserve requirements’ (as required in the updated BZR proposal) would potentially lead to incorrect conclusions, as it would disregard several other impacts associated to the operation of the balancing mechanism, such

as the effects on remedial actions costs to prevent violations of OSLs, related to the geographical distribution of balancing reserves.

(c) Include, as a transitional option, the possibility of considering that alternative configurations perform the same as the status quo with regard to the 'Impact on the operation and efficiency of the balancing mechanisms', until the approach to assess this criterion, described in Article 15(15), is technically feasible for TSOs.

(d) Relate the assessment of the sub-criterion ii) to the 'Accuracy and robustness of price signals' criterion, because accurate and robust imbalance prices correctly incentivise balance responsible parties (BRPs) to support an efficient balancing of the system when and where they are needed.

(134) ACER found it necessary to amend Article 15(16) related to the 'Stability and robustness of BZs over time' criterion, in order to explicitly request a minimum number of sensitivity analyses, as a firm requirement rather than as optional assessment. ACER considers that alternative quantitative analyses are more robust than only an 'expert discussion'.

(135) ACER found it necessary to amend Article 15(18) to reflect that the 'Assignment of generation and load units to BZs' criterion is essentially a prerequisite to be met and that such a prerequisite should be ensured when defining alternative BZ configurations; additionally it should be confirmed during the BZR.

(136) ACER found it necessary to amend Article 15(19) related to the 'Location and frequency of congestion (market and grid)' criterion, in order to request two indicators which better reflect the criterion. In particular, the assessment should aim to detect whether the BZ configurations are consistent with the location of congestions, i.e. that they are designed in such a way that i) most physical congestions are detected in the market, and ii) congestions lay mostly on BZ borders and only residually inside BZs.

(137) ACER found it necessary to split the analysis of the impacts on energy transition into three criteria related to i) short-term effects on CO_2 emissions; ii) short-term effects on RES integration; and iii) long-term effects on low-carbon investments.

(a) With regard to i), ACER found it necessary to incorporate an additional criterion, rather than considering the analysis 'for information', as described in Article 15(20).

(b) With regard to ii), ACER did not make any substantial change.

(c) With regard to iii), ACER found it necessary to describe the analysis to be performed, in Article 15(22). Specifically, ACER requested to rely on two other criteria, namely: i) the 'Accuracy and robustness of price signals' and ii) 'Price signals for building infrastructure'. ACER found that these two criteria indicate the effectiveness of price signals: i) for generation capacity, including RES; ii) demand response and iii) transmission infrastructure, in line with the arguments provided in paragraph (128) and (129). In particular, effective price signals to incentivise the uptake of demand response and investments in transmission

infrastructure contribute to the cost-efficient integration of RES and other low-carbon investments in the long-term.

(138) Contrary to the observation of TSOs, ACER did not find it necessary to include additional assessments to reflect risks or other negative impacts associated to the 'higher occurrence of low or negative prices'. First, in line with point (129)(a), ACER does not find that the higher occurrence of low or negative prices implies that the price signals are less robust, as long as such occurrences accurately reflect the underlying market fundamentals. And second, ACER considers that the (already included) assessment of market liquidity, in particular of the existence of sufficient hedging opportunities, is an adequate analysis to evaluate the described risks.

(139) Additionally, for each of the criterion included in Article 15, ACER found it necessary to describe how the results of the analyses should be interpreted in view of the different values of the various indicators assessed for each alternative BZ configuration in comparison with the status-quo, in order to ensure consistency among BZRRs.

6.4.18. Removal of the Article 14 of the updated BZR proposal

(140) ACER found it necessary to remove Article 14 of the updated BZR proposal, as this article referred to: i) the process to adopt the BZR methodology pursuant to Articles 14(5) of the Electricity Regulation, and ii) to the obligation for TSOs to submit a joint proposal to relevant MSs to amend or maintain the bidding zone, pursuant to Article 14 (6) of the Electricity Regulation; however these two aspects are not within the scope of the BZR methodology itself.

6.4.19. Amendments to Article 16 Transparency

(141) ACER found it necessary to introduce a specific article on transparency to ensure ‘a coherent, objective and reliable determination of BZs via a transparent process’ as envisaged in Recital 30 of the Electricity Regulation. In this respect, ACER found it necessary to remove Article 16(2) of the updated BZR proposal that considers that all information handled during the BZR is, by default, market sensitive and therefore needs to be treated as confidential, as it is not in line with the objective described.

(142) The Article introduced by ACER also ensures that the transparency requirements imposed on TSOs are proportionate to the aim pursued (e.g. by only requiring to publish certain detailed data upon request) and that the said requirements preserve confidentiality where relevant (e.g. confidential information under a given jurisdiction has to be published, for that jurisdiction, with the minimum level of aggregation, protecting confidentiality interests). In general, the addition of this Article is in line with the view, expressed by a majority of stakeholders during the public consultation, that there is a need for strengthening transparency in the updated BZR proposal.

6.4.20. Amendments to Article 17 Stakeholder involvement and consultation

(143) ACER found it necessary to introduce Article 17 to ensure a sufficient level of interaction and consultation with stakeholders, including the relevant authorities, in line with the legal arguments provided in point (60)(d). This is in line with the view, expressed by a majority of stakeholders during the public consultation, that there is a need for strengthening stakeholders' engagement in the updated BZR proposal.

6.4.21. Amendments to Article 18 Coordination among BZRRs

(144) ACER found it necessary to introduce Article 18 to ensure a sufficient level of coordination among BZRR, in line with the consultation with stakeholders, including relevant authorities. In line with the view expressed by a majority of stakeholders during the public consultation, this coordination ensures further harmonisation and pan-European consistency. In general, the addition of this Article is in line with the view, expressed by a majority of stakeholders during the public consultation, that there is a need for increased coordination across the EU in the updated BZR proposal.

6.5. Other changes to the BZR proposal

(145) ACER made several editorial changes to the BZR proposal with the aim to correct a number of typos and to ensure consistency throughout the BZR methodology, in particular in view of the substantive changes introduced by ACER.

7. REQUEST FOR ADDITIONAL INFORMATION TO DECIDE ON ALTERNATIVE BIDDING ZONE CONFIGURATIONS

(146) Pursuant to Article 3(2) of Regulation (EU) 2019/942, at ACER's request, which can take the form of a decision, TSOs shall provide to ACER the information necessary for the purpose of carrying out ACER's tasks under this Regulation, unless ACER has already requested and received such information.

(147) As explained in paragraphs (62) to (68), ACER requires data from a LMP analysis to take a decision on alternative BZ configurations; however TSOs have not performed this analysis and have not provided this data yet.

(148) In the course of these proceedings, ACER discussed with TSOs the need for the LMP analysis, the technical requirements and the feasibility in a reasonable timeline. In this respect, TSOs made a number of suggestions on such requirements in relationship with the timeline. Taking into account these suggestions, ACER specified the technical requirements and timeline for the provision of the requested data as set out in Annex II of this Decision.

(149) Given that the technical requirements defined by ACER do not go beyond what is strictly necessary for assessing the proposed alternative BZ configurations, that the timeline set by ACER leaves the TSOs sufficient time to provide the information, and that TSOs' suggestions were taken into account, ACER considers that the request for data set out in Annex II of this Decision is proportionate.

(150) ACER considers that the request to perform a LMP analysis needs to be addressed to all TSOs for the following reasons:

(a) First, as long as there are structural, physical or commercial, congestions within the area operated by a TSO, such geographical area should be subject to a BZR process that considers alternative BZ configurations for the said area, in line with point (52)(b), requiring 'all structural congestions' to be analysed.

(b) Second, the analysis of structural congestions should not be limited to identify the presence of structural physical congestions within a given BZ, but it should also analyse structural commercial congestions, in line with paragraphs (65) to (67).

(c) Third, the arguments provided by TSOs are, in general, insufficient to conclude that their BZs contain no structural congestions and in particular, to establish a cause-effect relationship between physical and commercial structural congestions. In particular, ACER considers that, as a first step, a LMP analysis is necessary to identify the BZs, and in particular the network areas, significantly contributing to structural physical congestions.

(151) ACER also considers that, in the specific case of United Kingdom, the relevant TSO(s) may be exempted from performing the LMP analysis if the TSO envisages that the Electricity Regulation and the CACM Regulation are not expected to apply in this MS for the target year of the BZR.

(152) In order to ensure robust and timing delivery of the data request, TSOs are recommended to organise, during the LMP simulations, frequent interactions with regulatory authorities and ACER, including:

(a) discussions and brief consultation on the input data;

(b) discussions to agree on the specific formats to be used by TSOs when delivering the data to ACER;

(c) clarifications on the modelling assumptions; and

(d) discussions and brief consultation on metrics to assess reliability and robustness of the results.

(153) For all those reasons, ACER considers it necessary, in order be able to decide on the proposed alternative BZ configurations according to Article 5(7) of Regulation (EU) 2019/942 and Article 14(5) of Regulation (EU) 2019/943, to request, in accordance with Article 3(2) of Regulation (EU) 2019/942, all TSOs to provide the information as specified in Annex II to this Decision.

8. CONCLUSION

(154) For the above reasons, ACER considers the following:

(a) The part of the updated BZR proposal referring to the BZR methodology and assumptions is in line with the requirements of the Electricity Regulation,

provided that the amendments described in section 6.4 and 6.5 above are integrated in the BZR methodology and assumptions, as presented in Annex I in conjunction with Annexes Ia and Ib, to this Decision. Therefore, ACER approves the BZR methodology and assumptions subject to the necessary amendments. Annex I, together with Annexes Ia and Ib, to this Decision sets out the BZR methodology and assumptions as amended and approved by ACER.

(b) Additional information is needed for ACER to assess whether the part of the updated BZR proposal concerning alternative BZ configuration is in line with the requirements of the Electricity Regulation. Therefore, ACER considers it necessary that TSOs submit additional information to enable ACER to take a decision on alternative BZ configurations. The scope and requirements, including submission deadlines, of the requested information is defined in Annex II to this Decision,

HAS ADOPTED THIS DECISION:

Article 1

The methodology and assumptions that are to be used in the bidding zone review process in accordance with Article 14(5) of Regulation (EU) 2019/943 are adopted as set out in Annex I in conjunction with Annex Ia and Annex Ib, to this Decision.

Article 2

The transmission system operators shall provide ACER with the information as set out in Annex II to this Decision.

This Decision is addressed to:

50Hertz - 50Hertz Transmission GmbH
Amprion - Amprion GmbH
APG - Austrian Power Grid AG
Augstsprieguma tïkls - AS Augstsprieguma tïkls
BritNed - BritNed Development Limited
ČEPS - ČEPS a.s.
Creos Luxembourg S.A.
EirGrid - EirGrid plc
Eirgrid Interconnector - Eirgrid Interconnector DAC
ElecLink - ElecLink Ltd
Elering - Elering AS
ELES - ELES, d.o.o. Sistemski operater prenosnega elektroenergetskega omrežja
Elia - Elia Transmission Belgium SA/NV
Energinet – Energinet
ESO - Electroenergien Sistemen Operator EAD

Fingrid - Fingrid Oyj
HOPS - Croatian Transmission System Operator Ltd
Independent Power Transmission Operator S.A. ("IPTO" or “ADMIE”)
Kraftnät Åland - Kraftnät Åland Ab
LITGRID - Litgrid AB
MAVIR Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság
Moyle Interconnector - Moyle Interconnector Ltd
National Grid ESO - National Grid ESO
National Grid Interconnectors - National Grid Interconnectors Ltd
PSE - Polskie Sieci Elektroenergetyczne S.A.
REE - Red Eléctrica de España S.A.
REN - Rede Eléctrica Nacional, S.A.
RTE - Réseau de Transport d'Electricité, S.A
SEPS - Slovenská elektrizačná prenosovú sústava, a.s.
SONI - System Operator for Northern Ireland Ltd
Svenska Kraftnät - Affärsverket svenska kraftnät
TenneT GER - TenneT TSO GmbH
TenneT TSO - TenneT TSO B.V.
Terna - Terna Rete Eletrica Nazionale S.p.A.
Transelectrica - National Power Grid Company Transelectrica S.A.
Transmission System Operator – Cyprus
TransnetBW -TransnetBW GmbH
VUEN - Vorarlberger Übertragungsnetz GmbH

Done at Ljubljana, on 24 November 2020.

- SIGNED -

For the Agency
The Director

C. ZINGLERSEN

Annexes:

Annex I – Methodology and assumptions that are to be used in the BZR process in accordance with Article 14(5) of the Electricity Regulation

Annex Ia – List of minimum data to be published in accordance with Article 16 of the BZR methodology and assumptions pursuant to Annex I

Annex Ib – Template to consolidate the results of the BZR, for each BZRR in accordance with Article 13(1)(d) of the BZR methodology and assumptions, pursuant to Annex I

Annex II – Detailed requirements, including submission deadlines, of the data request to TSOs, issued as part of the present Decision

Annex III (for information only) – Evaluation of the responses received in the context of the public consultation launched by ACER on 1 April 2020 with a view to support the approval of the BZR proposal

In accordance with Article 28 of Regulation (EU) 2019/942, the addressee may appeal against this Decision by filing an appeal, together with the statement of grounds, in writing at the Board of Appeal of ACER within two months of the day of notification of this Decision.

In accordance with Article 29 of Regulation (EU) 2019/942, the addressee may bring an action for the annulment before the Court of Justice only after the exhaustion of the appeal procedure referred to in Article 28 of that Regulation.

ACER
European Union Agency for the Cooperation of Energy Regulators

ACER Decision on the methodology and assumptions that are to be used in the bidding zone review process and for the alternative bidding zone configurations to be considered: Annex I

Methodology and assumptions that are to be used in the bidding zone review process

in accordance with Article 14(5) of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity

24 November 2020

Contents

Whereas

(1) This document sets out the methodology and assumptions that are to be used in the bidding zone (hereinafter referred to as 'BZ') review process pursuant to Article 14(5) of Regulation (EU) 2019/943 of the European Parliament and Council of 5 June 2019 on the internal market for electricity (recast) (hereinafter referred to as the 'Electricity Regulation'). This methodology is hereinafter referred to as the 'BZR Methodology'.

(2) The present BZR Methodology refers to alternative BZ configurations to be considered as if they were approved, pursuant to Article 14(5) of the Electricity Regulation; however, these alternative BZ configurations will be only approved in another decision to be issued separately from the present BZR Methodology, at a later stage.

(3) The BZR Methodology is based on structural congestions which are not expected to be overcome within the following three years, taking due account of tangible progress on infrastructure development projects that are expected to be realised within the following three years as set forth in Article 14(5) of the Electricity Regulation.

(4) The BZR Methodology takes into account the general principles and goals set in the Electricity Regulation and in Commission Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management (hereinafter referred to as the 'CACM Regulation').

(5) The BZR Methodology describes how to assess the ability of BZs to:

(a) maximise economic efficiency and cross-zonal trading opportunities in accordance with Article 16 of the Electricity Regulation, while maintaining security of supply, as set forth in Article 14(1) of the Electricity Regulation;

(b) create a reliable market environment, including for flexible generation and load capacity, which is crucial to avoiding grid bottlenecks, balancing electricity demand and supply and securing the long-term security of investments in network infrastructure. as set forth in Article 14(3) of the Electricity Regulation;

(c) reflect supply and demand distribution, ensure market liquidity, efficient congestion management, overall market efficiency, and operational security as set forth in Recital 19 of the Electricity Regulation; and

(d) provide effective price signals for new generation capacity, demand-side response (DSR) and transmission infrastructure as set forth in Recital 30 of the Electricity Regulation.

(6) The BZR Methodology takes into account the need to ensure that BZs reflect structural congestions and that in particular, cross-zonal capacity is not reduced in order to resolve internal congestions, as set forth in Recital 30 of the Electricity Regulation. In order to ensure this, the BZR Methodology takes into account the objective of finding a common solution on how to best address congestions as set forth in Recital 31 of the Electricity Regulation.

(7) The BZR Methodology takes into account the criteria for reviewing BZ configurations set out in Article 33 of the CACM Regulation.

(8) The BZR Methodology takes into account the need to involve and consult stakeholders and the relevant authorities as set forth in Article 14(3) of the Electricity Regulation, and Article 12 and Article 32(4)(b) of the CACM Regulation.

(9) The BZR Methodology ensures that relevant information is made transparent for stakeholders, to enable them understand and prepare for potential changes of the BZ configuration, and that detailed results are made available to MSs with a view to enable them to take an informed decision on whether to maintain or amend the BZs.

(10) The BZR Methodology recognises the need to protect confidential information in accordance with Article 13 of the CACM Regulation.

Article 1. Subject matter and scope

1. This BZR Methodology specifies the methodology and assumptions which the TSOs shall use in the BZR process.

Article 2. Definitions and interpretation

1. For the purposes of this BZR Methodology, the terms used shall have the meaning given to them in Article 2 of the Electricity Regulation, in Article 2 of the CACM Regulation, in Article 2 of Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation, in Article 3 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereinafter referred to as the 'SO Regulation') and in Article 2 of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing.
2. In addition, the following definitions and acronyms shall apply. In the event of any inconsistency between the following definitions and the definitions pursuant to paragraph 1, the latter shall prevail.
   (a) AC: Alternating Current;
   (b) ACER: Agency for Cooperation of Energy Regulators;
   (c) AMR: Adjustment for the minimum remaining available margin;
   (d) 'approval year' means the year when the configurations for a given BZR Region is approved;
   (e) BRP: Balancing Responsible Party;
   (f) BSP: Balancing Service Provider;
   (g) BZR: BZ Review;
   (h) BZRR: BZ Review Region means a set of BZs defined for the purpose of the BZR;
   (i) CCM: Capacity Calculation Methodology;
   (j) CCR: Capacity Calculation Region, pursuant to Article 2 of Electricity Regulation;
   (k) CGM: Common Grid Model;
   (l) CNE: Critical Network Element;
   (m) CNEC: Critical Network Element and Contingency means a CNE associated with a contingency used in capacity calculation. For the purpose of this BZR Methodology, the term CNEC also covers the case where a CNE is used in capacity calculation without a specified contingency;
   (n) Core DA CCM: means the common day-ahead capacity calculation methodology for the Core CCR[1];
   (o) 'cross-zonal' network element means a network element located on the BZ border or connected in series to such network element transferring the same power (without considering the network losses);
   (p) DC: Direct Current;

[1] Pursuant to ACER's Decision No 02/2019, available at https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Decision%2002-2019%20on%20CORE%20CCM.pdf

(q) DSR: Demand-Side Response;

(r) EC: European Commission;

(s) EENS: Expected Energy Not Served means, in a given modelled zone and in a given time period, the expected ENS;

(t) ENS: Energy Not Served means, for a given MTU and modelled zone, the energy which is not supplied due to insufficient capacity resources to meet the demand;

(u) ENTSO-E: European Network of Transmission System Operators for Electricity;

(v) ERAA: European Resource Adequacy Assessment;

(w) EU: European Union;

(x) FB: Flow-Based means the flow-based approach pursuant to CACM Regulation;

(y) FCR: Frequency Containment Reserve pursuant to SO Regulation;

(z) Fmax: Maximum flow on a critical network element;

(aa) Fref: Reference flow;

(bb) FRM: Flow Reliability Margin means the Reliability Margin as defined in Article 2(14) of the CACM Regulation applied to a CNEC;

(cc) FRR: Frequency Restoration Reserve pursuant to SO Regulation;

(dd) GSK: Generation Shift Keys pursuant to CACM Regulation;

(ee) HHI: Herfindahl-Hirschman Index;

(ff) HVDC: High Voltage Direct Current network element;

(gg) LMP: Locational Marginal Pricing;

(hh) LOLE: Loss Of Load Expectation means, in a given modelled zone and in a given time period, the expected number of hours in which resources are insufficient to meet the demand;

(ii) MACZT: Margin Available for Cross-Zonal Trade, i.e. the portion of capacity of a CNEC available for cross-zonal trade;

(jj) MACZT Recommendation: Recommendation of ACER on the implementation of MACZT[2];

(kk) MTU: Market Time Unit means the market time unit used for the modelling chain;

(ll) 'new BZ' refers to a BZ which does not coincide with any of the BZs of the status quo BZ configuration;

(mm) 'non-costly remedial action' refers to a remedial action without cost, e.g. changing PST tap positions and other topological actions, or changing HVDC active (or reactive) power flow, in line with Article 25(5) of the CACM Regulation;

(nn) NTC: Net Transfer Capacity means the cross-zonal capacity calculated using the coordinated NTC (cNTC) calculation approach, as defined in Article 2(8) of the CACM Regulation;

[2] Recommendation no 01/2019 of the European Union Agency for the Cooperation of Energy Regulators of 08 August 2019 on the implementation of the minimum margin available for cross-zonal trade pursuant to Article 16(8) of Regulation (EU) 2019/943, available at https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2001-2019.pdf

(oo) OSL: Operational Security Limit (including thermal rating);

(pp) PEMMDB: Pan-European Market Modelling Database means detailed ENTSO-E data following the National Trends scenario designed for the TYNDP;

(qq) PSI: Pivotal Supplier Index;

(rr) PST: Phase Shifting Transformer;

(ss) PTDF: Power Transfer Distribution Factor means an indicator which describes the impact of a BZ net position or of a commercial exchange between two BZs on a CNEC;

(tt) RAM: Remaining Available Margin means margin of a CNEC available for cross-zonal trade within a CCR;

(uu) RAO: Remedial Actions Optimisation;

(vv) RES: Renewable Energy Sources;

(ww) RR: Replacement Reserve pursuant to SO Regulation;

(xx) RSI: Residual Supply Index;

(yy) 'socio-economic welfare' means the aggregation of the economic surpluses of electricity consumers, producers, and transmission network owners (congestion revenue);

(zz) 'status quo configuration' means the BZ configuration which is expected to apply for the target year based on previously-adopted decisions[3];

(aaa) 'target year' means the year for which the BZ configurations are evaluated and compared;

(bbb) TRM: Transmission Reliability Margin means the Reliability Margin as defined in Article 2(14) of the CACM Regulation on a BZ border;

(ccc) TSO: Transmission System Operator;

(ddd) TYNDP: Ten-year network development plan means the 2020 edition of ENTSO-E's ten-year network development plan;

(eee) UCED: Unit Commitment Economic Dispatch refers to the problem that determines the commitment and schedule of individual generation, storage and DSR units in order to minimise operating costs while supplying demand and meeting technical and security constraints of both network and units; and

(fff) VOLL: Value Of Lost Load.

3. In the BZR Methodology, unless the context requires otherwise:

(a) the singular indicates the plural and vice versa;

(b) headings are inserted for convenience only and do not affect the interpretation of the BZR Methodology;

(c) any reference to legislation, regulations, directives, orders, instruments, codes or any other enactment shall include any modification, extension or re-enactment of it when in force; and

(d) any reference to an Article without an indication of the document shall mean a reference to the BZR Methodology.

[3] For example, as Italy decided to update its BZ configuration, which is expected to be implemented in 2021 (as described in footnote 4), this new configuration shall be considered as status quo for the target year.

Article 3. Overview of the BZR process

1. The TSOs shall perform a BZR consisting of the following steps:
   (a) TSOs shall define the scenario and assumptions pursuant to Article 4.
   (b) TSOs shall perform the modelling chain in accordance with Article 5 for the scenario, for all the alternative BZ configurations and for the status quo BZ configuration.
   (c) TSOs shall evaluate the relative performance of all the alternative BZ configurations according to Article 13.
   (d) TSOs shall publish the results of the BZR which shall include a proposal to the relevant MS on maintaining or amending the BZ configurations.
2. TSOs may conduct the specific tasks described in Article 5 to Article 15 at the BZRR level, except when specified otherwise in the said articles. When performing tasks at the BZRR level, the following BZRRs and BZs shall be considered:
   (a) the BZRR Central Europe comprises the BZs: France, Belgium, The Netherlands, Germany/ Luxembourg, Austria, Czech Republic, Poland, Slovakia, Hungary, Slovenia, Croatia, Romania, Denmark 1, and Italy 1 (Nord);
   (b) the BZRR Nordic comprises the BZs: Finland, Sweden 1, Sweden 2, Sweden 3, Sweden 4, and Denmark 2;
   (c) the BZRR South-East Europe comprises the BZs: Bulgaria and Greece;
   (d) the BZRR Central Southern Italy comprises the BZs: Italy 2 (Cnor), Italy 3 (Csud), Italy 4 (Sud), Italy 5 (Sici), Italy 6 (Sard), and Italy 7 (Rosn/Cala)[4];
   (e) the BZRR Iberian Peninsula comprises the BZs: Spain and Portugal;
   (f) the BZRR Baltic comprises the BZs: Estonia, Latvia and Lithuania;
   (g) the BZRR Ireland comprises the BZ: Ireland Single Electricity Market; and
   (h) the BZRR Great Britain comprises the BZ: Great Britain.

Article 4. Scenario, sensitivities, and assumptions

1. Scenario and target year: The scenario shall reflect the best forecast of TSOs for the target year. The target year shall be three years after the approval year. The TSOs may build this scenario based on the TYNDP data set. In this case, TSOs shall adapt, where needed, the TYNDP data set to reflect the latest available information, e.g. concerning network elements expected to be operational in the target year pursuant to point 2(e) of this article. The scenario assumptions shall align with paragraphs 2 to 9 of this article.
2. Network: The network model shall reflect the European power grid, and shall fulfil the following minimum requirements:
   (a) 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

[4] This BZRR reflects the BZ configuration approved by the Italian NRA on 19 March 2019 (ARERA Decision 103/2019/R/EEL). This BZ configuration is expected to be implemented in 2021.

with respect to electricity impedances, flows and operational security limits within the considered BZRR.

(b) Contingencies and OSLs related to network elements operating at nominal voltage higher than or equal to 380 kV shall be included. Contingencies and OSLs related to network elements operating at nominal voltage levels below 380 kV shall be excluded (and these network elements shall thus not be considered as CNEs in Article 6.7), unless TSOs are able to justify properly why different BZ configurations would significantly affect either:

i. the impact of contingencies in lower voltages on violation of OSLs on 380 kV network elements;

ii. violations of OSLs on lower voltage network elements; or

iii. the remedial actions available to solve the violations of OSLs on lower voltage network elements or on 380 kV network elements.

Such a justification may rely on:

i. a simplified network analysis highlighting the impact of alternative BZ configurations on flows and operational security limits of specific network elements or voltage levels; and

ii. a consultation of regulatory authorities on the topic pursuant to Article 17.2 and Article 17.3.

(c) The availability and activation of non-costly remedial actions shall reflect the best expected operational practices for the target year. In case non-costly remedial actions are expected to solve or alleviate the impact of specific contingencies or OSLs, TSOs may individually remove or increase some OSLs or remove some contingencies from the list defined in point 1(b) of this article, properly justifying such an approach and consulting regulatory authorities on the topic pursuant to Article 17.2 and Article 17.3.

(d) In this case, these non-costly remedial actions shall be unavailable within the modelling chain, and the updated contingencies and OSLs shall apply throughout the modelling chain.

(e) Only network elements expected to be operational during the target year, based on the latest available information, shall be included. Changes in the network, which are expected to be commissioned after the target year, shall be ignored. TSOs may model new network elements based on either of the following options:

i. define multiple network models appropriately reflecting the gradual commissioning of new network elements throughout the target year; or

ii. where the definition of network models according to point 2(e)i of this article is not possible, include, in all network models, all new network elements expected to be commissioned by 30 June of the target year.

(f) TSOs may individually change the network topology, e.g. by opening or closing circuit breakers or busbar breakers. These topological changes shall reflect the best expected operational practices for the target year, and shall aim at maximising cross-zonal capacity while safeguarding operational security for each BZ configuration. TSOs shall jointly describe to regulatory authorities the changes applied, and the reasons for the main changes applied, pursuant to Article 17.2 and Article 17.3.

(g) Generation and demand pursuant to paragraphs 5 and 6 of this article shall be connected to the node where they are expected to be located during the target year, in line with the disaggregation of zonal values into nodal values pursuant to paragraph 9 of this article.

(h) The network model shall include information about the net position of each BZ. The net position shall be consistent with load and generation forecasts pursuant to paragraphs 5 and 6 of this article.

(i) If the TSOs build the grid model for the target year by adapting the latest available reference grid model from the TYNDP data set that represents the reference grid of the closest year to the target year, they shall describe to regulatory authorities the changes they applied, and shall justify how such changes fulfil the previous requirements.

3. Reserve requirements: Reserve requirements shall be set separately for FCR, FRR and RR.

(a) For each target year, the dimensioning of FCR, FRR and RR, and the related contribution of each TSO, shall reflect reserve needs to cover imbalances in line with Articles 153, 157 and 160 of SO Regulation.

(b) The assignment of these balancing reserves to generation, demand and storage shall reflect expected operational practices for the target year.

4. Climate years: TSOs shall jointly select three reference climate years to assess BZ configurations. These three years shall be selected among the thirty most recent available climate years. The reference climate years shall be consistently used across all BZRRs and BZ configurations. A BZRR may select additional climate years, which shall be justified and published before the modelling chain starts, pursuant to the publication requirements described in Article 16, and consulted with regulatory authorities and ACER pursuant to Article 17.2 and Article 17.3. Unless stated otherwise and duly justified, all selected reference climate years shall have the same weight in the assessment and conclusions made for each criterion and configuration. Additional climate years may also be used as a sensitivity analysis as described in paragraph 10 of this article.

5. Load: Zonal load data shall be based on the demand from the PEMMDB for the target year, as follows:

(a) TSOs shall generate a realistic time series of zonal load curves for each climate year pursuant to paragraph 4 of this article.

(b) TSOs shall build a time series of zonal load curves by combining:

i. a pre-set zonal load forecast at the expected day-ahead price pursuant to point 5(c) of this article; and

ii. demand elasticity pursuant to point 5(g) of this article.

(c) TSOs shall consider the pre-set zonal load forecast, for each MTU of the target year, as follows:

i. if detailed wholesale price forecasts are available for each MTU of the target year at the beginning of the BZ review, the pre-set zonal load forecast shall be equal to the load at the expected day-ahead prices for the considered MTU;

ii. as a simplification, the pre-set zonal load forecast may be equal to the load forecast for the considered MTU at the average day-ahead price of the three years before the approval year; or

iii. an alternative approach to match the pre-set zonal load forecast with a price for each MTU of the target year, provided that TSOs properly justify why the alternative approach is more relevant, and highlight the main assumptions underlying the alternative approach.

(d) TSOs shall spread the time series of zonal load curves among electric nodes pursuant to paragraph 9 of this article.

(e) DSR shall be represented by both:

i. explicit DSR units which respond at specific activation prices, including interruptible demand units, pursuant to point 5(f) of this article; and

ii. implicit DSR based on the demand elasticity estimated pursuant to point 5(g) of this article,

as follows:

1. By default, demand shall be assumed to at least respond to price signals with day-ahead notice, i.e. in day-ahead markets.

2. By default, demand shall be inelastic when notice is shorter than in day-ahead markets. When specific means of DSR may be able to respond with shorter than day-ahead notice, the demand parameters shall reflect the shorter notice period.

(f) Each explicit DSR unit shall be described through the following parameters:

a. maximum power which may respond, in MW;

b. minimum price at which the response is triggered, in €/MWh;

c. if applicable, maximum activation duration, i.e. the maximum number of consecutive MTUs of DSR, in h; and

d. if applicable, maximum activated energy per day, in MWh.

(g) Implicit DSR shall be considered as follows:

i. For each BZ, TSOs shall estimate the elasticity of the remaining load, i.e. of the load which is not represented through explicit DSR units. TSOs shall compute at least one estimate per BZ; they may compute more values to reflect the change in demand elasticity as a function of the day-ahead price. Each estimate shall be equal to either of the following:

1. the average elasticity of the day-ahead market demand curve near the day-ahead clearing price, over all hours of the year before the approval year, or over hours where the day-ahead is close to a given value if multiple elasticity values are estimated;

2. the average elasticity of the whole demand, based on a robust and recent study forecasting demand elasticity for the target year; or

3. -0.2 or an average value based on a robust and recent EU study.

ii. As far as technically possible, day-ahead demand elasticity shall be modelled as a parameter(s) that can be explicitly considered by the modelling tool. Alternatively, TSOs may model demand elasticity as a set of equivalent generation units, pursuant to point 5(f) of this article, subject to the following conditions:

1. the parameters that describe these equivalent generation units shall be aligned with the estimated demand elasticity, pursuant to point 5(e)ii.1 and 5(g) of this article; and

2. this simplified modelling shall be compatible with the estimation of socio-economic welfare pursuant to Article 7.2.

iii. The elasticity of the remaining load shall only be available for market dispatch pursuant to Article 7, and shall be unavailable for remedial actions optimisation pursuant to Article 9.

(h) Demand which remains when the day-ahead price reaches the day-ahead price cap may be shed only when prices are greater than or equal to VOLL or the day-ahead price cap, whichever is higher. TSOs shall ensure consistency with the VOLL methodology pursuant to Article 11 of the Electricity Regulation, and shall ensure that VOLL reflects at least the impact of pre-notification of consumers before load shedding.

6. Generation: Zonal generation data shall be based on the generation data from the PEMMDB for the target year, as follows:

(a) For each climate-dependent generation unit and for each climate year pursuant to paragraph 4 of this article, TSOs shall generate a realistic generation time series. This generation time series may be calculated as a combination of:

i. installed generation capacities; and

ii. generation factors time series for each climate year, i.e. how much 1 MW would generate for each MTU of the climate year.

(b) TSOs shall spread zonal climate-dependent generation data among electric nodes pursuant to paragraph 9 of this article.

(c) Technical generation constraints shall be considered. These constraints shall at least include minimum and maximum generating capacities, must-run constraints, ramping capabilities, minimum run-time, start-up and shut-down times. These constraints may also include capacity requirements for system services, such as reserves or voltage support, capacity reductions due to mothballing, time series of derating ratio, due to constraints which are not explicitly modelled pursuant to Article 7 and Article 9, or planned maintenance requirements.

(d) TSOs may apply simplifications to the modelling of technical constraints subject to the conditions laid out in the relevant articles of this BZR methodology.

7. Storage: Zonal storage data shall be based on the storage data from the PEMMDB for the target year. The modelling of storage assets shall reflect expected operational practices for the target year, and shall include at least the following aspects:

(a) pumped-hydro storage shall respect constraints related to upper and lower reservoir levels, minimum and maximum pumped energy, minimum and maximum generated energy and minimum and maximum generation capacity; and

(b) the energy availability of batteries shall be based on energy storage capacities and charging and discharging constraints.

8. Other assumptions: Fuel and CO_2 prices shall be equal to the forecast used for the latest available TYNDP data set for the closest year to the target year, or, if available, equal to a forecast which is better than the one used for the latest available TYNDP.

9. Disaggregation to nodal level: TSOs shall disaggregate the zonal load and generation forecasts into nodal forecasts, i.e. they shall spread the zonal value into one value per node included in the network model pursuant to paragraph 2 of this article. To disaggregate zonal values to nodal level, TSOs shall either:

(a) follow the disaggregation methodology applied in the TYNDP; or

(b) follow an alternative disaggregation methodology which leads to load and generation forecasts at least as detailed as the TYNDP disaggregation methodology.

10. Sensitivity analysis:

(a) To enable the assessment of the 'Stability and robustness of BZs over time' criterion, pursuant to Article 15.16, TSOs shall at least perform one sensitivity analysis, while it is recommended that TSOs perform at least three sensitivity analyses.

(b) All sensitivities shall reflect appropriate and foreseeable variations, in any of the input data or grid infrastructure, of the scenario defined pursuant to paragraph 1 of this article.

(c) Except for the assessment of the 'Stability and robustness of BZs over time' criterion, the results of the sensitivity analyses shall be clearly separated from the results of the 'main study', as described in Article 13.2(d).

Article 5. Modelling chain

1. In order to assess the criteria described in Article 13, the TSOs shall develop a series of consecutive steps in a modelling chain to represent, for each BZRR, scenario and sensitivities described under Article 4, the following:

   (a) cross-zonal trade within the EU and with third countries; and

   (b) the flows of electricity through the BZRR electricity grid.

2. The modelling chain shall rely on the following steps:

   (a) TSOs shall run cross-zonal capacity calculation pursuant to Article 6, leading to cross-zonal capacities for each BZ border and MTU;

   (b) starting from available generation, demand, including DSR, and cross-zonal capacities, TSOs shall jointly simulate the market dispatch of generation and demand pursuant to Article 7, for each MTU;

   (c) based on the grid model pursuant to Article 4.2, and on the market dispatch, a load flow calculation shall determine flows and operational security violations pursuant to Article 8 throughout the electricity network, for each MTU;

   (d) in order to solve all operational security violations detected in the previous step, a redispatching simulation/analysis shall optimise remedial actions pursuant to Article 9, for each MTU; and

   (e) based on the outcome of the remedial action optimisation, TSOs shall estimate the flows not induced by cross-zonal trade, to determine the effects of internal trade on other BZs.

3. The MTU shall be one hour.

4. The steps pursuant to paragraph 2 of this article may be internal to the modelling tool, but the results shall be available for each step.

Article 6. Capacity calculation

1. For a given BZ border, MTU and scenario (including climate year), TSOs of a CCR shall jointly calculate cross-zonal capacity. For a given BZ border, the same cross-zonal capacity shall as much as possible be used across all BZRRs. For BZ borders outside the synchronous area of a considered BZRR, simplified cross-zonal capacities may be used; in this case, the simplified cross-zonal capacities shall be consistent with grid model simplifications pursuant to Article 4.2(a).

2. For each BZ border, cross-zonal capacity calculation shall rely on either:

   (a) the flow-based approach, on BZ borders which belong to a CCR with an adopted flow-based CCM for the day-ahead timeframe pursuant to the CACM Regulation; or

   (b) the cNTC approach, for the other BZ borders.

3. Capacity calculation shall ensure the 70% requirement pursuant to Article 16(8) of the Electricity Regulation unless derogations or action plans are expected to apply for the target

year. Derogations may only apply provided they have been consulted with regulatory authorities and agreed, for the target year, pursuant to Article 16(9) of the Electricity Regulation. The list of agreed derogations shall be published pursuant to Article 16 of this methodology. The application of the 70% requirement shall be consistent with the MACZT Recommendation.

4. TSOs shall at least compute seasonal cross-zonal capacities for each BZ border. If seasonal values are computed, the definition of the seasons used for capacity calculation shall match the expected operational practices of the target year. TSOs shall refine cross-zonal capacities when cross-zonal capacities are expected to vary significantly within a given season.

5. TSOs shall compute cross-zonal capacities based on the network model pursuant to Article 4.2.

6. GSKs shall reflect expected operational capacity calculation practices for the target year, as described in the CCM approved pursuant to the CACM Regulation in the considered CCR. For a given BZ, if those GSKs are too complex to estimate, TSOs may rely on a GSK proportional to the generation in the grid model for the target year, and MTU or season. Such a simplification shall be reported and justified to regulatory authorities and ACER pursuant to Article 17.2 and Article 17.3.

7. TSOs of a CCR shall jointly define CNECs. All cross-zonal network elements shall be considered as CNEs. The definition of internal CNEs shall rely on an economic efficiency analysis, e.g. considering the option to manage congestion through remedial actions or network investment. The definition of contingencies shall align with the CCM approved pursuant to the CACM Regulation, and shall be a subset of the contingencies considered in Article 8.3.

8. Upon agreement of all TSOs, TSOs of a CCR may simplify the definition of internal CNECs as follows. TSOs of a CCR may include as CNE all internal network elements whose maximum zone-to-zone PTDF is at least equal to a PTDF threshold. The PTDF threshold shall be the same for all TSOs, and shall not be lower than any PTDF threshold used in any CCM approved pursuant to the CACM Regulation. As default value, the PTDF threshold shall be 10%. If TSOs of a CCR use a different PTDF threshold, they shall justify why it better reflects an economic efficiency analysis for the whole EU. All internal network elements which do not have a maximum PTDF above the PTDF threshold shall not be defined as CNE.

9. For each CNEC and MTU, or season, Fmax shall reflect the expected operational practices of the target year, and shall be computed based on the network model pursuant to Article 4.2. Fmax shall reflect a subset of the operational security limits pursuant to Article 8.4.

10. For each CNEC, TSOs shall estimate the FRM. Within a given CCR, each TSO shall follow a uniform methodology when estimating the FRM on all CNECs which are located within its territory. The FRM shall be:

    (a) preferably computed individually for each CNEC in line with the CCM approved pursuant to the CACM Regulation in the considered CCR. In this case, network models reflecting the forecast D-2 grid and the real time situation (stemming from a market simulation reflecting the cross-zonal capacities of the alternative BZ configurations) for each MTU shall be used; or

    (b) where the computation pursuant to point 10(a) of this article is not technically possible, set to a fixed value. This value shall be 10% of Fmax for each CNEC, or any other fixed value if agreed by all TSOs of the relevant CCR. This fixed value shall be consistently applied across all alternative BZ configurations.

11. The same approach may apply to define the TRM on a BZ border, if TSOs are unable to define CNECs in capacity calculation. If TSOs define NTCs based on thermal ratings pursuant to point 17(a) of this article, they may set the FRM to zero on the HVDC interconnectors on this border.

12. For each CNEC and MTU, or season, TSOs shall compute PTDFs based on the network model pursuant to paragraph 5 of this article, relying on GSKs described in paragraph 6 of this article.

13. For each CNEC and MTU, or season, the flow without commercial exchanges within the whole system shall be[5]:

$$\vec{F}_{0,all} = \vec{F}_{ref} - \mathrm{PTDF}_{all}\,\overrightarrow{NP}_{ref,all}$$

with

$\vec{F}_{0,all}$	flow per CNEC in a situation without any commercial exchange between EU BZs, and with selected non-EU BZs. Cross-zonal exchanges with non-EU BZs shall only be included if and where an agreement with the non-EU country (as described in the MACZT Recommendation 2019 section 4.1) is expected to apply for the target year;
PTDF_{all}	power transfer distribution factor matrix for all BZs pursuant to paragraph 12 of this article;
$\overrightarrow{NP}_{ref,all}$	net positions per BZ included in the network model pursuant to Article 4.2. Only the share of the net position related to exchanges with EU BZs and BZs for which an agreement is expected to apply pursuant to Article 4.1 of the MACZT Recommendation shall be considered.

14. For each CNEC, a minimum RAM requirement shall be fulfilled in line with paragraph 3 of this article. For example, for CNECs for which the minimum margin available for cross-zonal trade is 70%, the adjustment for minimum RAM shall be:

$$\mathrm{AMR} = \max(0, F_{0,all} + \mathrm{FRM} - 0.3 * F_{max})$$

15. The flow without cross-zonal exchanges within the considered CCR shall be for each CNEC[6]:

$$\vec{F}_{0,CCR} = \vec{F}_{ref} - \mathrm{PTDF}_{f}\ \overrightarrow{NP}_{ref,CCR}$$

with

$\vec{F}_{0,CCR}$	flow per CNEC in the situation without commercial exchanges within the considered CCR;
$\vec{F}_{ref}$	flow per CNEC in the CGM, taking preventive remedial actions and topological actions into account;
PTDF_{f}	power transfer distribution factor matrix for the CCR (submatrix of PTDF_{all});
$\overrightarrow{NP}_{ref,CCR}$	net position per BZ of the CCR included in the CGM.

16. Finally, the margin available on each CNEC shall be:

$$RAM = F_{max} - FRM - F_{0,CCR} + AMR$$

with

$\vec{F}_{max}$	maximum active power flow pursuant to paragraph 9 of this article;

[5] See equation 11 of the Core DA CCM.
[6] See equation 10 of the Core DA CCM

$\overrightarrow{FRM}$ flow reliability margin pursuant to paragraph 10 of this article;

$\vec{F}_{0,CCR}$ flow without commercial exchanges in the CCR, described in paragraph 15 of this article;

$\overrightarrow{AMR}$ adjustment for minimum RAM pursuant to paragraph 14 of this article;

$\overrightarrow{RAM}$ remaining available margin without exchanges within the CCR.

17. TSOs of a CCR which does not rely on the flow-based approach shall jointly select one of the following approaches for all the BZ borders of the CCR in order to reflect expected operational practices for the target year:

(a) cNTC approach based on thermal ratings, for already existing DC borders only.

i. On each BZ border which was operational during at least one year prior to the approval of the alternative BZ configurations, the sum of the thermal ratings of cross-zonal network elements and the day-ahead NTCs shall be computed for all market time units when the considered BZ border was present, excluding time periods when exceptional contingencies affected the considered BZ border. The average ratio between the NTC and the sum of thermal ratings of cross-zonal network elements shall be the 'historical relative NTC'.

ii. The 'historical relative NTC' shall then be corrected to take expected operational changes and paragraph 10 of this article into account, leading to 'relative NTC'. The 'relative NTC' shall be greater than or equal to 70%, unless a derogation or action plan applies for the considered BZ border during the target year.

iii. For each BZ border and MTU of the target year, the relative NTC shall be combined with the thermal ratings of cross-zonal network elements to lead to the NTC.

(b) cNTC approach based on CNECs and GSKs.

i. TSOs shall determine GSKs and CNECs pursuant to paragraphs 6 and 7 of this article. For each CNEC, TSOs shall compute RAM consistently with paragraphs 9 to 16 of this article.

ii. TSOs shall jointly define different representative situations of cross-zonal exchanges.

iii. TSOs shall maximise cross-zonal capacity, while subject to the RAM on each CNEC defined in point 17(b)i, in line with paragraph 16 of this article. As a simplification, TSOs may check the fulfilment of the minimum RAM requirement only on the CNEC(s) which were identified as limiting at the capacity calculation stage. The flow impact on the CNEC is either computed by updating the grid model based on GSKs and performing a load-flow, or by combining cross-zonal exchanges with PTDFs. The same flow impact calculation shall be used on all BZ borders within a CCR. When conducting this step, TSOs shall share the power flow capability of CNECs in line with the CCM approved pursuant to the CACM Regulation in the considered CCR.

iv. This calculation shall be carried out on a set of timestamps selected by TSOs to reflect possible grid situations. At least one calculation per season shall be conducted.

(c) cNTC approach based on TYNDP for existing BZ borders which are not impacted by a change in BZ configuration, and for BZ borders with, or between, third countries. TSOs may use NTC values calculated as part of the latest TYNDP process. In this case, TSOs

shall ensure that these NTCs reflect the requirements set forth in Article 16(8) of the Electricity Regulation, adapted for derogations or action plans.

18. Flow-based approach: On borders where the flow-based approach is chosen, the initial flow-based domain shall be computed in line with paragraphs 6 to 16 of this article. The NTC values for the NTC base case shall be computed in line with one of the methods described in paragraph 17 of this article. Non-costly remedial actions may be taken into account to increase the size of the initial flow-based domain in the directions which are likely to be valuable for the market for the considered MTU. In this case, these remedial actions shall also be modelled pursuant to Article 9.2(a).

19. Allocation constraints: When approved CCMs explicitly allow allocation constraints for the target year, TSOs may introduce such constraint within capacity calculation. The constraint value shall reflect operational practices for each MTU when such a constraint applies. In case a change in BZ configurations would allow to phase out the allocation constraint, the allocation constraint shall be removed when modelling capacity calculation for this BZ configuration. Furthermore, for a given allocation constraint, the methodology to compute the allocation constraint shall be the same among all studied BZ configurations for which the allocation constraint is necessary. The kinds of allocation constraints introduced shall be published pursuant to Article 16. The detailed allocation constraints shall be consulted with regulatory authorities and ACER pursuant to Article 17.2 and Article 17.3.

20. Output: The capacity calculation leads to the following outputs for scenario, BZ configuration, BZ border and MTU:

    (a) for cNTC BZ borders: one NTC value per direction;

    (b) for flow-based BZ borders: a list of CNECs with zonal PTDFs and RAM;

    (c) where applicable, allocation constrains;

    (d) for all BZ borders: the list of remedial actions applied during capacity calculation; and

    (e) the network model as an outcome of capacity calculation, i.e. the network model pursuant to paragraph 5 of this article, updated to reflect preventive remedial actions in line with point 20(d) of this article.

Article 7. Day-ahead market dispatch

1. In order to estimate the EU generation dispatch resulting from the market for a scenario and given BZ configuration, TSOs shall run a UCED, assuming perfect forecast of demand and generation availability.

2. The UCED shall maximise the socio-economic welfare, which shall be equal to the difference between:

    (a) the utility function of supplied demand (including DSR), as described in point 6(b) of this article; and

    (b) the total generation and storage cost, including at least start-up and short-run marginal costs. In case short-run marginal costs are very close for few power plants within a BZ, and to ensure a more robust simulation outcome, TSOs shall add a small random hourly mark-up on top of the short-run marginal cost to define an hourly short-run marginal cost per power plant. The random mark-up shall lie within the range [-1; 1] €/MWh, and shall be larger than the numerical tolerance of the UCED.

3. In order to fully reflect the impact of intertemporal constraints on the UCED, the UCED shall jointly optimise all MTUs within a week, or within a longer time period.

4. The UCED shall reflect the following constraints:

(a) available generation, including storage, per BZ and MTU, including technical constraints pursuant to Article 4.6 and Article 4.7; where technical limitations apply to the consideration of technical constraints, simplifications analogous to the ones described in Article 9.8(b) may be applied as follows:

i. only for units with nominal generating capacity lower than 100 MW; and

ii. subject to a maximum of 400 MW per node and to a maximum of 50% of the installed thermal generation capacity in a given BZ.

(b) demand to supply, including DSR, per BZ and MTU pursuant to Article 4.5 and further described in paragraph 6 of this article;

(c) available cross-zonal capacity per BZ border and MTU pursuant to Article 6; and

(d) reserves and balancing requirements, as described in Article 4.2(i).

5. The UCED shall reflect the following generation and storage behaviour:

(a) Thermal power plants bid according to their start-up costs and short-run marginal costs, including fuel costs, CO_2 costs, variable operation and maintenance costs. Technical constraints pursuant to Article 4.6 shall be considered.

(b) The short-run marginal cost of wind and solar power plants shall be 0 €/MWh by default. However, other factors related to subsidy schemes or technical restrictions may also be considered.

(c) Unregulated, i.e. run-of-river, hydro power shall be modelled as an unregulated inflow pursuant to Article 4.6(a)ii.

(d) Regulated, i.e. reservoir or pumped, hydro power plants shall be subject to constraints set in power plant data. The time horizon over which the injections and withdrawal of these hydro power plants are optimised shall reflect expected operational practices for the target year. The withdrawals related to hydro pumping shall not be inputs; instead, the UCED shall optimise these variables. The hydro stock shall be optimised either:

i. based on the expected marginal cost during future hours when the hydro stock is expected to be used, i.e. 'water value calculation'; or

ii. based on perfect foresight, i.e. optimising the hydro stock over the whole target year to maximise socio-economic welfare.

(e) Biomass power plants may be represented either as conventional power plants similar to the category indicated in point 5(a) of this article, if the output depends on marginal costs, or fixed infeed time series if the output is price-independent.

(f) Other non-renewable power plants not included under category indicated in point 5(a) of this article shall be represented with infeed time series and a marginal cost that reflects the projected bidding price of the units.

(g) Other renewable power plants not specifically modelled are represented with load factor time series combined with forecasted installed capacity.

(h) Storage assets shall be modelled in line with Article 4 (7). In particular, withdrawals shall not be inputs, but shall be optimised by the UCED.

(i) Any other technologies shall be represented in accordance with expected operational practices and with market design aspects which impact their behaviour.

(j) For each MTU, capacity affected to FCR or FRR in accordance with Article 4.2(i) shall be considered unavailable.

6. Representation of load:

(a) The definition of load included in Article 2 applies.

(b) DSR shall be considered as described in Article 4.5. For implicit and explicit DSR, the utility shall be equal to the bid price. The utility of inelastic demand shall be equal to VOLL, assuming pre-notification of consumers one day before the load is shed, as variable cost.

7. For each BZRR, the market dispatch simulation shall provide the following results for the EU, for each MTU:

(a) the total socio-economic welfare in €;

(b) the utility of supplied demand in €;

(c) the total generation cost in €;

(d) the overall congestion revenue in €;

(e) for each generation unit, the production in MW;

(f) for each storage unit, the injection or withdrawal in MW;

(g) for each DSR unit, the activated DSR in MW;

(h) the change in load due to demand elasticity in MW;

(i) for each BZ, the amount of load-shedding in MW;

(j) for each BZ, the short-run marginal cost in €/MWh;

(k) for each BZ, the net positions in MW;

(l) for each BZ border, the cross-zonal exchange in MW; and

(m) for each CNEC, the flow in MW, and the shadow price in €/MW.

Article 8. Operational security analysis

1. For a given scenario, BZ configuration and MTU, TSOs shall combine the network model pursuant to Article 6.20(e) and the generation and demand schedules pursuant to Article 7.7 to define the network model resulting from the day-ahead market dispatch.

2. Based on the network model derived from paragraph 1 of this article, TSOs shall run an operational security analysis in order to assess whether contingencies pursuant to paragraph 3 of this article lead to violations of OSLs described in paragraph 4 of this article. To this end, TSOs may either run, as long as technically possible:

(a) an AC load-flow calculation; or

(b) a DC load-flow calculation whereby network losses have been accounted for; or

(c) as a fall-back, a DC load-flow calculation.

However, within a BZRR, all load-flow calculations shall be run in only one of the three above-listed methods.

3. First, the TSOs of a BZRR shall jointly establish a contingency list for the operational security analysis for that BZRR. The list shall be identical among all climate years and configurations, except if network elements are added or removed from the network model. In this case, the contingency list may reflect these additions or removals. The list shall be based on the following principles:

(a) the chosen set of contingencies to investigate for operational security analysis shall at least include the contingencies considered in capacity calculation;

(b) network elements monitored and used to define contingencies shall be defined in accordance with Article 4.2. No other network element shall be monitored; and

(c) occurrences of a loss of (a) power generating module(s) may also be included as contingency in the contingency list.

4. For each contingency, TSOs shall run a load-flow calculation to assess whether the following OSLs are violated:

(a) corrected thermal ratings of network elements for the considered MTU[7], before remedial actions if applicable. For each network element[8], the corrected thermal rating shall be the difference between the thermal rating defined in line with Article 4.2 and the FRM estimated pursuant to Article 6.10; and/or

(b) OSLs underlying an allocation constraint, when such a constraint was introduced pursuant to Article 6.19; and/or

(c) other limits e.g. related to voltage magnitude or phase angle, if and where relevant.

5. The operational security analysis shall provide the following results for each scenario, BZ configuration, MTU and violation of an OSL:

(a) the precise network configuration(s) when the violation occurs;

(b) the kind of OSL violated;

(c) the network element affected by the violation;

(d) the OSL of the network element; and

(e) the value of the violation.

Article 9. Consideration of remedial actions

1. For each scenario, BZ configuration and day for which at least one violation of OSL was detected pursuant to Article 8.4, TSOs shall run a RAO simultaneously covering all MTUs within the day in order to solve all operational security violations. Starting from the day-ahead market dispatch pursuant to Article 7.7, the remedial actions to activate shall minimise the additional cost to fulfil all OSLs. The additional cost shall include:

(a) cost induced by change in generation schedule pursuant to paragraph 4 of this article; and

(b) cost induced by DSR, and socioeconomic loss from load-shedding pursuant to paragraph 5 of this article.

2. The RAO shall optimise the following preventive and curative remedial actions:

(a) non-costly remedial actions (pursuant to Article 4.2(c));

(b) change in generation dispatch; and

(c) change in activation of explicit demand-response, or load-shedding.

3. The remedial action optimisation shall be subject to the following constraints;

(a) conditions for activation of non-costly remedial actions pursuant to paragraph 6 of this article;

(b) generation constraints pursuant to paragraph 7 of this article;

(c) DSR and load-shedding constraints pursuant to paragraph 9 of this article;

[7] At least seasonal line ratings shall be computed.
[8] i.e. not only for CNECs.

(d) operational security limits pursuant to Article 8.4, both without contingency and for all contingencies pursuant to Article 8.3; and

(e) the expected level of coordination of remedial actions among BZs, which shall follow paragraph 10 of this article.

4. Generation costs shall include at least start-up and variable costs.

(a) The variable cost for increasing generation shall be equal to the sum of:

i. the short-run marginal cost used for day-ahead dispatch pursuant to Article 7.5(a);

ii. an additional cost to reflect start-up cost, as a simplification if start-up costs are not explicitly modelled. In this case, the additional cost shall be equal to the start-up cost divided by the minimum technical power; and

iii. the readiness cost, which reflects additional costs related to the short notice of redispatching, the opportunity cost, which reflects lost opportunity on other markets such as the intraday and balancing markets, and any other additional costs inherently related to the participation of generation or demand in the redispatching timeframe, if such costs are not incurred in the day-ahead timeframe.

(b) These costs shall be calculated, per generation unit, as follows:

i. In BZs which are expected to rely on market-based redispatching for the target year, these costs shall be equal to the average relative difference, over the year before the approval year, between:

1. the upward bid price of the unit in the redispatching mechanism, excluding profit margin, but including opportunity cost and other costs described in point 4(a)iii of this article; and

2. the estimated bid price in the day-ahead market, based on the short-run marginal cost used for day-ahead dispatch pursuant to Article 7.5(a).

ii. In BZs which are expected to rely on non-market-based redispatching for the target year, these costs shall be equal to the regulated additional cost allowed for upward redispatching bids, provided that the regulated additional cost covers, at least, opportunity and readiness costs.

iii. If TSOs are unable to estimate the cost pursuant to points 4(b)i and 4(b)ii of this article, they shall rely on the average relative difference calculated for BZs which meet the conditions described in point 4(b)ii of this article, over the BZRR, or over the EU.

(c) The variable cost for decreasing generation shall be equal to the difference between:

i. the short-run marginal cost used for day-ahead dispatch as described in point 4(a)i of this article; and

ii. the cost to reflect readiness cost and opportunity cost, and any other additional costs that are inherently related to the participation in the redispatching timeframe, as described in points 4(a)ii and 4(a)iii of this article, but reflecting downward redispatching opportunity cost.

(d) As a simplification, e.g. if data is missing, the above described variable costs may be computed jointly for each generation technology.

5. The activation cost of DSR shall be greater than or equal to the activation cost used for the day-ahead market dispatch. An additional cost may be added to reflect the decreased notification time before the activation of DSR, and/or lost opportunity on other markets which are not explicitly modelled. The socio-economic loss coming from load-shedding shall be equal to the

VOLL of the consumers most likely to be disconnected during a load-shedding event taking place during the considered MTU(s). This VOLL shall assume a pre-notification time of at most one hour.

6. The availability and activation of non-costly remedial actions shall reflect the expected operational practices of TSOs for the target year. Non-costly remedial actions shall be assumed to lead to no cost.

7. TSOs shall assess for each generation technology or generation unit within their control area whether it is available for the redispatching simulation, considering the expected practices in their respective control area for the target year. For each MTU, capacity affected to FCR or FRR in accordance with Article 4.3 shall be considered unavailable.

8. All technical generation constraints pursuant to Article 4.6 shall be fulfilled as much as possible. In particular:

   (a) Hydro power plants shall not change the net[9] total amount of energy used during the whole day, in order to ensure consistency with the day-ahead market dispatch.

   (b) As a simplification, TSOs may reflect start-up and shutdown time as follows:

      i. Generation units which are not running during the last hour of the day before the simulated day, based on the outcome of the day-ahead market dispatch, shall be considered as unavailable at the beginning of the day during the time duration equal to sum of start-up and shutdown time of the considered unit.

      ii. Generation units which are not running during the first hour of the day after the simulated day, based on the outcome of the day-ahead market dispatch, shall be considered as unavailable at the end of the day during the time duration equal to the sum of start-up and shutdown time of the considered unit.

9. DSR shall be considered as described in Article 4.5. In particular, demand elasticity shall be unavailable for the RAO and explicit DSR may be available, if it reflects expected operational practices, and provided its activation time is short enough to allow for its participation in the RAO. All technical DSR constraints pursuant to Article 4.5 shall be fulfilled.

10. Coordination of remedial actions activation shall reflect the expected level of coordination of redispatching among TSOs for the target year. In particular, the RAO shall reflect:

   (a) the geographical scope of perfect coordination of remedial actions, if and where such perfect coordination is expected to apply for the target year;

   (b) the geographical scope of imperfect coordination, if and where such imperfect coordination is expected to apply for the target year;

   (c) when such coordination of remedial actions is expected to be (gradually) implemented; and

   (d) the impact of imperfect coordination of remedial actions on the availability and cost of remedial actions.

11. TSOs may run additional studies to calibrate the model and ensure that it leads to realistic costs of remedial actions.

12. TSOs may reduce the number of days to simulate to reduce computation time. In this case, TSOs shall select at least 50 representative days to simulate, the selection of which shall be duly justified, and simulate this reduced sample. TSOs shall then affect each day to a

[9] i.e. the difference between the used and stored hydro energy.

representative day, and shall assume that the additional cost for each day is consistent with the additional cost derived for the representative day.

13. For each scenario, BZ configuration and geographic scope, and based on RAO results, TSOs shall also estimate the cost of ensuring availability of units for redispatching purposes, i.e. associated to the procurement of capacity or any other mechanism aimed at ensuring that sufficient redispatching reserves are available when needed.

14. By default, the cost of ensuring availability of units for redispatching purposes shall be assumed to be proportional to the activated redispatching energy over a full year, and shall thus be equal to:

$$cost\ for\ RD\ availability\ (year_{target}) = cost\ for\ RD\ availability\ (year_{historical}) * \frac{RD\ energy\ activated\ (year_{target})}{RD\ energy\ activated\ (year_{historical})}$$

with

$year_{target}$	the target year of the BZR pursuant to Article 4.1;
$year_{historical}$	the latest year for which full historical data related to redispatching is available within the BZRR;
$cost\ for\ RD\ availability\ (year_{target})$	the cost of ensuring availability of units for redispatching purposes for the target year over the BZRR, excluding MSs for which the option in paragraph 15 of this article applies;
$cost\ for\ RD\ availability\ (year_{historical})$	the cost of ensuring availability of units for redispatching purposes for the historical year over the BZRR, excluding MSs for which the option in paragraph 15 of this article applies;
$RD\ energy\ activated\ (year_{target})$	the total upward dispatch change over the target year over the BZRR, excluding MSs for which the option in paragraph 15 of this article applies;
$RD\ energy\ activated\ (year_{historical})$	the total upward dispatch change over the historical year over the BZRR, excluding MSs for which the option in paragraph 15 of this article applies.

15. Alternatively, TSOs may estimate the cost of ensuring availability of units for redispatching purposes in their respective MS, as proportional to the peak hourly activated redispatching energy over a full year, as follows:

$$cost\ for\ RD\ availability\ (year_{target}) = cost\ for\ RD\ availability\ (year_{historical}) * \frac{peak\ RD\ energy\ activated\ (year_{target})}{peak\ RD\ energy\ activated\ (year_{historical})}$$

with

$year_{target}$	the target year of the BZR pursuant to Article 4.1;
$year_{historical}$	the latest year for which full historical data related to redispatching is available within the BZRR;

$cost\ for\ RD\ availability\ (year_{target})$	the cost of ensuring availability of units for redispatching purposes for the target year, per MS;
$cost\ for\ RD\ availability\ (year_{historical})$	the cost of ensuring availability of units for redispatching purposes for the historical year, per MS;
$peak\ RD\ energy\ activated\ (year_{target})$	the hourly peak upward dispatch change over the target year, per MS;
$peak\ RD\ energy\ activated\ (year_{historical})$	the hourly peak upward dispatch change over the historical year, per MS.

16. For each scenario, BZ configuration, geographic scope and day, TSOs shall calculate the total additional cost of fulfilling all OSLs. The total additional cost shall be the sum of:
    (a) the additional cost from the RAO pursuant to paragraph 1 of this article; and
    (b) the cost of ensuring availability of redispatching units, in line with paragraph 14 and 15 of this article.
17. For each scenario, BZ configuration, geographic scope of the RAO and MTU, the RAO shall yield:
    (a) the total upward[10] dispatch change, in MW;
    (b) the total downward dispatch change, in MW;
    (c) for each unit, the new dispatch, and the change in dispatch, in MW;
    (d) for each BZ, the new net position, in MW; and
    (e) the grid model from Article 8.1 updated to include all preventive remedial actions.
18. If the TSOs simulate a reduced number of days pursuant to paragraph 12 of this article, the data listed in paragraph 17 of this article shall be provided only with respect to the days effectively simulated. Additionally, information on the representative days associated to each of the non-simulated days and the resulting total costs for the non-simulated days shall be provided.

Article 10. Estimate of flows not induced by cross-zonal trade

1. The TSOs of a BZRR shall calculate the flows not induced by cross-zonal trade after the day-ahead market dispatch and after operational security analysis based on the network models pursuant to Article 6.20(e) and Article 9.17(e), respectively. The flow calculation shall either:

[10] i.e. increase of injections or decrease of withdrawals.

(a) follow the flow decomposition methodology applicable to share redispatching and countertrading costs in line with Article 74 of the CACM Regulation (if any); or

(b) follow assumptions similar to the ACER Recommendation 01/2019. In this case, DC interconnectors shall be modelled as additional BZs with a GSK of 1 on each side of the DC interconnector, and the flow without commercial exchanges shall be $\vec{F}_{0,all}$ from Article 6.13 (taking the net positions of all BZs into account).

2. The following flow contributions not induced by cross-zonal trade shall at least be computed:

(a) oriented flows in the same direction as the flow resulting from the day-ahead market dispatch, pursuant to Article 7.7(m), for all CNECs considered in capacity calculation pursuant to Article 6; and

(b) oriented flows in the same direction as the flow in the CGM, for all CNECs for which at least one violation of OSL was detected pursuant to Article 8.

Article 11.LMP analysis

1. The TSOs shall jointly carry out a LMP analysis, for the scenario described under Article 4. TSOs may decide to perform the LMP analysis separately for each of the synchronous areas that are expected to exist in Europe for the target year.

2. For this purpose, the TSOs shall run a UCED at nodal level, assuming perfect forecast of demand and generation availability.

3. The UCED shall maximise the socio-economic welfare defined according to the same assumptions used for the day-ahead market dispatch pursuant to Article 7; where technical limitations apply, TSOs may reduce the optimization period of the UCED to one day.

4. The LMP analysis shall cover at least all the nodes at nominal voltage level greater than or equal to 220 kV that are included in the grid model pursuant to Article 4.2.

5. The UCED shall use the network model pursuant to Article 4.2 and shall reflect the following constraints:

(a) available generation and storage per node and MTU, including technical constraints, pursuant to Article 4.6 and Article 4.7 respectively. As far as technically possible, these constraints shall be consistent with the ones adopted for the day-ahead market dispatch according to Article 7.4(a). Alternatively, simplifications analogous to the ones described in Article 9.8(b) may be applied as follows:

i. only for units with nominal generating capacity lower than 400 MW; and

ii. subject to a maximum of 400 MW per node and to a maximum of 50% of the installed thermal generation capacity in a given BZ.

(b) demand to supply, including DSR, per node and MTU pursuant to Article 4.5 and Article 7.6;

(c) security constraints based on OSLs and contingencies identified according to Article 4.2. As far as technically possible, these constraints shall be consistent with the assumptions adopted for the operational security analysis pursuant to Article 8. Alternatively, the two following options may be considered:

i. including only the most significant contingencies not fully resolved by means of non-costly remedial actions; or

ii. performing an iterative analysis where OSLs are progressively included in the UCED.

As far as technically feasible, the LMP analysis shall make use of the same AC or DC load-flow calculation as the one selected for the operational security analysis pursuant to Article 8.

(d) reserves and balancing requirements, as described in Article 4.3; these constraints shall be consistent with the ones adopted for the day-ahead market dispatch according to Article 7.4; and

(e) energy balance at each node.

6. Disaggregation at nodal level shall be performed according to the scenario and assumptions reported in Article 4.

7. TSOs shall endeavour to include all non-costly remedial actions in the UCED. Where technical limitations apply, the UCED shall at least take into account the following non-costly remedial actions: PSTs taps and HVDCs active power flow. The non-costly topological remedial actions not taken into account by the UCED shall reflect the expected operational practices of TSOs for the combination of target and climate years. For each MTU, TSOs shall highlight any difference between the non-costly remedial actions used for LMP analysis according to this paragraph and the non-costly remedial actions resulting from the remedial action optimisation pursuant to Article 9. TSOs shall qualitatively estimate the impact of these differences on the results.

8. As far as technically possible, TSOs shall perform the LMP analysis for all MTUs of the target year. Where technical limitations apply, TSOs may limit the time horizon to a minimum of eight weeks, ensuring that this limited time horizon is representative of the entire target year.

9. The following output shall at least be provided:

(a) nodal price for each node and MTU, in €/MWh;

(b) cleared generation, storage and demand volumes for each node and MTU, in MW;

(c) flows on all considered network elements for each MTU, in MW;

(d) active network constraints for each MTU if any;

(e) shadow prices associated to the active network constraints, €/MW;

(f) overall socio-economic welfare resulting from the optimization, in €; and

(g) any other information deemed relevant by the TSOs.

Article 12.List of evaluation criteria

1. TSOs of a BZRR shall assess the status quo BZ configuration and each alternative BZ configuration studied within the BZRR and compare these configurations by using the criteria listed below, which includes the minimum list of criteria set out in Article 33 of the CACM Regulation.

2. The TSOs in every BZRR shall use the following evaluation criteria:

(a) To assess network security:

i. operational security;

ii. security of supply; and

iii. degree of uncertainty in cross-zonal capacity calculation.

(b) To assess market efficiency:

i. increase or decrease in economic efficiency;

ii. firmness costs;

iii. market liquidity and transaction costs;

iv. market concentration and market power, analysed separately for:

1. the various market timeframes, from long-term to short-term markets; and
2. the TSOs' mechanism to resolve physical congestions.

v. effective competition, differentiating between:

1. short-term competition;
2. long-term competition; and
3. competition for cross-zonal capacity.

vi. price signals for building infrastructure;

vii. accuracy and robustness of price signals;

viii. transition costs;

ix. infrastructure costs;

x. market outcomes in comparison to corrective measures;

xi. adverse effects of internal transactions on other BZs; and

xii. impact on the operation and efficiency of the balancing mechanisms and imbalance settlement processes.

(c) To assess stability and robustness of BZs:

i. stability and robustness of BZs over time;

ii. consistency across capacity calculation time frames;

iii. assignment of generation and load units to BZs; and

iv. location and frequency of congestion, market and grid.

(d) To assess energy transition:

i. short-term effects on CO_2 emissions;

ii. short-term effects on RES integration; and

iii. long-term effects on low-carbon investments.

Article 13.Evaluation: General approach and outcome of the BZ review

1. TSOs shall assess the performance of alternative BZ configurations in accordance with the following steps:

(a) Step 1: Monetised benefits

i. TSOs shall assess the monetised benefit of each alternative configuration which shall be equal to the sum of:

1. the change in economic efficiency, as defined in Article 15.4; and
2. as far as technically possible, the benefits, or losses, derived from other criteria that can be potentially monetised, such as the security of supply criterion pursuant to Article 15.2 or the sub-criterion related to the operation and efficiency of the

balancing mechanisms pursuant to Article 15.15(a). The aggregation of benefits, or losses, derived from various criteria shall be done consistently to avoid double counting.

ii. The TSOs shall take the monetised value related to the 'transition costs' criterion separately into account to calculate the minimum lifetime of a BZ configuration, as described in point 1(d) of this article.

iii. Based on the monetised benefits of each alternative BZ configuration, compared to the status quo, the TSOs shall proceed as follows:

1. If the monetised benefit compared to the status quo is negative, then TSOs may:

a. decide not to proceed with the next steps of the overall process, thus rejecting the said alternative BZ configuration; or

b. decide to proceed with next steps of the assessment if they can duly justify that further assessment is needed.

2. If the monetised benefit compared to the status quo is not negative, then TSOs shall proceed to evaluate the alternative BZ configuration according to Step 2.

3. To reflect the benefits from combining alternative BZ configurations, TSOs of a BZRR may generate additional alternative BZ configurations which simultaneously reflect the changes, with respect to the status quo, of two or more of the approved alternative BZ configurations. When doing so, TSOs shall combine alternative BZ configurations with positive monetised benefits compared to the status quo. TSOs shall then estimate the monetised benefits of the additional, combined, alternative BZ configurations compared to the status quo, and proceed with all other steps of the evaluation as for any other alternative BZ configuration.

4. TSOs may also reject alternative BZ configurations that do not meet the requirement of unique and unambiguous assignment of generation and load units to BZs, pursuant to Article 15.18.

(b) Step 2: Assessment of all other criteria

i. For the BZ configurations that remain following Step 1, TSOs shall assess all other criteria, i.e. those not considered in Step 1, according to the evaluation approaches described in Article 15.

ii. Based on this assessment, TSOs shall conclude, for each criterion, on the performance on each alternative BZ configuration with regard to the status quo configuration. TSOs shall at least specify whether each alternative BZ configuration performs better, worse or the same[11] than the status quo BZ configuration. TSOs may jointly agree on a more detailed scale to grade the performance of the alternative BZ configurations which shall be consistently used for all other criteria, alternative BZ configurations and BZRRs.

iii. For each criterion and alternative configuration, TSOs shall provide a justification for the outcome of the individual assessment, including the following items:

1. the quantitative values, related to the indicators defined in Article 15, that support the conclusions;

[11] E.g. respectively using the scale +/-/0.

2. where applicable, a brief description of any qualitative analysis or considerations which complement the quantitative analysis, and how such analysis or considerations support the conclusions; and
3. the identification of practical considerations, which need to be balanced with the need for expeditiousness when deciding on a BZ configuration change, as set forth in Article 14(10) of the Electricity Regulation.

(c) Step 3: Acceptability assessment of the alternative BZ configurations

i. In case for a given alternative BZ configuration all other criteria are assessed to perform better or the same as the status quo configuration pursuant to Step 2, the said alternative BZ configuration shall be deemed acceptable.

ii. For alternative BZ configurations that perform worse than the status quo configuration for at least one criteria pursuant to Step 2, TSOs shall perform an assessment of the acceptability of each of these configurations as follows:

1. TSOs shall first perform an assessment aiming at identifying alternative BZ configurations that potentially perform below 'acceptable' levels. When performing this assessment, TSOs shall at least consider the following:
   a. the relative performance of alternative configurations with regard to the status quo configuration, in light of the indicators envisaged in Step 2;
   b. the relative performance of individual BZs (or BZRRs) of alternative BZ configurations compared to the BZs (or BZRRs) of the status quo, across the EU, in light of the indicators envisaged in Step 2; and
   c. the need to consider all criteria assessed in Step 1 and Step 2, taken together, rather than considering each criterion individually.
2. Based on the above-described assessment, TSOs shall draw a list of potentially ‘unacceptable’ configurations.
3. Based on the aforementioned list, TSOs shall consult the relevant authorities. The consultation shall aim at collecting the relevant authorities’ views on at least the following aspects:
   a. whether the BZ configurations identified by TSOs as potentially performing below ‘acceptable' levels should be deemed 'unacceptable', after considering possible measures to mitigate negative impacts related to certain criteria; and
   b. whether, in light of the information provided by TSOs, other BZ configurations should be deemed as ‘unacceptable’, after considering possible measures to mitigate negative impacts related to certain criteria.
4. As an input for the consultation to the relevant authorities, TSOs shall provide:
   a. the outcome of the TSOs' assessment of each criterion pursuant to Step 1 and 2, including all justifications provided in point 1(b)iii of this article;
   b. stakeholders’ replies to the relevant aspects of the public consultation pursuant to Article 17.4; and
   c. justifications on why certain configurations are considered as potentially ‘unacceptable’.

iii. TSOs shall draw a list of 'unacceptable' configurations, which shall be duly justified. Such a justification shall include the views of the relevant authorities and how those views have been taken into account.

(d) Step 4: Consolidation of the results of the BZR

i. TSOs shall consolidate the results in one joint report for all BZRRs, and they shall publish the joint report according to Article 16 and Article 18 of this BZR Methodology.

ii. TSOs shall include a recommendation on whether to maintain or amend the BZs, for each BZRR, in the joint report.

iii. When making the recommendation, the TSOs shall proceed as follows:

1. TSOs shall recommend to maintain the status quo BZs if there is no 'acceptable' alternative BZ configuration which leads to positive monetised benefits compared to the status quo; or

2. TSOs shall recommend to amend the BZs if at least one 'acceptable' alternative BZ configuration leads to positive monetised benefits compared to the status quo. This configuration shall be among the list of 'acceptable' configurations with positive monetised benefits compared to the status quo, and shall be, by default, the one with the highest monetised benefits compared to the status quo, for each BZRR.

3. Alternatively, TSOs may:

a. recommend an alternative BZ configuration, among the 'acceptable' ones but different from the one with the highest monetised benefits compared to the status quo, if they can duly justify the recommendation; or

b. recommend to maintain the status quo configuration, if they can duly justify that this is a better option than any of the 'acceptable' alternative BZ configurations.

iv. The results shall be consolidated in three different tables per BZRR, as follows:

1. A first table displaying all BZ configurations ranked according to decreasing monetised benefits compared to the status quo as calculated in Step 1. This table shall include the following information for all alternative BZ configurations:

a. the monetised benefits from the alternative BZ configuration as calculated in Step 1; and

b. additionally, for all 'acceptable' alternative BZ configurations:

– the related transition costs as defined in Article 15.11; and

– the minimum lifetime, in years, of the BZ configuration that would be needed to pay back the transition costs, in light of the monetised benefits compared to the status quo, and considering a discount rate.

2. A second table with the assessment of all other criteria that mainly refer to short-term effects of all alternative BZ configurations and that cannot be monetised pursuant to Step 2. This table shall at least include the following criteria and sub-criteria: *Operational security, market liquidity and transaction costs, market concentration and market power (from long-term to short-term markets), market concentration and market power (redispatching mechanism), facilitation of effective competition (short-term), adverse effects of internal transactions on other BZs, short-term effects on CO_2 emissions, and short-term effects on RES integration.*

3. A third table with the assessment of all other criteria that mainly refer to long-term effects of all alternative BZ configurations and that cannot be monetised pursuant to Step 2. This table shall at least include the following criteria and sub-criteria: *Facilitation of effective competition (long-term), facilitation of effective competition (relative access to cross-zonal capacity), price signals for building infrastructure, accuracy and robustness of price signals, infrastructure cost, impact on the imbalance settlement processes, stability and robustness of BZs over time*[12]*, location and frequency of congestion (market and grid), and long-term effects on low-carbon investments.*
4. Tables two and three shall at least include a conclusion on whether each alternative BZ configuration performs better, worse or the same, or a more detailed scale if agreed by all TSOs, than the status quo BZ configuration, as described in Step 2. A summarised justification for the outcome of the assessment of each criterion, as described in Step 2, may also be included.
5. The above results shall refer to the results of the 'main study', i.e. considering the scenario and the reference climate years, as envisaged in Article 4.
6. As far as technically possible, a breakdown of the results per MS shall also be provided.
7. Annex Ib includes a template which may be used to consolidate the results of the BZR, for each BZRR.

2. When assessing the alternative BZ configurations in accordance with the steps 1 to 4 of paragraph 1 of this article:

(a) TSOs shall consider market design changes that are expected to be in place for the target year, in particular market design changes which may mitigate negative impacts of specific alternative BZ configurations with regard to any of the evaluation criteria. Those market design changes may be complemented with potential measures derived from the consultation among stakeholders and the relevant authorities pursuant to Step 3.

(b) TSOs shall assess alternative BZ configurations by mainly considering the scenario and the reference climate years pursuant to Article 4.4. In particular, the assessment shall lead to a single outcome per criterion, as defined in Article 15, and alternative BZ configuration, which constitute the results of the 'main study'. Unless stated otherwise during the process to select reference climate years pursuant to Article 4.4, all reference climate years shall have the same weight in the single outcomes per criterion and configuration.

(c) TSOs shall present the results of all sensitivity analyses, conducted pursuant to Article 4.10, together with the final conclusions of the study, although clearly separated from the results of the 'main study'.

(d) TSOs may conduct external studies, to perform or complement the evaluation of certain criteria. Criteria that may require external advice are suggested in Article 15.

(e) TSOs shall determine the geographical scope and granularity of the evaluation criteria pursuant to Article 14.

(f) TSOs shall evaluate each individual criterion in accordance with Article 15.

[12] The 'Accuracy and robustness of price signals', 'Impact on the imbalance settlement processes', and the 'Stability and robustness of BZs over time' criteria may be included in both the 'short-term' and 'long-term' effects table.

Article 14.Evaluation criteria: Geographical delimitation

1. Before assessing the alternative BZ configurations, the TSOs shall jointly agree on how to categorise the criteria according to the two following dimensions:

   (a) The geographical scope of the assessment of the alternative BZ configurations with regard to each criterion, as follows:

      i. for the 'Economic efficiency' criterion, the geographical scope shall be the EU; and

      ii. for all other criteria, the geographical scope shall be, either:

         1. the EU; or

         2. the BZRR, if an alternative BZ configuration is deemed not to have significant impacts outside the BZRR.

   (b) The granularity of the assessment with regard to each criterion, i.e. the level of disaggregation of the indicators associated to each criterion pursuant to Article 15, which shall be:

      i. the entire geographical scope of the BZR, i.e. the EU, if one aggregated value is sufficient to reach conclusions for a given criterion; or

      ii. the BZRR, if one aggregated value is sufficient to reach conclusions for a given criterion; or

      iii. the BZ, if a value per BZ needs to be estimated to reach conclusions for a given criterion; or

      iv. a combination of points 1(b)ii and 1(b)iii of this article, if e.g. a value per BZ inside the BZRR shall be given, while for BZs outside the BZRR, only one aggregated value shall be given; or

      v. any of the above options and optionally a higher level of granularity to complement the analysis.

2. The categorisation agreed upon by the TSOs shall be the same for all BZRRs, except otherwise duly and jointly justified by TSOs.

Article 15.Evaluation approach per criterion

1. The '*Operational security*' criterion shall be evaluated as follows:

   (a) The assessment of the impact of alternative BZ configurations on operational security shall be based on the security analysis as described in Article 8 and shall consider the following two indicators:

      i. the aggregated number of N and N-1 operational security violations before considering remedial actions; and

      ii. a physical congestion index calculated as follows:

$$Cong.index\ (BZc) = \sum_{h=1}^{H} \sum_{i=1}^{I} \left(physical\ congestion_{i,h}\right),$$

      with

      BZc — the zonal configuration under consideration;

      h — the hour under consideration;

H	the total number of hours in a year;
i	the network element under consideration whose forecasted flow before the application of remedial actions is above the thermal rating;
I	the number of network elements whose forecasted flow before the application of remedial actions is above the thermal rating for the considered hour;
$physical\ congestion_{i,h}$	any physical congestion identified pursuant to Article 8.5. It shall be calculated as the difference between the forecasted flows before the application of remedial actions and the thermal rating of the relevant network element, for the network element i during hour h, expressed in MW.

(b) Interpretation of the results: A given BZ configuration is expected to:

i. Perform better (respectively worse) than the status quo configuration with regard to the '*Operational security*' criterion when either the two above described indicators show a lower (respectively higher) value for the said configuration than for the status quo one, or at least one of the two indicators shows a lower (respectively higher) value for the said BZ configuration while the other is the same as for the status quo configuration.

ii. Perform the same as the status quo configuration with regard to the '*Operational security'* criterion in any other case.

2. The '*Security of supply*' criterion shall be evaluated as follows:

(a) The evaluation should at least be based on the following indicators:

i. 'LOLE';

ii. 'EENS'; and

iii. the monetised impact of the ENS, which should be calculated by combining the EENS and the VOLL, as envisaged in Article 11 of the Electricity Regulation.

(b) The calculation process to estimate the above indicators should be probabilistic. Additionally, it should:

i. Consider the network within and between BZs, i.e. the grid within BZs should not be considered as copper-plate networks. In particular, the assessment shall reflect the probabilistic EENS which may occur due to physical congestion in the internal network.

ii. Except for the consideration of the network, be aligned with the latest methodology of the European Resource Adequacy Assessment Methodology[13].

iii. Be progressively implemented based on experienced gained from upcoming ERAAs and BZRs.

(c) Interpretation of the results:

i. As far as technically possible, the '*Security of supply*' criterion shall be monetised as above described, and therefore considered together with all other monetised criteria.

[13] Envisaged in Article 23 of the IME Regulation.

ii. Otherwise, and until the modelling tools to estimate the above described indicators are developed, the alternative BZ configurations may be considered to perform the same as the status quo with regard to the '*Security of supply*' criterion.

3. The '*Degree of uncertainty in cross-zonal capacity calculation*' criterion shall be evaluated as follows:

(a) The degree of uncertainty in cross-zonal capacity calculation shall relate to the FRMs of CNECs used in capacity calculation as described in Article 6.10.

(b) Interpretation of the results: As the FRMs are inputs for the capacity calculation process, which is in itself an input for the calculation of the 'Economic efficiency' criterion, pursuant to paragraph 4 of this article, the 'Degree of uncertainty in capacity calculation' criterion shall be considered as implicitly monetised, and therefore considered together with all other monetised indicators.

4. The '*Economic efficiency*' criterion shall be evaluated as follows:

(a) The assessment of the economic efficiency shall be based on the change of socio-economic welfare, as follows:

i. For each alternative BZ configuration, the change in socio-economic welfare shall be calculated. This change refers to the difference between socio-economic welfare of the said BZ configuration and of the status quo BZ configuration, both calculated at the EU level.

ii. The change in socio-economic welfare shall be equal to the sum of:

1. the change in the socio-economic welfare derived from the market dispatch, pursuant to Article 7; and

2. the change in total additional costs derived from the RAO pursuant to Article 9.16.

iii. A breakdown of socio-economic welfare into producer surplus, consumer surplus and congestion revenue shall also be provided.

iv. As far as technically possible, a breakdown of socio-economic welfare per MS shall also be provided.

5. The '*Firmness cost*' criterion shall be evaluated as follows:

(a) The assessment of firmness costs shall be based on the costs of guaranteeing that the cross-zonal capacity allocated to market participants remains unchanged.

(b) As the remedial action optimisation described in Article 9 assumes that the allocated cross-zonal capacity is always guaranteed by applying the necessary remedial actions, the firmness costs shall be considered as implicitly monetised in the '*Economic efficiency*' criterion described in paragraph 4 of this article.

(c) Interpretation of the results: The '*Firmness cost*' criterion is indirectly monetised as part of the '*Economic efficiency*' criterion described in paragraph 4 of this article and therefore considered together with all other monetised indicators.

6. The '*Market liquidity and transaction costs*' criterion shall be evaluated as follows:

(a) The assessment of the expected evolution of market liquidity and its impacts, including potential impacts on transaction costs, shall be performed for both the long-term timeframe, i.e. before the day-ahead timeframe, and the short-term timeframes, i.e. day-ahead and closer-to-real-time timeframes.

(b) The analysis of liquidity and transaction costs in long-term timeframes shall be based on a study, conducted for the whole EU, that aims to capture the impacts of long-term markets

liquidity, in particular on whether liquidity changes impact the existence of sufficient hedging opportunities for market participants. The analysis shall, at least, consider the following elements:

i. A descriptive analysis of liquidity aiming to describe the starting point of market liquidity in the concerned BZs. The analysis shall at least include the following indicators:

   1. the volume of trade in organised and non-organised markets; and

   2. average of the lowest bid-ask spread per period that is relevant for market participants with hedging needs[14], for the most frequently traded product(s).

Market depth indicators may also be used for the analysis.

ii. A correlation analysis, aiming to describe the correlation of average day-ahead prices of the concerned BZ with average day-ahead prices of other BZs or BZ combinations. The correlation analysis shall at least be performed based on simple correlation indicators between the monthly average simulated day-ahead prices for the alternative BZ configurations and the status quo BZ configuration.

iii. To describe possible liquidity impacts because of expected changes in competition, the analysis shall also consider indicators related to the '*Market concentration and market power*' criterion, e.g. Herfindal-Hirschman-Index or the Residual Supply/ Pivotal Supplier Indexes, and to the organisation of retail markets, such as the number of retailers.

iv. A holistic analysis of the above numerical results shall be carried out in order to conclude whether a BZ reconfiguration is likely to result in increased/reduced hedging opportunities. In particular, an assessment of the impacts of changed hedging opportunities in a 'new' BZ may be based on a comparison with existing BZs of comparable characteristics. Where relevant, the assessment shall also consider the evolution of long-term markets liquidity, including hedging opportunities, in areas subject to recent changes of BZ configuration in Europe.

v. The analysis shall also identify practical considerations which may need to be considered in case of a possible BZ configuration change as set forth in Article 14(10) of the Electricity Regulation, including possible timescales for implementation of alternative BZ configurations. In doing so, the outcome of the public consultation conducted pursuant to Article 17.4 shall be considered.

vi. The perceived effects of alternative BZ configurations on market liquidity and transaction costs, based on the public consultation conducted pursuant to Article 17.4.

(c) The analysis of liquidity and transaction costs in short-term markets timeframes shall be based on a study conducted at EU level. The analysis shall, at least, consider the following elements:

i. Relevant liquidity indicators, which shall include:

   1. traded volumes; and

   2. churn ratios.

[14] For example, the average of the lowest bid ask spread per week, or the average of the lowest bid-ask spread per month, depending on the period that is deemed as relevant for market participants' hedging needs.

ii. Where relevant, the evolution of short-term markets liquidity in areas subject to recent changes of BZ configuration in Europe.

i. The possible effect of intra-company transactions on short-term liquidity following a BZ configuration change.

ii. The above mentioned study shall be conducted at least for the day-ahead timeframe. Additional short-term timeframes may also be studied.

(d) In order to conclude on the effects of alternative BZ configurations on market liquidity and transaction costs, TSOs may request regulatory authorities' opinion on the matter, as part of the consultation pursuant to pursuant to Article 17.2 and Article 17.3. If the relevant authorities are consulted, TSOs shall take their opinion duly into account.

(e) Interpretation of the results: A given BZ configuration is expected to:

i. Perform better (respectively worse) than the status quo configuration with regard to the '*Market liquidity and transaction costs*' criterion when the analysis of liquidity for both long-term and short-term timeframes suggests that either:

1. the two timeframes perform better (respectively worse) than the status quo configuration with respect to liquidity; or

2. at least one of the two timeframes performs better (respectively worse) than the status quo configuration, while the performance of the other timeframe remains the same as for the status quo configuration.

ii. Perform the same as the status quo configuration with regard to the '*Market liquidity and transaction costs*' criterion in any other case.

7. The '*Market concentration and market power*' criterion shall be split into the following sub-criteria: i) '*Market concentration and market power in the wholesale markets (from long-term to short-term markets)*' and ii) '*Market concentration and market power in the TSOs' mechanisms to resolve physical congestions'*. The analysis of the two sub-criteria shall be made as follows:

(a) The evaluation of market concentration shall be made by using, at least, one of the following two types of indicators:

i. Herfindal-Hirschman-Index (HHI). For each BZ, an annual HHI shall be calculated as a time-weighted average HHI, considering that the relevant market price area may be different during each hour. For each hour, the relevant market price area shall be equal to the largest set of BZs which are interconnected and whose day-ahead price is identical. The index shall be calculated using the following formula:

$$HHI_{BZ\,i}^{year\,y} = \frac{\sum_{h=1}^{8760} HHI_{price\ area\ of\ BZi}^{hour\,h}}{8760}$$

with

HHI	calculated for a given price area as $\sum_{i=1}^{n} Si^2$;
Si	the market share of installed capacity for firm i, over total installed capacity and interconnector capacity; moreover, the interconnector capacity shall be considered as a set of firms with the same concentration as in the neighbouring market.

ii. Residual Supply/ Pivotal Supplier Indexes (RSI/PSI). RSI shall be calculated, at least, for the largest player per hour, as follows:

$$RSI_{player\ i}^{hour\ t} = \frac{Total\ capacity - Company\ i's\ relevant\ capacity}{Total\ demand} = \frac{\sum_{player\ j \neq i} ProductionCapacity_j \times Availability_j + Import\ capacity}{Load^t + TSOreserveRequirement^t}$$

Based on the above hourly index, two annual indicators shall then be derived for at least the largest player I, as follows:

$$RSI_{player\ i}^{year\ y} = \frac{\sum_{t=1}^{T} RSI_{player\ i}^{hour\ t}}{T}$$

$PSI_{player\ i}^{year\ y}$, estimated as the % hours when RSI<1 for a certain player i.

(b) Interpretation of the results: The interpretation of the results shall be as follows:

i. The above indicators shall be used to identify the timeframes where it is more likely that market power issues might arise, i.e. either in the organised markets or in the TSOs' processes to resolve physical congestions.

ii. For each alternative BZ configuration, two conclusions, one for each of the sub-criteria mentioned above, shall be obtained.

1. When the HHI values tend to be higher (lower) for a BZ configuration than for the status quo configuration; or

2. When the RSI/PSI values tend to be lower (higher) for a BZ configuration than for the status quo configuration;

it shall be concluded that:

a. higher (respectively lower) levels of market concentration and, potentially, scope for market power can be expected in the wholesale markets (from long-term to short-term markets) than in the status quo configuration; and

b. lower (respectively higher) levels of market concentration and, potentially, scope for market power can be expected in the TSOs' mechanisms to resolve physical congestions, i.e. in the redispatching mechanisms, than in the status quo configuration.

8. The '*Facilitation of effective competition*' criterion shall be split into the following three different sub-criteria, which shall be separately assessed: '*Short-term competition'*, '*Long-term competition'* and '*Competition for cross-zonal capacity'*.

(a) The assessment of short-term competition shall be based on the comparison of the results of two other criteria:

i. '*Market liquidity and transaction costs'*; and

ii. '*Market concentration and market power'*.

(b) The assessment of long-term competition shall be based on the comparison of the results of two other criteria:

i. '*Accuracy and robustness of price signals'*; and

ii. '*Price signals for building infrastructure'*.

(c) The assessment of competition for cross-zonal capacity shall aim to analyse whether structural differences in zonal PTDFs may lead to competitive disadvantages for certain BZs. In order to perform the analysis, the following indicator shall be used:

$$\sigma\left[\mu\left|PTDF_{BZ_i-BZ_j}\right|\right]$$

with

σ	the standard deviation over all pairs of BZs within the CCR;
μ	the arithmetic average over all CNECs considered in capacity calculation within a CCR for a given pair of BZs;
$\left\|PTDF_{BZ_i-BZ_j}\right\|$	the absolute value of the zone-to-zone PTDF for two given BZs i and j and for a given CNEC;
i, j	pair of BZs within a CCR.

The above described indicator shall be at least calculated for all CCRs where PTDFs are computed for the purpose of capacity calculation.

(d) Interpretation of the results: A given BZ configuration shall be expected to:

i. Perform better (respectively worse) than the status quo configuration with regard to the '*Short-term competition'* sub-criterion when the analysis of the criteria i) '*Market liquidity and transaction costs'* and ii) '*Market concentration and market power'* suggest that either a BZ configuration performs better (respectively worse) with respect to both these criteria or that at least it performs better (respectively worse) with regard to one of the two criteria while the performance of the other criterion remains the same as for the status quo configuration. In any other case, it shall be expected to perform the same as the status quo configuration.

ii. Perform better (respectively worse) than the status quo configuration with regard to the '*Long-term competition'* sub-criterion when the analysis of the criteria: i) '*Accuracy and robustness of price signals'* and ii) '*Price signals for building infrastructure'* suggest that either a BZ configuration performs better (respectively worse) with respect to both criteria or that at least it performs better (respectively worse) with regard to one of the two criteria while the performance of the other criterion remains the same as for the status quo configuration. In any other case, it shall be expected to perform the same as the status quo configuration.

iii. Perform better (respectively worse) than the status quo configuration with regard to the '*Competition for cross-zonal capacity'* sub-criterion, when the indicator associated to the relevant sub-criterion shows a lower (respectively higher) value for the said configuration than for the status quo one.

9. The '*Price signals for building infrastructure*' criterion shall be evaluated as follows:

(a) Infrastructure refers both to

i. generation or demand assets; and

ii. network infrastructure.

(b) In order for prices to give relevant signals to build generation and demand assets in a cost-efficient manner, prices shall be accurate and robust. Therefore, the ability of prices to promote efficient investments in generation and demand assets shall be based on the results

of the '*Accuracy and robustness of price signals*' criterion, pursuant to paragraph 10 of this article.

(c) In order for prices to give relevant signals to build network infrastructure, physical congestions should be preferably dealt with in the market. This shall be evaluated by using the following indicator:

Percentage of time when the physical congestion was not previously detected in the day-ahead market, i.e. the percentage of time when physical congestion (or no remaining physical capacity) was detected in a given network element, following the operational security analysis pursuant to Article 8, while market congestion, for the said network element, was not identified following the day-ahead market dispatch pursuant to Article 7.

'Market congestions' refers to Article 2(17) of the CACM Regulation, i.e. to market time units when there is a least one constraint, with a shadow price, which actively limits cross-zonal exchanges during capacity allocation. Such a constraint may be a cross-zonal or internal line, or an allocation constraint, based on the day-ahead market simulations, pursuant to Article 7.

(d) Interpretation of the results: In order to conclude on this criterion, the two aspects included in points 9(b) and 9(c) of this article shall be considered, as follows:

i. A given BZ configuration shall be expected to perform better (respectively worse) with regard to the indicator included in point 9(c) of this article, when the said indicator shows a lower (respectively higher) value for the said configuration than for the status quo one.

ii. A BZ configuration shall be expected to perform better (respectively worse) than the status quo configuration with regard to the '*Price signals for building infrastructure*' criterion when it performs better (respectively worse) with regard to both the above mentioned aspects or that at least it performs better (respectively worse) with regard to one of the aspects while the performance of the other aspect remains the same as for the status quo configuration.

iii. In any other case, it shall be expected to perform the same as the status quo configuration.

10. The '*Accuracy and robustness of price signals'* criterion shall be evaluated as follows:

(a) Prices are accurate and robust when a majority of market participants, i.e. participating to day-ahead markets and/or using the day-ahead price as the main price reference, perceive the benefits of reacting to the actual needs of the system at the precise location and point in time.

(b) The accuracy and robustness of price signals shall be measured by using the following indicator:

For the geographical areas comprised within 'new' BZs of each alternative BZ configuration, the correlation between volume-weighted average nodal prices, pursuant to Article 11 and the zonal day-ahead market prices in the said area. The correlation shall be then compared to the correlation for the same geographical area in the status quo, i.e. the nodal prices used for the former correlation would be the same as for the latter, but the zonal prices would differ.

(c) Interpretation of the results: A given BZ configuration shall be expected to:

i. Perform better (respectively worse) than the status quo configuration with regard to the '*Accuracy and robustness of price signals'* criterion when the indicator above described

shows a higher (respectively lower) value for the said configuration than for the status quo one.

ii. In any other case, it shall be expected to perform the same as the status quo configuration.

11. The '*Transition costs'* criterion shall be evaluated as follows:

(a) Transition costs refer to the one-off costs expected to be incurred in case the BZ configuration is amended. In particular, transition costs:

i. Shall relate to adaptations that are inherently and unambiguously related to a specific BZ configuration change.

ii. Shall include an estimation of the cost of amending existing contractual obligations incurred by market participants, NEMOs and TSOs. Such estimation shall reflect the expected implementation timeline for an eventual BZ change, and the fact that when deciding on the implementation date, MSs are required to balance the need for expeditiousness with practical considerations, including forward trade of electricity.

iii. Shall not relate to adaptations that are, in general, necessary to ensure sufficient flexibility of the systems to cope with a variable number of BZs due to a potential amendment of the BZ configuration in the future.

iv. In order to identify and possibly estimate transition costs, a study shall be jointly performed for all BZRRs. The study shall aim to provide an overview of necessary adaptations and possibly a range of related cost estimates. The study shall also consider stakeholders' replies to the public consultation conducted pursuant to Article 17.4.

(b) The resulting estimates shall be considered to calculate the minimum 'lifetime', in years, of a BZ configuration, as described in Step 4 in Article 13.1(d).

12. The '*Infrastructure cost'* criterion shall be evaluated as follows:

(a) Infrastructure costs should preferably be estimated by modelling the effect of BZ configurations on investment decisions, e.g. on generation or demand assets, and on the need to build, or not, network infrastructure to address congestions in a cost-efficient manner.

(b) In the absence of modelling tools able to robustly assess the aspects mentioned in point 12(a) of this article, the assessment of the '*Infrastructure cost'* criterion shall be based on the comparison of the results of two other criteria: i) '*Accuracy and robustness of price signals'* and ii) '*Price signals for building infrastructure'*.

(c) Interpretation of the results: A given BZ configuration is expected to:

i. Perform better (respectively worse) than the status quo configuration with regard to the '*Infrastructure cost'* criterion when the analysis of the criteria i) '*Accuracy and robustness of price signals'* and ii) '*Price signals for building infrastructure'* suggest that either a BZ configuration performs better (respectively worse) with respect to both these criteria or that at least it performs better (respectively worse) with regard to one of the two criteria while the performance of the other criterion remains the same as for the status quo configuration.

ii. In any other case, it shall be expected to perform the same as the status quo configuration.

13. The '*Market outcomes in comparison to corrective measures'* criterion shall be evaluated as follows:

(a) Corrective measures refer to the remedial actions that are applied to solve all operational security violations pursuant to Article 8.5.

(b) Consequently, the evaluation of the '*Market outcomes in comparison to corrective measures*' criterion shall be performed by calculating the total remedial action costs as envisaged in Article 9 and shall be evaluated together with the socio-economic welfare derived from the market dispatch as envisaged in Article 7. This joint evaluation corresponds to the assessment of the '*Economic efficiency*' criterion, as described in paragraph 4 of this article.

14. The '*Adverse effects of internal transactions on other BZs'* criterion shall be evaluated as follows:

(a) The adverse effects of internal transactions on other BZs shall be assessed based on:

i. The analysis of flows not induced by cross-zonal trade as described in Article 10. In particular, the assessment of these adverse effects shall be estimated by using the following two indicators:

1. *Average share of loop flows on network elements*, with either a market congestion following the day-ahead market dispatch, or with physical congestion during the operational security analysis following the day-ahead market dispatch pursuant to Article 7.

2. *Number of occurrences (hours) with loop flows, on all network elements, higher than a given threshold,* expressed as a percentage of Fmax, and agreed upon by all TSOs of a CCR.

Loop flows shall be calculated according to the flow decomposition methods and on the CGMs pursuant to Article 10.1.

ii. Impacts derived from inaccurate price signals, due to flows not induced by cross-zonal trade, potentially leading to inefficient investments in other BZs. These impacts are assessed through the '*Accuracy and robustness of price signals'* and the '*Price signals for building infrastructure*' criteria.

(b) Interpretation of the results:

i. A given BZ configuration is expected to:

1. Perform better (respectively worse) than the status quo configuration with regard to '*Adverse effects of internal transactions on other BZs*' criterion when, either the two above described indicators show a lower (respectively higher) value for the said configuration than for the status quo one, or at least one of the two indicators shows a lower (respectively higher) value for the said BZ configuration, while the other is the same as for the status quo configuration.

2. Perform the same as the status quo configuration with regard to the '*Adverse effects of internal transactions on other BZs*' criterion in any other case.

ii. The presence, or lack, of adverse impacts related to the '*Accuracy and robustness of price signals*' criterion shall also be included as 'other considerations', when justifying the outcome of the assessment of the 'Adverse effects of internal transactions on other BZs' criterion, pursuant to Article 13.1(b)iii.2.

15. The '*Impact on the operation and efficiency of the balancing mechanisms and imbalance settlement processes*' criterion shall be split into two different sub-criteria which shall be separately assessed: i) '*Operation and efficiency of the balancing mechanisms'* and ii) '*Imbalance settlement processes'*.

(a) The assessment of the operation and efficiency of the balancing mechanism should be based on the calculation of the socio-economic welfare in the balancing timeframe as follows:

i. For each alternative BZ configuration, the change in socio-economic welfare in the balancing timeframe shall be calculated. This change shall refer to the difference between socio-economic welfare of the said BZ configuration and of the status quo BZ configuration.

ii. The estimation of socio-economic welfare in the balancing timeframe shall consider the following elements:

1. The estimated balancing capacity reservation costs, which shall be based on the expected reserve requirements for each alternative BZ configuration and be equal to the sum of the expected opportunity costs reflected in the capacity bids of BSPs to cover the reserve requirements.

2. The socio-economic welfare related to the co-optimisation of balancing capacity and day-ahead energy, i.e. that cross-zonal capacity for the exchange of balancing capacity is allocated based on a comparison of the day-ahead market curves and balancing capacity bids in each BZ.

3. The costs related to the activation of balancing energy, defined as the costs incurred by BSPs when they are activated by TSOs to keep the system in balance. This analysis requires making an assumption on the system imbalance volumes and their geographical distribution, per MTU, for the target year. In case TSOs are unable to estimate system imbalance volumes, TSOs may consider all BRPs to be always in balance according to the results of the day-ahead market dispatch pursuant to Article 7.

4. The effects on remedial actions, and related costs, to consider how the geographical distribution of the reserves impacts the need for TSOs' actions to prevent violations of OSLs. To enable this analysis, TSOs shall:

a. First, estimate how the reservation of balancing capacity impacts the amount of capacity available on network elements to accommodate flows from commercial exchanges. Such an estimation implies that in order to quantitatively assess the operation and efficiency of the balancing mechanism sub-criterion, FRMs on CNECs shall not be considered as uniform as envisaged in Article 6.10(b), but rather computed as envisaged in Article 6.10(a).

b. Second, use such information as an input for the modelling chain described in Article 5 to Article 9.

iii. The assessment of the '*Imbalance settlement processes'* sub-criterion shall consider the following:

1. It shall refer to the accuracy and robustness of imbalance prices to incentivise BRPs to support an efficient balancing of the system when and where they are needed.

2. The above mentioned assessment shall be based on the results of the '*Accuracy and robustness of price signals'* criterion.

(b) Interpretation of the results:

i. With respect to '*Operation and efficiency of the balancing mechanisms'* sub-criterion: As far as technically possible, this sub-criterion is expected to be monetised as above described, and therefore considered together with all other monetised indicators.

Otherwise, and until the process to estimate the above-described indicators is in place, the alternative BZ configurations may be considered to perform the same as the status quo configuration with regard to operation and efficiency of the balancing mechanisms sub-criterion.

ii. With respect to '*Imbalance settlement processes'* sub-criterion: A given BZ configurations is expected to perform better (worse, or the same) than the status quo configuration when it performs better (respectively worse or the same) with regard to the 'Accuracy and robustness of price signals' criterion.

16. The '*Stability and robustness of BZs over time'* criterion shall be evaluated as follows:

(a) The assessment of the '*Stability and robustness of BZs over time*' criterion shall be based on, at least, the evaluation of the '*Economic efficiency'* criterion in line with paragraph 4 of this article, for each of the sensitivity analyses pursuant to Article 4.10.

(b) Interpretation of the results: A given BZ configuration shall be expected to:

i. Perform better (respectively worse) than the status quo configuration with regard to the '*Stability and robustness of BZs over time*' criterion when:

1. the evaluation of the '*Economic efficiency*' criterion leads to a positive change in socio-economic welfare compared to the status quo configuration for the majority of sensitivities considered; or

2. having analysed all criteria, TSOs conclude that the said BZ configuration performs better (respectively worse) than the status quo configuration for the majority of sensitivities considered.

ii. Performs the same as the status quo configuration with regard to the '*Stability and robustness of BZs over time*' criterion in any other case.

17. The '*Consistency across capacity calculation time frames'* criterion shall be evaluated as follows: The impact of alternative BZ configurations on this criterion shall not be considered as dependant on the BZ configuration since the consistency across capacity calculation timeframes is a regulatory requirement. Alternative BZ configurations shall thus perform the same as the status quo configuration with regard to this criterion.

18. The '*Assignment of generation and load units to BZs'* criterion shall be evaluated as follows: The impact of alternative BZ configurations on this criterion shall be considered as a prerequisite for the effective operation of a given BZ configuration. In this respect, the unique and unambiguous assignment of generation and load units to a BZ should be addressed when proposing alternative BZ configurations to be studied in the BZR. In order to confirm that all alternative BZ configurations meet this prerequisite, the fulfilment of this criterion shall be assessed during the BZR; in case this requisite is not met, then the alternative BZ configuration may be 'rejected' as part of Step 1 of the assessment, pursuant to Article 13.1(a)iii.4; otherwise, an alternative BZ configuration shall be considered to perform the same as the status quo configuration with regard to this criterion.

19. The '*Location and frequency of congestion (market and grid)*' criterion shall be evaluated as follows:

(a) The evaluation of the '*Location and frequency of congestion (market and grid)*' criterion shall be made by using the following two indicators:

i. *Percentage of time when the physical congestion was not previously detected in the day-ahead market*, pursuant to point 9(c) of this article; and

ii. the share of market congestions which occurred on cross-zonal network elements over the total market congestions on internal and cross-zonal network elements, as follows:

$$Share\ of\ market\ congestions\ on\ BZ\ borders = \frac{\sum_{1}^{N} number\ of\ market\ congestions\ on\ cross-zonal\ lines}{\sum_{t=1}^{8760} total\ number\ of\ market\ congestions}$$

with

N, the number of simulated MTUs.

(b) Interpretation of the results: A given BZ configuration is expected to:

i. Perform better (respectively worse) than the status quo configuration with regard to the '*Location and frequency of congestion (market and grid)*' criterion when the two indicators above described show:

1. a better (respectively worse) performance for the two indicators, compared to the status quo configuration, meaning a lower (respectively higher) value for the '*Percentage of time when the physical congestion was not previously detected in the day-ahead market*' indicator and a higher (respectively lower) value for the share of market congestions which occurred on cross-zonal network elements over the total market congestions on internal and cross-zonal network elements; or

2. one of the two indicators shows a better (respectively worse) performance, while the other indicators shows the same performance as for the status quo configuration.

ii. Perform the same as the status quo configuration with regard to the '*Location and frequency of congestion (market and grid)*' criterion in any other case.

20. The *'Short-term effects on CO_2 emissions'* criterion shall be evaluated as follows:

(a) The assessment of the '*Short-term effects on CO_2 emissions*' criterion shall be based on the simulated overall volume of CO_2 emissions, after optimisation of remedial actions, for the different BZ configurations under investigation.

(b) Interpretation of the results: A given BZ configuration shall be expected to perform better (respectively worse) than the status quo configuration with regard to the *'Short-term effects on CO_2 emissions'* criterion when the overall volume of CO_2 emissions for the said BZ configuration is lower (respectively higher) than for the status quo one. If the overall volume of CO_2 emissions is the same as in the status quo configuration, the said configuration shall be considered to perform the same as the status quo configuration.

21. The *'Short-term effects on RES integration'* criterion shall be evaluated as follows:

(a) The assessment of the *'Short-term effects on RES integration'* criterion shall be based on the total amount of simulated fed-in energy from RES, after optimisation of remedial actions, for the different BZ configurations under investigation.

(b) Interpretation of the results: A given BZ configuration shall be expected to perform better (respectively worse) than the status quo configuration with regard to the '*Short-term effects on RES integration'* criterion when the total amount of simulated fed-in energy quantities from RES for the said BZ configurations is higher (respectively lower) than for the status quo one. If the fed-in energy quantities from RES are the same as in the status quo configuration, the said configuration shall be considered to perform the same as the status quo configuration.

22. The *'Long-term effects on low-carbon investments'* criterion shall be evaluated as follows:

(a) The assessment of the *'Long-term effects on low-carbon investments*' criterion shall be based on the comparison of the results of two other criteria: i) '*Accuracy and robustness of price signals'* and ii) '*Price signals for building infrastructure*'.

(b) Interpretation of the results: A given BZ configuration shall be expected to:

i. Perform better (respectively worse) than the status quo configuration with regard to the '*Long-term effects on low-carbon investments*' criterion when the analysis of the criteria i) '*Accuracy and robustness of price signals'* and ii) '*Price signals for building infrastructure'* suggest that either a BZ configuration performs better (respectively worse) with respect to both these criteria or that at least it performs better (respectively worse) with regard to one of the two criteria while the performance of the other criterion remains the same as for the status quo configuration.

ii. Performs the same as the status quo configuration with regard to the *'Long-term effects on low-carbon investments'* criterion in any other case.

Article 16. Transparency

1. TSOs shall jointly ensure the publication of all relevant information concerning the BZR, including scenario, assumptions, input and output data, parameters and all other relevant information, quantitative or qualitative, used or generated during the BZR, with the exception of confidential information according to paragraph 3 of this article.
2. A list of the minimum set of data to be published pursuant to this article is included in Annex Ia.
3. Any confidential information received, exchanged or transmitted pursuant to this BZR methodology shall be managed in accordance with Article 13 of the CACM Regulation and the procedure to ensure its protection.
4. Where information is confidential under a given jurisdiction, this shall not prevent that information from being published in other jurisdictions.
5. Confidential information under a given jurisdiction shall be published, for that jurisdiction, with the minimum level of aggregation, protecting confidentiality interests.
6. All information concerning a given jurisdiction shall be disclosed to the respective regulatory authorities, and to ACER.
7. The following deadlines for the publication of data, shall apply:
   (a) all inputs for the BZR shall be published no later than 4 months after the BZR starts; and
   (b) all outputs of the BZR shall be published no later than one month after the BZR ends.

Article 17. Stakeholder involvement and consultation

1. TSOs shall involve stakeholders during the BZR. This shall include scheduling regular meetings with stakeholders to inform on the progress of the BZR, including on the difficulties encountered during the process, and collecting feedback from stakeholders. These meetings shall not replace the stakeholder consultations in accordance with this Article.
2. Two months after the BZR starts, TSOs shall submit all information used as an input for the BZR, pursuant to Article 16, to regulatory authorities and to ACER. The TSOs shall submit:
   (a) all detailed information of their respective jurisdictions, including input data, scenario, sensitivities, assumptions, parameters, etc.; and

(b) information of all other jurisdictions, including input data, scenario, sensitivities, assumptions, parameters, etc., subject to a minimum level of aggregation in case of confidentiality concerns pursuant to applicable legislation.

3. Following the submission of information pursuant to paragraph 2 of this article, regulatory authorities and ACER may submit comments on the submitted data to TSOs within six weeks. TSOs shall duly consider the comments of regulatory authorities and ACER. TSOs shall provide a clear and robust justification on how the comments were taken into account. Such a justification shall be published in a timely manner before or simultaneously with the publication of all information used as an input for the BZR, pursuant to Article 16.7(a).

4. No later than six months after the start of the BZR, TSOs of a BZRR shall hold a public consultation regarding at least the following aspects of the BZR:

   (a) the impacts of alternative BZ configurations on at least the following criteria: '*Market liquidity and transaction costs*' and '*Transition costs*';

   (b) possible measures to mitigate negative impacts of specific alternative BZ configurations with regard to at least the criteria listed in point 4(a) of this article; and

   (c) the identification of practical considerations which may need to be considered in case of a possible BZ configuration change as set forth in Article 14(10) of the Electricity Regulation, including possible timescales for implementation of alternative BZ configurations.

5. The responses related to points 4(a) and 4(b) of this article, linked to the above-mentioned public consultation, shall be used for the assessment on the acceptability of alternative BZ configurations to be performed by the relevant authorities, in accordance with Article 13.1(c)ii.3.

6. The responses related to point 4(c) of this article, linked to the above-mentioned public consultation, shall be used as an input for TSOs to identify practical considerations when deciding on a BZ configuration change, as described in Article 13.1(b)iii.3.

Article 18. Coordination among BZRRs

1. The TSOs shall jointly ensure coordination among the different BZRRs when performing the BZR, in particular the TSOs shall perform the following activities in a coordinated manner:

   (a) When performing consultations, TSOs shall:

      i. conduct such consultations simultaneously for all BZRRs;

      ii. use the same platform for all BZRRs; and

      iii. define the same scope and use a harmonised structure and format of the consultations for all BZRRs.

   (b) When publishing or disclosing data, TSOs shall:

      i. publish or disclose such data simultaneously for all BZRRs; and

      ii. use the same publication formats for all BZRRs.

   (c) When publishing the final report, which shall include the proposals to amend or maintain the BZ configuration, TSOs shall:

      i. consolidate the results of the BZ review in one single report for all BZRRs;

      ii. use for all BZRRs the same structure and layout of the different parts of the final report referring to different BZRRs; and

iii. include in the report all the elements described in Article 13.1(d).

(d) TSOs shall jointly agree on at least the following aspects of the BZR:

i. on the three reference climate years to assess BZ configurations, pursuant to Article 4;

ii. on the definition of internal CNECs used in capacity calculation, pursuant to Article 6;

iii. on the geographical scope of perfect and imperfect coordination of remedial actions and when such coordination of remedial actions is expected to be (gradually) implemented, pursuant to Article 9;

iv. on the scale adopted to grade the performance of alternative BZ configurations, pursuant to Article 13;

v. on the geographical scope and the geographical granularity of the assessment of the alternative BZ configurations with regard to each criterion, pursuant to Article 14; and

vi. on any other aspect throughout this BZR Methodology for which the joint agreement of TSOs is required.

(e) With regard to the assessment of criteria pursuant to Article 15, TSOs shall:

i. jointly ensure the harmonised use of the indicators for each criterion across all BZRRs; and

ii. when relevant, jointly conduct or commission studies at the EU level.

Article 19. Publication of the BZR Methodology

The TSOs shall publish the BZR Methodology without undue delay after the BZR Methodology has been approved in accordance with Article 14(5) of the Electricity Regulation.

Article 20. Miscellaneous

The reference language for the BZR Methodology shall be English. For the avoidance of doubt, where the relevant TSOs need to translate the BZR Methodology into their national language(s), in the event of inconsistencies between the English version and any version in another language, the relevant TSOs shall dispel any inconsistencies by providing a revised translation of the BZR Methodology to their relevant regulatory authorities.

ACER
European Union Agency for the Cooperation of Energy Regulators

ACER Decision on the methodology and assumptions that are to be used in the bidding zone review process and for the alternative bidding zone configurations to be considered: Annex Ia

List of minimum data to be published

24 November 2020

At least the following data shall be published in accordance with Article 16 of the BZR methodology as per Annex I of Decision No 29/2020:

A. Input data

Where the same input data, or the same assumptions, and disaggregation methods per node are not used for both the modelling chain to assess BZ configurations and for the LMP simulations, any differences between these two set of simulations shall be highlighted when publishing the input data.

1. Scenario (Article 4)

a. List of all climate years used as a basis for the study.

b. Description of the sensitivities used to complement the scenario of the 'main study'.

c. Network model for the scenario and sensitivities[1].

d. List of additional infrastructure projects for the target year compared to the year when the BZR starts. Alternatively, the main changes applied to the TYDNP latest available reference grid model, if the latter is used as a starting point to reflect the target year.

e. Assumptions on how different voltage levels were considered or not, per bidding zone.

2. Generation

Data item	Level of granularity[2]	Corresponding article in the methodology
a. Generation time series for weather-dependent generation units	Climate year, MTU, generation unit (or the maximum level of disaggregation available)	Article 4
b. Minimum and maximum generating capacities	Generation unit	Article 4
c. Must-run constraints	Generation unit	Article 4
a. Ramping capabilities	Generation unit	Article 4
b. Minimum run-time	Generation unit	Article 4
c. Start-up and shut-down times	Generation unit	Article 4

[1] Individual TSOs may withhold the information on network models if it is classified as sensitive critical infrastructure protection related information in their Member States as provided for in point (d) of Article 2 of Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection. In such a case, the information on network models shall be replaced with an anonymous identifier which shall be stable across all MTUs and all network models used throughout the BZR.

[2] Generation and load data shall at least be published with a level of aggregation per technology and per bidding zone. Upon request, the level of granularity described in the respective generation and load tables shall apply.

d. Start-up costs	Generation unit	Article 7, 9
e. Breakdown of short-run marginal costs used for the market dispatch, including at least fuel costs, CO2 costs and variable operation and maintenance costs	Generation unit	Article 7, 9
f. Additional costs used for the redispatching mechanism including specific opportunity costs, readiness costs and any other cost related to the participation to redispatching	Generation unit	Article 7, 9

3. **Load**

Data item	Level of granularity	Corresponding article in the methodology
a. Load time series	Climate year	Article 4
b. Day-ahead demand elasticity[3].	Implicit DSR, bidding zone	Article 4
c. Maximum power [MW] which may respond	Explicit DSR unit	Article 4
d. Minimum price [€/MWh] at which the response is triggered	Explicit DSR unit	Article 4
e. Maximum activation duration [h]	Explicit DSR unit	Article 4
f. Maximum activated energy per day [MWh]	Explicit DSR unit	Article 4
g. Average amount of DSR [MW] available for the market dispatch	Bidding zone	Article 7
h. Average amount of explicit DSR [MW] not available for redispatching after considering market dispatch and technical constraints	Bidding zone	Article 9
i. Average amount of DSR [MW] available for neither of them	Bidding zone	Article 4,7,9

4. **Reserves (Article 4)**

    a. Per reserve type, per technology and per bidding zone:

        i. FCR requirement [MW];

[3] In case of several elasticities, also price ranges for which each elasticity value applies.

ii. FRR requirement [MW]; and

iii. RR requirement [MW]

5. **Capacity calculation (Article 6)**

   a. Capacity calculation methodology per border.

   b. List of action plans and derogations for the target year considered pursuant to the IME Regulation.

   c. Average FRM over all CNECs, per BZ.

   d. PTDF thresholds used by each TSO and, if different from default value, why the adopted threshold better reflects an economic efficiency analysis.

   e. Allocation constraints per border/BZ.

6. **Miscellaneous**

   a. List and brief description of the main characteristics of the modelling tools used for the analysis.

   b. All other assumptions and parameters set at pan-European or BZRR level with an impact on the results of the BZR.

B. Output data

Output data shall be published for each BZ configuration, including the status quo.

1. **Capacity calculation (Article 6)**

Data item	Level of granularity
a. NTC value [MW] per direction	Scenario, NTC BZ border and MTU
b. List of CNECs with zonal PTDFs and RAM	Scenario, flow-based BZ border and MTU
c. Allocation constraints	Scenario, BZ border and MTU
d. List of remedial actions applied during capacity calculation and the network model resulting from their implementation	Scenario, BZ border and MTU

2. **Day-ahead market dispatch (Article 7)**

Data item	Level of granularity
a. The total socio-economic welfare [€]	The whole EU, MTU
b. The utility of supplied demand [€]	The whole EU, MTU
c. The total generation cost [€]	The whole EU, MTU
d. The overall congestion revenue [€]	The whole EU, MTU

e. The production [MW]	The whole EU, MTU, generation unit
f. Average amount of generation [MW] available for the market dispatch	Bidding zone
g. Average amount of generation [MW] not available for redispatching after considering market dispatch and technical constraints	Bidding zone
h. Average amount of generation [MW] available for neither of them (e.g. due to mothballing or planned maintenance)	Bidding zone
i. The injection or withdrawal [MW]	The whole EU, MTU, storage unit
j. The activated DSR [MW]	The whole EU, MTU, DSR unit
k. The change in load due to demand elasticity [MW]	The whole EU, MTU
l. The amount of load-shedding [MW]	Bidding zone, MTU
m. The short-run marginal cost [€/MWh]	Bidding zone, MTU
n. The net positions [MW]	Bidding zone, MTU
o. The cross-zonal exchange [MW]	The whole EU, MTU, bidding zone border
p. The flow [MW] and the shadow price [€/MW]	The whole EU, MTU, CNEC

3. **Operational security analysis (Article 8)**

Data item	Level of granularity
a. The precise network configuration(s) when the violation occurs	Scenario, MTU and violation of an OSL
b. The kind of OSL violated	Scenario, MTU and violation of an OSL
c. The network element affected by the violation	Scenario, MTU and violation of an OSL
d. The OSL of the network element	Scenario, MTU and violation of an OSL
e. The value of the violation	Scenario, MTU and violation of an OSL

4. Remedial action optimisation (Article 9)

Data item	Level of granularity
a. The additional cost from the RAO	Scenario, geographic scope and day

b. The cost of ensuring availability of redispatching units	Scenario, geographic scope and day
c. The total upward dispatch change [MW]	Scenario, geographic scope of the RAO and MTU
d. The total downward dispatch change [MW]	Scenario, geographic scope of the RAO and MTU
e. The new dispatch [MW] and the change in dispatch [MW]	Scenario, geographic scope of the RAO, MTU and unit
f. The new net position [MW]	Scenario, geographic scope of the RAO, MTU and bidding zone
g. The network model updated to include all preventive remedial actions	Scenario, geographic scope of the RAO and MTU

5. LMP analysis (Article 11)

Data item	Level of granularity
a. Nodal price [€/MWh]	Node, MTU
b. Cleared generation, storage and demand volumes [MW]	Node, MTU
c. Flows on all considered network elements [MW]	MTU
d. Active network constraints	MTU
e. Shadow prices associated to the active network constraints [€/MW]	MTU
f. Overall socio-economic welfare [€]	MTU

6. **Results of the evaluation, for each indicator and criterion assessed in the BZR (Article 15)**

7. Outcome of the BZR (Article 13)

a. Final results consolidated in one joint report for all BZRRs.

b. Results of the sensitivity analyses.

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ACER Decision on the methodology and assumptions that are to be used in the bidding zone review process and for the alternative bidding zone configurations to be considered: Annex Ib

Template to consolidate the results of the BZR

24 November 2020

1.1. Table I – Ranking and acceptability of BZ configurations

BZ configuration	Monetised benefits [€/year]	Transition costs [€]	Minimum lifetime [years]	Accepted/Rejected	Justification
1	10	20	2	Accepted	
2	15	30	2	Rejected	
…					
n					

1.2. Table II – Short-term effects

	Operational security		Market liquidity and transaction costs		…	Short-term integration of RES	
Criterion / BZ configuration	Performance	Justification (or reference to it)	Performance	Justification (or reference to it)		Performance	Justification (or reference to it)
1	+/0/- or a more detailed scale						
2							
…							
n							

1.3. Table III – Long-term effects

	Facilitation of effective competition (long-term)		Facilitation of effective competition (relative access to cross-zonal capacity)		…	Long-term integration of RES	
Criterion / BZ configuration	Performance	Justification (or reference to it)	Performance	Justification (or reference to it)		Performance	Justification (or reference to it)
1	+/0/- or a more detailed scale						
2							
…							
n							

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ACER Decision on the methodology and assumptions that are to be used in the bidding zone review process and for the alternative bidding zone configurations to be considered: Annex II

Technical specifications and timeline of the data request for LMP analysis

24 November 2020

1. The Transmission System Operators (TSOs) shall provide the following data items resulting from a Locational Marginal Pricing (LMP) simulation in line with Article 11 of Annex I of Decision No 29/2020:
    a. nodal price for each node and MTU, in €/MWh;
    b. cleared generation, storage and demand volumes for each node and MTU, in MW;
    c. flows on all considered network elements for each MTU, in MW;
    d. active network constraints for each MTU if any;
    e. shadow prices associated to the active network constraints, €/MW;
    f. overall socio-economic welfare resulting from the optimization, in €;
    g. network model(s) used for the simulations; and
    h. geographical coordinates of all nodes included in the network model(s).
2. The TSOs shall provide the data items listed in point 1 above in three steps, as follows:
    a. templates detailing the specific formats to be used by TSOs when delivering the data to ACER and at least one network model used for the simulations, per synchronous area;
    b. provisional results, covering the number of MTUs specified in Article 11 of Annex I of Decision No 29/2020; and
    c. final results, covering the number of MTUs specified in Article 11 of Annex I of Decision No 29/2020.
3. The TSOs shall provide the data items listed in point 1 above according to the following deadlines:
    a. 28 February 2021, for the delivery of templates and at least one network model used for the simulations, per synchronous area;
    b. 31 May 2021, for the delivery of provisional results; and
    c. 31 October 2021, for the delivery of the final results of the analysis.
4. In order to ensure robust and timing delivery of the data request, TSOs are recommended to organise, during the LMP simulations, frequent interactions with regulatory authorities and ACER, including:
    a. discussions and brief consultation on the input data;
    b. discussions to agree on the specific formats to be used by TSOs when delivering the data to ACER;
    c. clarifications on the modelling assumptions; and
    d. discussion and brief consultation on metrics to assess reliability and robustness of the results.

Annex III (for information only) - Evaluation of responses to the public consultation on the methodology and assumptions that are to be used in the bidding zone review process and for the alternative bidding zone configurations to be considered

Note: *The present evaluation of responses is limited to the questions related to the bidding zone review methodology. Questions related to the definition of alternative bidding zone configurations will be evaluated as part of a separate decision, as outlined in sub-section 6.2 of this Decision.*

1 Introduction

On 1 April 2020, ACER launched a public consultation aimed at collecting stakeholders' views on the all TSOs' proposal on the methodology and assumptions and for the alternative bidding zone configurations to be considered for the bidding zone review process pursuant to Article 14(5) of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity. The consultation was intended to support on-going regulatory discussions prior to the adoption of the methodology. The consultation was closed on 24 April 2020.

2 Responses

By the end of the consultation period, the Agency received responses from 35 respondents.

This evaluation paper summarises all received comments and responses to them. The table below is organised according to the consultation questions and provides the respective views from the respondents, as well as a response from the Agency clarifying the extent to which their comments were taken into account.

ACER highlights that it might have slightly streamlined the text of some observations for the sake of brevity and clarity. ACER strove to respect the content of the responses provided, but to avoid any possible misunderstanding arising from summarising the observations received, the names of the respondents are not explicitly provided in the table below. For transparency reasons, full access to the original and non-confidential responses to the public consultation, including the name of the stakeholder, is provided here.

Respondents' views	ACER views
1. Bidding zone review: Methodology	
Topic 1: Pan-European consistency of the methodology	
Question 1.1.1: Please rate your degree of agreement or disagreement with the following statements: (1- Strongly disagree; 2- Disagree; 3- Neither agree nor disagree; 4- Agree; 5- Strongly agree).	
1. The assumptions and the methodology for the bidding-zone review must remain pan-European to the extent possible. Further consistency between regions must be ensured in the methodology included in the Proposal. *Respondents' answers (total: 27):* • *1 – Strongly disagree: 0%* • *2 – Disagree: 0%* • *3 – Neither agree nor disagree: 0%* • *4 – Agree: 52%* • *5 – Strongly agree: 48%*	
2. While the proposal may accommodate regional aspects when duly justified, pan-European principles that aim to maximise European welfare should be ensured, e.g. concerning capacity calculation principles. In this regard, the methodology should be consistent with recommendations and decisions of ACER regarding capacity calculation (e.g. the ACER Recommendation on capacity calculation and the ACER decision on the Core capacity calculation methodology).	

Respondents' views	ACER views
Respondents' answers (total:27): • *1 – Strongly disagree: 11%* • *2 – Disagree: 4%* • *3 – Neither agree nor disagree: 0%* • *4 – Agree: 59%* • *5 – Strongly agree: 26%*	
Question 1.1.2: Please detail below which aspects of the Proposal adequately ensure overall pan-European consistency of the bidding-zone review methodology and should therefore be retained in the final methodology.	
18 respondents provided an answer to this question.	
With regard to this question, the following elements have been listed by stakeholders as to be retained: (i) common scenarios and assumptions, including grid, load and generation data; (ii) common approach to the analysis (modelling chain), taking into account the different market coupling approaches (flow-based or NTC); (iii) maximization of pan-European welfare; (iv) up-to-date approaches for efficient redispatching and countertrading; (v) common approach to cross-border capacity calculation (e.g. 70% requirement).	**Answer 1** ACER observes that: a. The BZR methodology should ensure, to the extent possible, consistency across the EU. b. Regional specificities on selected aspects may be allowed subject to proper justifications and provided they do not negatively impact EU welfare. c. While simulations may be performed at the regional level, the objective function for any regional computation should still be the maximisation of EU welfare. d. For the sake of legal certainty, the review may consider the envisaged action plans and derogations for the time horizon of the study, subject to the conditions established in the Regulation.

Respondents' views	ACER views
Different views emerge with respect to the 70% requirement: while 1 respondent is in favour of considering any derogations and national action plans in place, 3 other respondents consider that there are no reasons to reduce capacities between BZRs even if the TSOs have established an approved action plan as those action plans are administrative measures to handle structural congestions that could be better handled by bidding zones. 2 respondents also argue than the minimum capacity for DC interconnectors should be 100%.	See Answer 1(d).
5 respondents are in favour of keeping some regional specificities where relevant. According to 2 respondents, if a regional approach is selected, the definition of the BZR regions should be transparent and based on solid and objective justifications with the same criteria to delineate every BZR region. 3 respondents are against the inclusion of any regional element in accordance to CACM and the Electricity Regulation recast.	See Answer 1(a) to 1(c).
Question 1.1.3: Please detail below which aspects of the Proposal hamper overall pan-European consistency of the bidding-zone review methodology, and should therefore be amended in the final methodology.	
22 respondents provided an answer to this question.	
The evaluation criteria leave room for (regional) interpretation and it will be inevitable that regions will come to different outcomes. The review should be based on much larger regions and additional cooperation and coordination between BZRRs must be ensured.	**Answer 2** ACER observes that: a. The BZR methodology should ensure, to the extent possible, consistency across the EU. b. Regional specificities on selected aspects may be allowed subject to proper justifications and provided they do not negatively impact EU welfare.

Respondents' views	ACER views
	c. Overall, the methodology should ensure adequate coordination and cooperation among the regions, possibly through dedicated provisions in the methodology.
The evaluation criteria that highlight economic efficiency of different configurations (i.e. quantification and monetization) should be reduced and/or prioritized. Nevertheless, elements that are hard to monetize cannot be ignored, but must still be assessed and quantified to the best extent possible.	**Answer 3** ACER observes that: a. Criteria that aim to assess the extent to which the various bidding zones address structural congestions in an efficient manner may be considered in a first step. b. All criteria should, a priori, be analysed, subject to technical limitations. c. The methodology should leave room for a certain degree of flexibility for TSOs to consider qualitative aspects, where relevant and duly justified.
The principles for the assessment of both network congestions and market efficiency should be clear and harmonized in the methodology. This assessment must include the effects on liquidity and competition following any re-delineation of zones. Several principles should be strengthened: (i) target year; (ii) grid data; (iii) weather year; (iv) disaggregation to nodal level.	**Answer 4** ACER observes that: a. The main elements of the scenario (including target year, network data, climate year and disaggregation at nodal level) should be more clearly defined in the methodology. b. In particular, the modelling of welfare changes resulting from the evaluation of the relevant criteria should be defined as precisely as possible.
A higher degree of transparency to enable stakeholders to verify the results and to justify what is deemed to be a negligible impact from neighbouring regions should be ensured.	**Answer 5** ACER observes that: a. Higher levels of transparency should be pursued during the review, possibly including a number of provisions in this respect.

Respondents' views	ACER views
	b. In particular, ACER finds it useful to list the minimum set of data to be published, both at an early stage of the review (input data) and at the end of the review (output data).
A consistent modelling approach which is able to capture dynamic effects such as the impact of different bidding zone configurations on locational price signals for investment and divestments, the effects of liquidity in forward and intraday markets and the influence on the level of competition and market concentration should be sought.	**Answer 6** ACER observes that: a. Several criteria (including those related to price signals for investments, liquidity, competition and market concentration) require further elaboration. b. The evaluation of these criteria should rely to the extent possible on quantifiable indicators, in combination with qualitative analyses where relevant.
Under Article 13.4 (6b), the analysis should be done for all timeframes, not only for day-ahead.	**Answer 7** ACER observes that: a. Different timeframes should be considered where relevant (e.g. to analyse liquidity impacts). b. However, the modelling may require some simplifications that do not allow to model all timeframes. In particular, a balance between complexity and computational tractability should be struck.
For some articles, the scope of the analysis is not clear. The concerned articles are the following: Article 4 (4), Article 10 (3), Article 5-3-a, Article 5-f, Article 6-1-c, Article 6-2, Article 6-3, Article 7-3 and 7-4-d, Article 7-5, Article 9-4, Article 9-6, Article 10-3, Article 12-4, Article 13-4 (6b).	**Answer 8** ACER observes that: a. Several articles require further elaboration to clearly describe the analysis to be performed during the bidding zone review.
It is unclear how much time is given to NRAs for reaching a unanimous decision and how much time is given to ACER for making a final call.	**Answer 9** ACER observes that:

Respondents' views	ACER views
	a. The timeline for the adoption is defined in Article 14(5) of the Electricity Regulation. b. Moreover, sufficient information needs to be made available for NRAs and ACER to take an informed decision.
Applying the 70% MACZT regardless of potential limitations introduced by regional coordination centres, when available remedial actions are insufficient to ensure secure operation, could be unrealistic and it would then imply a very high level of redispatching and countertrading which may turn out to be inefficient and excessively costly. Moreover, a bidding zone review should not be used to address operational issues of TSOs, which should be solved with the use of operational means available to TSOs.	**Answer 10** ACER observes that: a. The bidding zone review methodology should reflect the expected operational practices as well as the applicable regulation for the time horizon of the study. In this regard, the bidding zone review should shed light on whether the various alternative BZ configurations may fulfil the 70% minimum target in a more efficient manner than the status quo configuration. b. The bidding zone review is multidimensional and operational security is one of the several aspects to be considered.
Question 1.1.4: Please add any comment on the need to ensure pan-European consistency.	
11 respondents provided an answer to this question.	
5 respondents stress the importance to take regional specificities into account. In particular, these regional specificities are necessary to ensure that the results of the study faithfully reflect reality and can be used by TSOs to draw reliable conclusions. The proposed methodology offers the flexibility required in order to accommodate regional specificities and methodologies adopted on regional (CCR) level.	See Answer 1.
4 respondents flag the risk of possible unintended distortions in a pan-EU regulatory framework. In particular, the delimitation of bidding zones does also impact liquidity for zonal price hedging which must be taken into	**Answer 11** ACER observes that:

Respondents' views	ACER views
account. Moreover, changing the bidding zone configuration may have severe welfare redistribution effects. It is important that any update of the bidding zones is subject to a comprehensive study and to an approval by all NRAs of the countries where network operators or network users can be affected by the decision. In addition, severe impact will occur on long-term horizons towards investment perspectives. The proposed criteria focus mainly on short-term system operations, more than long-term system behaviour, in particular considering European objectives. Finally, if bidding zone regions remain in the methodology, it must be clear how the coordination between regions is ensured, e.g. in the case a country is assigned to more than one region.	a. The bidding zone review methodology should consider the different impacts according to the envisaged assessment criteria. b. Redistribution of welfare effects may indeed be identified, though the main guiding principle of the review should be the maximisation of EU welfare. c. The extent to which configurations contribute or not to cost-efficient investments should be considered. d. With regard to coordination across regions, see Answer 2.
2 respondents warn against possible detrimental effects in case of very small bidding zones and thus favour also the possibility to merge the existing smaller ones. More specifically, transparency requirements at bidding zone level (e.g. day-ahead bid/offer curves) might lead to competition issues in case of very small bidding zones with resources. Furthermore, flow-based capacity allocation with small bidding zones could impede the development of a functioning cross border intraday trading.	**Answer 12** ACER observes that: a. Pursuant to the Electricity Regulation, the review should be based on structural congestions which are not expected to be overcome within the following three years. b. The size of the bidding zone is not in itself a criterion to be considered, rather how the alternative configurations perform with respect to the criteria to be assessed.
4 respondents highlight the need to ensure common practice on the predictability of bidding zones over time. Changing bidding zones within the period between the bi-annual BZR should as the general rule not be allowed. This should only be allowed if extraordinary circumstances occur and be justified.	**Answer 13** ACER observes that: a. The bidding zone review methodology does not establish rules on the frequency of the changes. b. The decision on whether and when changing bidding zones is a prerogative of MSs.

Respondents' views	ACER views
3 respondents emphasize the need for consistency with the longer term exercises such as Ten Year Network Development Plan (TYNDP) and European Resources Adequacy Assessment (ERAA). The BZR should examine different possibilities for an efficient bidding zone structure and evaluate whether TYNDP is up to date or whether it needs to be amended. Ideally, these two processes (BZR and TYNDP) should be merged into one. Instead of taking the current bidding zones and grid plans and system management tools as the basis for new bidding zones, the TSOs need to take a more holistic approach.	**Answer 14** ACER observes that: a. The current legal framework does not envisage the same time horizons for the TYNDP and the bidding zone review process. b. In particular, pursuant to the Electricity Regulation, the review should be based on structural congestions which are not expected to be overcome within the following three years.
Finally, 2 respondents express their disagreement with the idea that the BZR should necessary be consistent with ACER decision and recommendation on capacity calculation, as by definition the 70% rule is not motivated by economic efficiency. Proper capacity calculation (including security checks by TSOs) would be more useful to provide an adequate picture of – future - possible situations.	**Answer 15** ACER observes that: a. The bidding zone review methodology should reflect both the applicable regulation and expected operational practices for the time horizon of the study. b. ACER's recommendation may bring a value in ensuring common, consistent and unbiased approaches on how to apply certain obligations stemming from the Clean Energy Package.
Topic 2: Transparency and stakeholders' engagement	
Question 1.2.1: Please rate your degree of agreement or disagreement with the following statements: (1- Strongly disagree; 2- Disagree; 3- Neither agree nor disagree; 4- Agree; 5- Strongly agree).	
1. Maximum transparency must be guaranteed at all stages of the bidding zone review. In particular, all data, assumptions and relevant parameters used in the review should be published, subject to confidentiality issues and aggregation. *Respondents' answers (total:28):*	

Respondents' views	ACER views
• *1 – Strongly disagree: 0%* • *2 – Disagree: 0%* • *3 – Neither agree nor disagree: 0%* • *4 – Agree: 4%* • *5 – Strongly agree: 96%*	
2. There is a need for enhanced involvement of stakeholders during the bidding zone review process. This involvement should be described in the methodology. *Respondents' answers (total:28):* • *1 – Strongly disagree: 0%* • *2 – Disagree: 0%* • *3 – Neither agree nor disagree: 0%* • *4 – Agree: 25%* • *5 – Strongly agree: 75%*	
Question 1.2.2: Please detail below which aspects of the Proposal adequately ensure transparency and stakeholders' engagement, and should therefore be retained in the final methodology.	
14 respondents provided an answer to this question.	

Respondents' views	ACER views
All respondents believe that the proposal/methodology does not take sufficiently into account transparency and stakeholder engagement as many of the assumptions are not publicly available. Furthermore, one respondent considers this proposal an opportunity to build an example about transparency and data publication, in particular in the current dynamic of open-source software and open-data platforms. All data and tools not concerned by confidentiality issues shall be made available.	See Answer 5.
Question 1.2.3: Please detail below which aspects of the Proposal hamper transparency and stakeholders' engagement, and should therefore be amended in the final methodology.	
20 respondents provided an answer to this question.	
The methodology should require mandatory engagement with stakeholders, in particular by involving stakeholders during the BZ process and/or on the question of how to quantify the criteria to assess market efficiency (Article 13.4). Furthermore, the consultation with stakeholders should also include discussions and workshops, especially before finalizing the documents.	**Answer 16** ACER observes that: a. Higher levels of engagement with stakeholders should be pursued during the review, possibly including a number of provisions in this respect. b. In particular, regular meetings with stakeholders should be held and a public consultation should be launched.
The assessment should be carried out on the basis of an open-source model and a full dataset should be made available to all stakeholders. An open-source model software would allow researchers and stakeholders to propose improvements to the methodology and develop complementary studies. In addition, Article 16.2 is too restrictive when it comes to data sharing.	See Answer 5.
Question 1.2.4: Please add any comment on the topic of transparency and stakeholders' engagement.	
20 respondents provided an answer to this question.	

Respondents' views	ACER views
16 respondents further stress the need to have a greater degree of stakeholder involvement/engagement (also at a regional and EU level), particularly on BZR process and proposed configurations. Engagement could take the form of webinars, workshops and consultations. Information on these events and consultations should be published early. Moreover, having stakeholder engagement as a part of the methodology and including a dedicated a Stakeholder Advisory Group are also proposed options.	See Answer 16.
3 respondents believe that information such as market data should be reported and shared in an aggregated and non-discriminatory way without violating confidentiality, national regulations or pose risks to efficient market functioning.	See Answer 5.
3 respondents argue that there is a lack of visibility of the process and in particular on analysis results of different bidding zone configurations, how they are evaluated and what lies behind recommendations of different bidding zone configurations.	**Answer 17** ACER observes that: a. There is room to describe the various analyses to be performed in the methodology in a clearer and more explicit manner. b. With respect to transparency and stakeholders' engagement, see Answer 5 and Answer 16.
1 respondent highlights that it is unclear how the role of distribution networks and DSOs is being considered when it comes to BZR.	**Answer 18** ACER observes that: a. The selection of network elements, including distribution networks, to be considered for the review, should depend on whether the inclusion of those network elements in the analysis would have significant impacts on the results of the review.

Respondents' views	ACER views
1 respondent comments that regular updates and project timetables should be provided on a website coordinated by ENTSO-E, to make it more accessible for stakeholders. Moreover, 1 respondent remarks that the periods for public consultations should be long enough to ensure sufficient stakeholder participation and proposes a period of at least four weeks/20 working days to prepare feedback.	See Answer 16.
Topic 3: Need to ensure a conclusive bidding zone study	
Question 1.3.1: Please rate your degree of agreement or disagreement with the following statements: (1- Strongly disagree; 2- Disagree; 3- Neither agree nor disagree; 4- Agree; 5- Strongly agree).	
1. Quantifiable, possibly monetised criteria should be the focus of the bidding zone review. *Respondents' answers (total:28):* • *1 – Strongly disagree: 4%* • *2 – Disagree: 29%* • *3 – Neither agree nor disagree: 4%* • *4 – Agree: 25%* • *5 – Strongly agree: 39%*	
2. The assumptions and data used as inputs for the bidding zone review should be, as much as possible, checked against reality; the methodology should be based on realistic expectations about the future. *Respondents' answers (total:29):* • *1 – Strongly disagree: 0%*	

Respondents' views	ACER views
• *2 – Disagree: 0%* • *3 – Neither agree nor disagree: 7%* • *4 – Agree: 28%* • *5 – Strongly agree: 66%*	
3. While methodological simplifications may be necessary to enable a timely delivery of the bidding zone study, they should not decrease the quality and relevance of the underlying analysis and indicators. In general, methodological simplifications should be sought when they are not expected to impact the results of the study. *Respondents' answers (total:27):* • *1 – Strongly disagree: 0%* • *2 – Disagree: 0%* • *3 – Neither agree nor disagree: 7%* • *4 – Agree: 67%* • *5 – Strongly agree: 26%*	
4. The current TSOs' proposal to assess market liquidity mainly focuses on possible changes of liquidity in day-ahead markets. While liquidity of day-ahead markets is important, an assessment of liquidity impacts across all timeframes should be included. In particular additional indicators to capture the impact of a bidding zone reconfiguration on forward markets liquidity in a holistic manner should be considered. *Respondents' answers (total:28):*	

Respondents' views	ACER views
• *1 – Strongly disagree: 0%* • *2 – Disagree: 0%* • *3 – Neither agree nor disagree: 4%* • *4 – Agree: 7%* • *5 – Strongly agree: 89%*	
5. In the first bidding zone review pursuant to CACM, significant efforts were put in simulating cross-zonal capacity calculation in a very detailed manner. In view of the 70% minimum target of cross-zonal capacity envisaged in the CEP, which will be taken into account in the bidding zone review, the role of capacity calculation may be less crucial than in the first bidding zone review. As a consequence, some simplifications in simulating cross-zonal capacity calculation should be envisaged, which would allow to increase the efforts on other important aspects of the review. *Respondents' answers (total:29):* • *1 – Strongly disagree: 17%* • *2 – Disagree: 21%* • *3 – Neither agree nor disagree: 17%* • *4 – Agree: 41%* • *5 – Strongly agree: 3%*	
6. The current TSOs' proposal for the simulation of short-term welfare effects seems to exclusively rely on the changes in generation dispatch and related costs, while demand-side response is mostly disregarded.	

Respondents' views	ACER views
Given that a bidding zone configuration may have relevant impacts on the patterns of day-ahead market prices, DSR (including day-ahead demand elasticity) should be more robustly considered. *Respondents' answers (total:27):* • *1 – Strongly disagree: 0%* • *2 – Disagree: 0%* • *3 – Neither agree nor disagree: 26%* • *4 – Agree: 33%* • *5 – Strongly agree: 41%*	
7. The current TSOs' proposal for the simulation of short-term welfare effects seems to highly depend on the difference between the costs of scheduling generation (and residually demand) units in day-ahead markets and the costs of (re)scheduling generation (and residually demand) units in the re-dispatching timeframe. Some assumptions included in the Proposal such as considering full cross-zonal coordination for re-dispatching or the insufficient consideration of the difference between the costs incurred in day-ahead and the re-dispatching timeframe may lead to conclude that all alternative bidding zone configurations deliver the same short-term welfare results as the status quo configuration. Such strong assumptions should be revised and aligned with the envisaged reality for the time horizon of the study as much as possible. *Respondents' answers (total:28):* • *1 – Strongly disagree: 11%*	

Respondents' views	ACER views
• *2 – Disagree: 7%* • *3 – Neither agree nor disagree: 21%* • *4 – Agree: 61%* • *5 – Strongly agree: 0%*	
Question 1.3.2: Please detail below which aspects of the Proposal adequately ensure the bidding zone review to be conclusive and should therefore be retained in the final methodology.	
11 respondents provided an answer to this question.	
The process should be more strictly bound to the rules. All aspects which ensure that bidding zones will be defined in a manner to ensure market liquidity, efficient congestion management and overall market efficiency should be retained and enforced if required, especially focusing on a long-enough time horizon according to Art. 5 (1) and Art 13.4 (19).	**Answer 19** ACER observes that: a. The focus of the bidding zone review should be in line with the different provisions including in the Regulation, describing how bidding zones should be evaluated. b. In particular, the Electricity Regulation prescribes that the bidding zone review methodology should be based on structural congestions which are not expected to be overcome within the following three years. c. See also Answer 3 and Answer 20.
The methodology is poor when it comes to describing that the BZR process shall conclude and recommend on BZ configuration and the basis for such recommendation. Article 3, 3(d) is the only part that describes that the outcome of the analysis shall be conclusive.	**Answer 20** ACER observes that: a. The bidding zone review methodology should be clearer and more explicit on the process to be followed to derive conclusions, while leaving a certain degree of flexibility where relevant.

Respondents' views	ACER views
In order to be in compliance with the provisions in the European legislation, at least all criteria listed in Art 33 CACM need to be part of the final methodology and all criteria need to be treated equally. To ensure a robust model all criteria must be included, even if not all the criteria can be monetized easily. The criteria network security might be considered as non-relevant, while effect on operational complexity and speed should be added. A criteria reflecting the European climate and energy targets should also be added. Furthermore, a qualitative indicator is preferred to a non-robust quantitative one as criteria are hard to monetize and might bring to a misleading single figure.	**Answer 21** ACER observes that: a. The bidding zone review methodology should strive to make the following principles compatible: i. Be in line with the objectives and criteria prescribed in the Regulation. ii. Possibly focusing on certain aspects in light of objectives envisaged for the review process in the Regulation (see Answer 3). iii. Seek comparability to the extent possible. iv. Some elements referring to climate targets may be added.
Question 1.3.3: Please detail below which aspects of the Proposal prevent the bidding zone review from being conclusive and should therefore be amended in the final methodology.	
28 respondents provided an answer to this question.	
Market liquidity and overall efficiency (especially for forward contracts) is not adequately taken into account. Article 4(4) favours too much compliance with 70% criterion (Article 16(8) of IME) at the cost of market liquidity and overall market efficiency. Therefore, it allows TSOs to ignore overall market efficiency issues as long as the application of 70% criterion is guaranteed. Furthermore, the request of NRAs to model flow-based market coupling results proved particularly unhelpful as it dramatically increased the complexity of the analysis, while focusing it on the day-ahead timeframe and foregoing the forward, intraday and balancing markets.	**Answer 22** ACER observes that: a. The Electricity Regulation establishes a link between the fulfilment of the 70% criterion and the bidding zone review process; as such, the 70% criterion cannot be ignored and sufficient relevance to it should be given. b. The analysis of certain criteria, e.g. market liquidity, should be strengthened in the bidding zone review methodology.

Respondents' views	ACER views
Other criteria should be taken into account, especially non-monetized ones. In particular, 2 respondents suggest to add two criteria linked to social and political costs, whereas 1 respondent proposes to include key qualitative factors like market efficiency, market integration and robustness in size. Furthermore, 5 respondents underline that Art. 13/ 13.2 (8c) iii) should be amended so that the final recommendation is based on a balanced view between monetized benefits and the non-monetized criteria. On the other hand, 3 respondents argue that too many criteria are included and therefore the evaluation process can lead to inconclusive evaluations.	See Answer 21.
Art. 13 / 13.4 (15) on the impact on the operation and efficiency of the balancing mechanisms and imbalance settlement processes includes only impacts on reserve requirements. The adequacy of the required reserves in each, and especially small bidding zones should be analysed as well.	**Answer 23** ACER observes that: a. The analysis of the impact on the operation and efficiency of the balancing mechanisms and imbalance settlement criterion should be further elaborated and should be performed more accurately, as long as technically feasible.
In Article 9(6), it is recommended that DC load flow analysis is used in the operational security analysis. However, it is questionable that a DC load flow analysis is accurate enough and therefore an AC load flow analysis should be included as a requirement. Additionally, dynamic analysis is not mentioned in Art. 9 at all even though for example in the Nordic synchronous area dynamic oscillations often set the limits and thus also dynamic analysis would be needed.	**Answer 24** ACER observes that: a. As far as technically possible, the operational security analysis shall be conducted by means of an AC load-flow, whereas a DC load-flow may only be used as a fall-back. b. A dynamic analysis would pose too many additional computational challenges in comparison with the potential benefits of such an approach. Nonetheless, under an AC load-flow calculation, phase angle violations may also be considered in the operational security analysis.
The RES integration and the analysis of integrated amount of energy from RES and qualitative evaluation of long-term effects is not a relevant criterion.	**Answer 25** ACER observes that:

Respondents' views	ACER views
The criteria chosen should be objective and neutral and should not prioritize a technology compared to another one. The adjunction of such a "political" criteria in addition to the one foreseen in CACM guidelines is thus questionable. There are also other means than the bidding zones reconfiguration to tackle the challenge of RES integration in the system.	a. The bidding zone review methodology should be technology-agnostic. b. Assessing how climate targets may be achieved in a cost-efficient manner may be considered within the bidding zone review.
Redispatch costs should be reconsidered as they have a big impact on the welfare. Unrealistic assumptions, such as full coordination of redispatch across borders, should be avoided, as this will underestimate the impact of redispatch costs on the welfare. To assess welfare, the full system costs must be taken into account. Redispatch costs alone are not an indicator for an inefficient system, they must be related to the dispatch costs and congestion income. Furthermore, a model based on full cross-zonal coordination for redispatching should be corrected with appropriate considerations about actual limitations on cross-zonal flows.	**Answer 26** ACER observes that: a. Any welfare analysis should consider both the market dispatch and the redispatch costs, together and not in an isolated manner. b. The modelling of redispatching and other aspects should be based on realistic assumptions about the future.
The timeframe of the bidding zone review should be extended to 5 years to make sure that upcoming grid development to overcome structural congestions will be properly considered as well as considering forward positions entered into by market participants and giving certainty to investors.	**Answer 27** ACER observes that: a. The bidding zone review methodology has to follow the provisions included in the Electricity Regulation, including those referring to the time horizon of the study.
Transaction costs and transition costs are two key criteria that should be considered separately. Stability is key to limit financial risk, and therefore transition costs (as the amount of potential stranded costs associated with a change in configuration) should be considered as a major dimension in the bidding zone review.	**Answer 28** ACER observes that: a. Transition and transaction costs should be analysed separately. b. Transition costs should be limited to what it is inherently linked to specific bidding zone changes.

Respondents' views	ACER views
The modelling of renewables is fundamental for meaningful results, as their share will increase in the power system in the target year time frame and beyond. It is therefore important that the assumptions are clear and reflect the bidding behaviour of renewable assets. For instance, if weather indicators are used to assess the load factors for wind only, this will ignore economic reasons to switch off RES in times of negative prices. This can lead to wrong assessments of grid load and redispatch requirement in times of high RES-input. Furthermore, the need to include demand-side response and storage is also stressed. If these new technologies are not taken into account in a bidding zone review, the outcome might suggest that a bidding zone split is more efficient, whereas the development of demand-side flexibility in combination with grid extension might indicate the opposite.	**Answer 29** ACER observes that: a. The modelling of the different technologies should be as a realistic as possible, subject to technical limitations. b. In markets based on marginal pricing, considering that technologies bid based on their marginal cost may strike a good balance between realistic modelling and feasibility of the analysis. c. The modelling of the bidding behaviour of renewable assets could be considered, as long as such modelling can be applied in a consistent and unbiased manner. d. Storage and demand-response, both implicit and explicit, should be also adequately modelled.
Question 1.3.4: How do you think that the inclusion of experts' views should be organised and could help ensure a conclusive bidding zone review?	
24 respondents provided an answer to this question.	
9 respondents suggest that experts' views should be made public and discussed with the stakeholders before including them in the review. Transparency is needed on which criteria are assessed based on experts views and on the way expert views are considered, in order to gain stakeholders' trust in the experts' views and in the bidding zone review results. Market participants should be able to react to such views in form of public consultations.	See Answer 5 and Answer 16.
11 respondents consider that experts should represent all type of stakeholders and the market as a whole, not only the TSOs. Experts from major market players should be able to add value both regarding assumptions and	**Answer 30** ACER observes that:

Respondents' views	ACER views
assessments of BZ configurations. Experts' panel should include perspectives of different groups of market players (power producer, industrial consumers, power exchanges, traders etc.), members from the producers, DSOs and the industry, other non-TSO experts from more neutral stakeholder like analysts and/or research institutions could also add value to the process.	a. Public consultation and regular stakeholders' engagement may be an adequate manner to enrich the analysis and ensure transparency. b. The analysis of some aspects may benefit from joint studies conducted at EU level. c. See also Answer 5 and Answer 16.
4 respondents underline that experts' view are important to assess the results of a quantitative bidding zone review and to put them into the context of political and regulatory realities and other constraints that a technical model cannot include. In this respect, the bidding zone review conducted by TSOs should serve as a strong input for a bidding zone delineation but should preferably not take into account national borders and political constraints from the beginning.	**Answer 31** ACER observes that: a. The bidding zone review should be neutral and unbiased. b. Also, see Answer 30.
2 respondents reckon that the status quo is one possible conclusion which is perfectly admissible, and that may result from the inability to identify a BZ configuration that would rank better than the current one on all criteria (possibly weighted). Such a case should not be considered as an "inconclusive BZR".	**Answer 32** ACER observes that: a. Maintaining the status quo configuration is a possible outcome of the bidding zone review, but should preferably not be the result of the inability to conclude, rather the outcome of a sound analysis.
Question 1.3.5: Please specify how specific the final recommendation of the TSOs should be: **a. TSOs should specify whether the bidding zone configuration should be maintained or changed and in case of the latter, specify their preference for one alternative bidding zone configuration.** **b. TSOs should specify whether the bidding zone configuration should be maintained or changed and then present a number of possible options, highlighting the benefits and shortcomings of different options, subject to the considerations of other aspects (e.g. implementation timeline, minimum 'lifetime' of the alternative bidding zone configuration to ensure the benefits exceed the transitional costs, measures to mitigate certain impacts, etc.).**	

Respondents' views	ACER views
c. Other possible ways of presenting the final recommendation. **Please specify.** *Respondents' answers (total:28):* • *a: 4%* • *b: 68%* • *c: 29%*	
7 respondents provided an answer to this question.	
All respondents believe that TSOs should present a number of possible options, which can also include maintaining the current bidding zone configuration, highlighting the benefits and shortcomings of different options. In addition, 4 respondents further support the possibility for the TSOs of a given bidding zone to only submit the status quo configuration if sufficient justification is provided on the absence of structural congestions. In any case, if none of the alternative configuration presents sufficiently clear and robust benefits over the long-term, the status quo should be maintained.	**Answer 33** ACER observes that: a. In line with the Regulation, a bidding zone review should be carried out in light of the existence of structural congestions. Alternative bidding zone configurations should be then expected where structural congestions exist. b. With regard to possible outcomes of the review, see Answer 32.
Question 1.3.6: Please add any comment on the topic of ensuring a conclusive bidding zone review, which adequately supports the decision making process.	
31 respondents provided an answer to this question.	
4 respondents argue that TSOs might be biased towards status quo configurations (changes result in additional work and problems for them) and therefore the decision should be made by regulators which might be more neutral.	**Answer 34** ACER observes that: a. Based on the Regulation, the decision on whether to change or not the bidding zones, lays on MSs.

Respondents' views	ACER views
12 respondents suggest that TSOs should present a subset of similar performing candidate configurations with thorough analysis and explanation of the pros and cons. The preference should be based on IME and CACM criteria as well as on market liquidity and efficiency. Several of the evaluated bidding zone configurations may perform comparably well overall, but show different trade-offs between the indicators (e.g. day ahead costs versus redispatch costs).	**Answer 35** ACER observes that: a. The bidding zone review methodology indeed aims to analyse alternative bidding zone configurations based on the objectives and criteria prescribed in the Regulation. b. See also Answer 21.
2 respondents argue that BZ evolution could compromise the development of assets despite their economic and environmental relevance. It is essential to build a holistic overview of the system interest, in particular in the long run, especially by better taking into account financial risks for investors of all kinds. There is a higher risk of not receiving any conclusions from the BZR if concerned TSOs cannot agree on one solution.	**Answer 36** ACER observes that: a. Investments should be cost-efficient. An efficient bidding zone configuration should provide efficient price signals to incentivise cost-efficient investments in both network infrastructure, and generation or load units.
1 respondent suggests to create screening indicators to determine whether alternative configurations for a given bidding zone should be assessed or not. This is useful in limiting the number of bidding zones concerned by the review and the number of alternative configurations to study.	See Answer 33.
1 respondent further adds that the bidding zone review should make recommendations not only based on a single point in time; on the contrary, it should assume a forward-looking perspective including foreseeable developments within a relevant number of years in the future. The recommended bidding zone configuration should be optimal for years thereafter.	**Answer 37** ACER observes that: a. The Electricity Regulation prescribes that the bidding zone review methodology should be based on structural congestions that are not expected to be overcome in the next three years.

Respondents' views	ACER views
1 respondent points out potential inconsistencies in the statements given in the public consultation: agreeing with statement 7 in Table 1.3.1 would imply that TSOs should not assume a common pan-European redispatch in the bidding zone review as no such market currently exists. At the same time, agreeing with statement 6 would imply that TSOs should account for large-scale implementation of demand-side response and day-ahead price elasticity in the bidding zone review, however, such demand-side flexibility also does not yet exist.	**Answer 38** ACER observes that: a. The consideration of the various elements, should be based on realistic assumptions about the future. b. In this respect: i. Based on existing studies, some level of demand flexibility at typical market prices already exists today. ii. Coordination in cross-zonal redispatch should progressively increase in the next coming years, and realistic expectations on this level of coordination for the time horizon of the study should be considered.
1 respondent further emphasizes that transparency should be made on those TSOs and countries getting the benefits and those getting the costs of a bidding zone reconfiguration, i.e. transfers between those supposed to win and those supposed to lose.	See Answer 11.

3 List of respondents

Organisation	Type
50Hertz Transmission GmbH	TSO
Amprion GmbH	TSO
AS Latvenergo	Energy company
Bundesverband der Energie- und Wasserwirtschaft (BDEW)	Association
Danish Energy	Association
EDF	Energy company
Edison S.p.A.	Energy company
Eesti Energia AS	Energy company
Enefit Lithuania	Energy company
Energy Norway	Association
ENTSO-E	Association
EPEX SPOT SE	Power exchange
Eurelectric	Association
European Energy Exchange AG	Power exchange
European Federation of Energy Traders (EFET)	Association
Europex	Association
Finnish Energy	Association
Fortum Oyj	Energy company
German Federal Ministry for Economic Affairs and Energy	Governmental organisation
IFIEC Europe	Association

Organisation	Type
Ignitis group	Energy company
Ignitis Latvija	Energy company
Ignitis Lithuania	Energy company
Market Parties Platform (MPP)	Association
Nord Pool Market Surveillance	Power exchange
Norsk Hydro	Energy company
RWE Supply & Trading GmbH	Energy company
SFE Produksjon	Energy company
SIA Enefit	Energy company
Swedenergy	Association
TenneT TSO GmbH	TSO
Terna S.p.A.	TSO
TransnetBW GmbH	TSO
Union française de l'électricité (UFE)	Association
Vattenfall AB	Energy company