
SEE CCR TSOs' proposal for the common capacity calculation methodology for the long term market time-frame in accordance with Article 10 of the Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation

September 2020

TSOs of the SEE CCR, taking into account the following:

Whereas

- (1) This document (hereafter referred to as “common capacity calculation methodology”, or “this methodology”) is a common proposal developed by all Transmission System Operators (hereafter referred to as “SEE TSOs”) within the South East Europe Capacity Calculation Region (hereafter referred to as “SEE Capacity Calculation Region or Capacity Calculation Region 10” or “SEE CCR”), on the common capacity calculation methodology for long-term time frames. This proposal is required by Article 10 of Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on Forward Capacity Allocation (hereafter referred to as the “FCA Regulation”).
- (2) This proposal (hereafter referred to as the “Long-Term Capacity Calculation Methodology” or “LT CCM”) takes into account the general principles and goals set in the FCA Regulation as well as Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity (hereafter referred to as “Regulation (EC) No 714/2009”).
- (3) The goal of the FCA Regulation is the coordination and harmonization of capacity calculation and allocation in the long-term cross-border markets. To facilitate these aims the TSOs in the Capacity Calculation Region shall calculate in a coordinated manner the available cross-border capacity.
- (4) According to article 4(8) of the FCA Regulation, the expected impact of the LT CCM on the objectives of the FCA Regulation has to be described and is presented below.
- (5) The LT CCM serves the objective of promoting effective long-term cross-zonal trade with long-term cross-zonal hedging opportunities for market participants (article 3(a) of the FCA Regulation) by taking into account the hedging needs of market participants by calculating reliable capacities at an early stage and making them available to market participants, which makes long-term planning possible since it ensures that the cross-zonal capacity is calculated in such a way that the same LT CCM will apply to all market participants on all respective bidding zone borders in the SEE CCR, thereby ensuring a level playing field amongst market participants.
- (6) The LT CCM for SEE CCR contributes to the optimal calculation of long-term capacity (article 3(b) of the FCA Regulation) by taking into account all critical network elements, coordinates the timings of delivery of inputs, provides a calculation approach and coordinates validation requirements of the capacity calculation between SEE TSOs and the Coordinated Capacity Calculator of SEE CCR (SEE CCC).
- (7) The LT CCM for SEE CCR contributes to the objective of providing non-discriminatory access to long-term cross-zonal capacity (article 3(c) of the FCA Regulation) by adhering to the rules of JAO and by publication of the results, hence ensuring non-discrimination between market participants.
- (8) The LT CCM for SEE CCR is designed to ensure a fair and non-discriminatory treatment of SEE TSOs, the Agency, regulatory authorities and market participants (article 3(d) of the FCA Regulation) since it has been developed and adopted within a process that ensures the involvement of all relevant stakeholders and independence of the approving process. After the drafting process, in which all SEE TSOs participated, a public consultation step is provided fall the other parties can say them opinions and SEE TSOs will take into consideration before transmitting the methodology to Regulatory Authorities.
- (9) This LT CCM for SEE CCR contributes to the objective of respecting the need for a fair and orderly forward capacity allocation and orderly price formation (article 3(e) of the FCA Regulation) by making

available in due time the information about cross-zonal capacities to be released in the market, and by ensuring a backup solution when capacity calculation fails to provide results.

- (10) The LT CCM for SEE CCR determines the main principles and main processes for the long-term timeframe. It requires that the SEE TSOs provide market participants with reliable information on cross-zonal capacities and import/export limits for year and month ahead allocation in a transparent way and at the same time. This includes regular reporting on specific processes within capacity calculation. The LT CCM therefore contributes to the objective of transparency and reliability of information (article 3(f) of the FCA Regulation).
- (11) The LT CCM provides requirements for efficient use of existing electricity infrastructure and facilitates competitive access to transmission infrastructure in particular in case of congestions in the long-term timeframe. This provides a long-term signal for efficient investments in transmission, generation and consumption, and thereby contributes to the efficient long-term operation and development of the electricity transmission system and electricity sector in the Union (article 3 (g) of the FCA Regulation).
- (12) In conclusion, the LT CCM contributes to the general objectives of the FCA Regulation.
- (13) Articles 10 to 15 of the FCA Regulation constitute the legal basis for this proposal and define several specific requirements that the LT CCM should take into account:
 1. LT CCM shall include at least the following items for each capacity calculation time frame:
 - (a) methodologies for the calculation of the inputs to capacity calculation, which shall include the following parameters:
 - (i) a methodology for determining the reliability margin in accordance with Article 11;
 - (ii) the methodologies for determining operational security limits, contingencies relevant to capacity calculation and allocation constraints that may be applied in accordance with Article 12;
 - (iii) the methodology for determining the generation shift keys in accordance with Article 13;
 - (iv) the methodology for determining remedial actions to be considered in capacity calculation in accordance with Article 14.
 - (b) a detailed description of the capacity calculation approach which shall include the following:
 - (i) a mathematical description of the applied capacity calculation approach with different capacity calculation inputs;
 - (ii) rules for avoiding undue discrimination between internal and cross-zonal exchanges to ensure compliance with point 1.7 of Annex I to Regulation (EC) No 714/2009;
 - (iii) rules for taking into account, where appropriate, previously allocated crosszonal capacity;
 - (iv) rules on the adjustment of power flows on critical network elements or of crosszonal capacity due to remedial actions in accordance with Article 14;
 - (v) for the flow-based approach, a mathematical description of the calculation of power transfer distribution factors and of the calculation of available margins on critical network elements;

- (vi) for the coordinated net transmission capacity approach, the rules for calculating cross-zonal capacity, including the rules for efficiently sharing the power flow capabilities of critical network elements among different bidding zone borders;
- (vii) where the power flows on critical network elements are influenced by crosszonal power exchanges in different capacity calculation regions, the rules for sharing the power flow capabilities of critical network elements among different capacity calculation regions in order to accommodate these flows.
- (c) a methodology for the validation of cross-zonal capacity in accordance with Article 15.
- (14) According with Article 9 of the FCA Regulation, SEE TSOs shall ensure that long-term cross-zonal capacity is calculated for each forward capacity allocation and at least on annual and monthly time frames.
- (15) Article 10(1) of the FCA Regulation defines the deadline to submit the proposal for the LT CCM as no later than six months after the approval of the common coordinated capacity calculation methodology referred to in Article 9(7) of Regulation (EU) 2015/1222.
- (16) According to Article 10(2) of the FCA Regulation, the approach to be used in the common capacity calculation methodology shall be either a coordinated net transmission capacity approach or a flow-based approach.
- (17) Article 10(3) of the FCA Regulation requires that the LT CCM shall be compatible with the capacity calculation methodology established for the day-ahead and intraday time frames pursuant to Article 21(1) of Regulation (EU) 2015/1222.
- (18) Article 2(8) of the CACM Regulation defines the “*coordinated net transmission capacity approach*” as “*the capacity calculation method based on the principle of assessing and defining ex ante a maximum energy exchange between adjacent bidding zones*”.
- (19) In the context of this proposal, the definition of “*coordinated capacity calculator*” is important and is defined in Article 2(11) of the CACM Regulation as: “*the entity or entities with the task of calculating transmission capacity, at regional level or above*”.
- (20) The LT CCM is based on forecast models of the transmissions system. The inputs of the LT CCM are determined more than a year, respectively more than a month, before the electricity delivery date taking into account the available knowledge at that time. Therefore, the outcomes are subject to inaccuracies and uncertainties that are higher than the inaccuracies and uncertainties of the day-ahead capacity calculation methodology. The aim of the reliability margin is to cover a level of risk induced by these forecast errors.
- (21) The final definition of the capacity calculation inputs (the reliability margin, the list of critical network elements, the generation shift key) shall be reviewed and redefined if needed after the implementation of this methodology once some operational experience is obtained. The SEE TSOs shall make ex-post analysis of these input parameters regularly and, if considered necessary, they will request to change them. If any change leads to an adaption of this methodology, SEE TSOs will amend this methodology according to Article 9(13) of the CACM Regulation.
- (22) To avoid undue discrimination between internal and cross-zonal exchanges (and the underlying discrimination between market participants trading inside or between bidding zones), this methodology introduces important measures. The SEE TSOs shall monitor only the elements significantly impacted by cross-zonal power exchanges. As mid-term and long-term measures, the SEE TSOs shall investigate

a higher sensitivity threshold for the elements significantly impacted by cross-zonal power exchanges and consider future investments in the transmission grid.

- (23) Despite coordinated application of capacity calculation, SEE TSOs remain responsible for maintaining operational security. For this reason, each SEE TSO shall validate and have the right to correct cross-zonal capacity relevant to the TSOs bidding zone border for reasons of operational security during the validation process. The validation process may lead to reductions of cross-zonal capacities. Thus, transparency, monitoring and reporting as well as exploration of alternative solutions in order to prevent similar cases in the future, is necessary.
- (24) Transparency and monitoring of capacity calculation is essential for ensuring its efficiency and understanding. This methodology establishes significant requirements on TSOs to publish the information required by stakeholders to analyse the impact of capacity calculation on market functioning. Furthermore, this methodology establishes significant reporting requirements in order for the stakeholders, regulatory authorities and other interested party to verify either the transmission infrastructure is operated efficiently and in the interest of consumers.

SUBMIT THE FOLLOWING LONG-TERM COMMON CAPACITY CALCULATION METHODOLOGY TO NATIONAL REGULATORY AUTHORITIES OF THE SEE CCR:

Article 1

Subject matter and scope

The common capacity calculation methodology shall be considered as a SEE TSOs methodology in accordance with Article 10 of the FCA Regulation and the capacity shall be calculated for each forward capacity allocation and at least on annual and monthly time frames for the SEE CCR bidding zone borders.

Article 2

Definitions and interpretation

- (1) For the purposes of the year-ahead and month-ahead common capacity calculation methodology, (hereinafter Long Term Capacity Calculation Methodology "LT CCM"), the terms used in this document shall have the meaning of the definitions included in Article 2 of Regulation (EC) 714/2009, Article 2 of FCA Regulation, Article 2 of CACM Regulation, Article 3 of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereinafter SO Regulation), Article 2 of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, Article 2 of Commission Regulation (EC) 2013/543 of 14 June 2013 on submission and publication of data in electricity markets and amending Annex I to Regulation (EC) No 714/2009 of the European Parliament and of the Council and Article 2 of the capacity calculation methodology developed in the SEE CCR in accordance with Article 20(2) of the CACM Regulation (hereinafter SEE DA&ID CCM).
- (2) In addition, the following definitions, abbreviations and notations shall apply:
 1. 'AAC' means the already allocated capacities, which is the capacity allocated as an outcome of the latest capacity calculation in the SEE CCR;
 2. 'Agency' or 'ACER' means Agency for the Cooperation of Energy Regulators;
 3. 'ATC' means the available transmission capacity, which is the transmission capacity that remains available for the allocation procedure and which respects the physical conditions of the transmission system;
 4. 'CCC' means the coordinated capacity calculator of the SEE CCR as defined in Article 2(11) of the CACM Regulation;
 5. 'CCR' means the capacity calculation region as defined in Article 2(3) of the CACM Regulation;
 6. 'CGM' means the common grid model as defined in Article 2(2) of the CACM Regulation;
 7. 'CGMM' means the common grid model methodology, pursuant to Article 18 of the FCA Regulation;
 8. 'CNE' means a critical network element;
 9. 'CNEC' means a critical network element with a contingency;
 10. 'CNTC approach' means the coordinated net transmission capacity defined in Article 2(8) of the CACM Regulation;
 11. 'D-2' means two days before the day of delivery;
 12. 'GR-BG border' means bidding zone border between Greece and Bulgaria;
 13. 'BG-RO border' means bidding zone border between Bulgaria and Romania;
 14. 'EIC' means energy identification code;
 15. 'ENTSO-E' means European Network of Transmission System Operators for Electricity;
 16. 'GSK' means the generation shift key as defined in Article 2(12) of the CACM Regulation;
 17. 'HVDC' means a high voltage direct current network element;
 18. ' I_{max} ' means the maximum admissible current;
 19. 'JAO' means Joint Allocation Office;
 20. 'LT' means the long-term time frame;
 21. 'LTA' means the long-term allocated capacity, which is capacity allocated as an outcome of the long-term capacity calculation in the SEE CCR;

22. 'LT CC process' means the long term capacity calculation process;
23. 'LTN' means the long term nominated capacities, which is the long-term nomination of the long-term allocated capacity;
24. 'MTU' means a market time unit; the definition for 'market time' is provided at Article 2(15) of the CACM Regulation;
25. 'NTC' means the Net Transmission Capacity which is the maximum energy exchange for commercial purposes between adjacent bidding zones for each market time unit in a specific direction;
26. 'PST' means a phase-shifting transformer;
27. 'RA' means a remedial action;
28. 'RM' means the reliability margin as defined in Article 2(14) of the CACM Regulation;
29. SEE TSOs are Independent Power Transmission Operator ('ADMIE'), Electricity System Operator EAD ('ESO EAD') and National Power Grid Company Tranelectrica S.A. ('Tranelectrica');
30. 'SEE NRAs' means the SEE National Regulatory Authorities;
31. 'TTC' means the Total Transmission Capacity which is the maximum exchange) complying with the operational security limits between adjacent bidding zones for each market time unit in a specific direction.

(3) In this LT CCM, 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 this methodology; and
- 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.

Article 3

Application of this methodology

This common capacity calculation methodology solely applies to the year-ahead and month-ahead common capacity calculation within the SEE CCR. Common capacity calculation methodologies within others capacity calculation regions or for others time-frames are not in scope of this methodology.

Article 4

Cross-zonal capacities for the long-term market

- (1) For the long-term time frames, values for the cross-zonal capacity for annual and monthly time frame shall be calculated using an approach based on a coordinated NTC methodology, in line with Art. 10(2) of FCA Regulation.
- (2) Each TSO of the SEE CCR shall provide the SEE CCC without undue delay the following initial inputs:
 - a. operational security limits and contingencies in accordance with Article 6;
 - b. *RMS* in accordance with Article 5;
 - c. *GSKs* in accordance with Article 7.
- (3) The long-term capacity calculation is based on the common set of scenarios developed in accordance with Article 9.
- (4) For the long-term common capacity calculation in the SEE CCR, performed by the SEE CCC, the high-level process flow includes five steps until the final *CNTC* domain for the relevant market time-frame are set:
 - a. first, for the capacity calculation inputs as defined in Article 4(2) a quality check process shall be performed by the SEE CCC;
 - b. the second process step is to determine the relevant *CNECs* in accordance with Article 6(4) used during common capacity calculation;

- c. the third step is to determine the *NTC* values for each direction and border of SEE CCR in accordance with Article 10;
- d. the fourth step is to validate the cross-zonal capacities by the SEE TSOs in accordance with Article 11;
- e. finally, the *ATC* values are calculated for relevant market time-frame in accordance with Article 12.

Article 5

Reliability margin methodology

- (1) The long-term common capacity calculation methodology is based on forecast models of the transmission system. Therefore, the outcomes are subject to inaccuracies and uncertainties. The aim of the RM is to cover a level of risk induced by these forecast errors.
- (2) Each SEE TSO will provide CCC with the RM to be used in the long-term capacity calculation.
- (3) Before the first operational calculation of the RMs for day-ahead timeframe the SEE TSOs shall use RM values already in operation in the existing capacity calculation initiatives. They will be equal to 100 MW for BG-RO and BG-GR borders for each direction.
- (4) After the first operational calculation of the RMs for day-ahead timeframe, the SEE TSOs, will use for the long-term common capacity calculation, the same RM used for day-ahead capacity calculation as described in the SEE DA&ID CCM.
- (5) The RM values shall be updated every year and shall remain fixed until the next update.

Article 6

Methodologies for operational security limits and contingencies

- (1) Each TSO of the SEE CCR shall define a list of proposed CNEs, which could be fully or partly located in its own control area. The list of CNEs shall be provided to the SEE CCC, who shall monitor the CNEs during the coordinated NTC calculation process. This list shall be updated at least on a yearly basis and in case of topology changes (commissioning of new grid elements in the observability area of each SEE TSO) in accordance with Article 14. A CNE is a network element, significantly impacted by SEE crosszonal trades, which are supervised under certain operational conditions, the so-called contingencies. A CNE can be a cross zonal element or an internal network element. Those elements can be an overhead line, an underground cable, or a transformer.
- (2) Each TSO of the SEE CCR shall define a list of proposed contingencies used in operational security analysis in accordance with Article 33 of the SO Regulation, limited to their relevance for the set of CNEs as defined in Article 6(1) and pursuant to Article 23(2) of the CACM Regulation. The contingencies of a SEE TSO shall be located within the observability area of that SEE TSO. This list shall be updated at least on a yearly basis and in case of topology changes in the grid of the TSOs (commissioning of new grid elements in the observability area of each TSO) in accordance with Article 14.

A contingency can be an unplanned outage of:

- a line, a cable, or a transformer;
 - a busbar;
 - a generating unit;
 - a load; or
 - a set of the aforementioned contingencies.
- (3) Each TSO from the SEE CCR shall associate the contingencies established pursuant to Article 6(2) with the CNEs established pursuant to Article 6(1) following the rules established in accordance with Article 75 of SO

Regulation. Until such rules are established and enter into force, the association of contingencies to CNEs shall be based on each SEE TSO operational practise.

- (4) Each TSO of the SEE CCR shall provide to the SEE CCC a list of the proposed CNECs. The SEE CCC shall merge the list of CNECs provided by all SEE TSOs into a single list, which shall constitute the initial list of CNECs.
- (5) For the capacity calculation, the SEE TSOs shall only monitor the CNECs significantly impacted by cross-zonal power exchanges. The selection of those CNECs shall be done by the CCC, according with the rules described in Article 7a of the SEE DA&ID CCM. The TSOs shall investigate whether a higher sensitivity threshold could be taken into account while guarantying security of supply, as a mid-term measure. A study shall be provided to the relevant regulatory authorities in 3 months after collecting 1 year of data since the LT capacity calculation go-live. The TSOs shall consider efficient investments, as a long-term measure.
- (6) SEE TSOs shall provide to the SEE CCC for each CNEC, for each long-term capacity calculation time-frame and for each scenario the operational security limits. SEE TSOs shall respect the operational security limits used in operational security analysis carried out in line with Article 72 of the SO Regulation. The operational security limits used in the common capacity calculation are the same as those used in operational security analysis, therefore any additional descriptions pursuant to Article 23(2) of the CACM Regulation are not needed. In particular:
 - a. SEE TSOs shall respect the maximum admissible current limit (I_{max}) which is the physical limit of a CNE according to the operational security policy in accordance with Article 25 of the SO Regulation. The maximum admissible current can be defined with:
 - i. fixed limits for all MTUs of each of the four seasons;
 - ii. fixed limits for all MTUs in the case of transformers and certain types of conductors which are not sensitive to ambient conditions;
 - iii. fixed limits for all MTUs, in case of specific situations where the physical limit reflects the capability of substation equipment (such as circuit-breaker, current transformer, or disconnecter).
 - b. I_{max} shall represent only real physical properties of the CNE and shall not be reduced by any security margin, as all uncertainties in the common capacity calculation are covered on each CNEC by the RM in accordance with Article 5.
- (7) SEE TSOs shall not apply allocation constraints.
- (8) SEE TSOs shall review and update the application of the methodologies for determining operational security limits, list of CNEs, contingencies and respectively the list of CNECs, on a yearly basis in accordance with Article 16.

Article 7

Generation shift keys methodology

- (1) Each SEE TSO shall define for its bidding zone and for each scenario a GSK, which translates a change in a bidding zone net position into a specific change of injection or withdrawal in the CGM. This expectation shall be based on the observed historical response of generation units to changes in net positions, clearing prices and other fundamental factors, and thereby contributing to minimizing the RM.
- (2) In accordance with Article 13 of FCA Regulation and in line with Article 24 of the CACM Regulation, SEE TSOs developed the following methodology to determine the common GSK:

- a. SEE TSOs shall take into account the available information on generation available in the CGM for each scenario developed in accordance with Article 19 of the FCA Regulation in order to select the nodes that will contribute to the GSK;
 - b. SEE TSOs shall aim to apply a GSK that resembles the dispatch and the corresponding flow pattern, thereby contributing to minimizing the reliability margins;
 - c. SEE TSOs shall define its GSK based on scenarios with production and load units reflecting TSO's best forecast of flow patterns and market behavior.
- (3) For the application of the methodology, SEE TSOs shall define, for the capacity calculation process, GSKs impacted by the actual generation present in the seasonal CGM. SEE TSOs shall take into account the available information on generation available in the CGM in order to select the nodes that will contribute to the GSK.
- (4) SEE TSOs have harmonized their GSK determination methodologies:
- a. In its GSK, each TSO shall use flexible and controllable production units which are available inside the TSO grid;
 - b. Units unavailable due to outage or maintenance are not included;
- (5) For the Greek bidding zone a proportional representation of the generation variation to the remaining capacity, based on ADMIE's best estimate of the initial generation profile, ensure the best modeling of the Greek system. After reaching the limits generating units already in operation the available generating units will be put in operation using a merit order list.
- (6) For the Bulgarian bidding zone a proportional representation of the generation variation to the remaining capacity respecting the limits of the generating units, based on ESO EAD's best estimate of the initial generation profile, ensure the best modeling of the Bulgarian system. After reaching the limits generating units already in operation the available generating units will be put in operation using a merit order list. The nuclear units are not included in the list.
- (7) The Transelectrica GSK file contains dispatchable units which are included in the CGM and are forecasted to be available at that time-frame. The nuclear units are not included in the list. The fixed participation factors of GSK are impacted by the actual generation present in the yearly and monthly CGM.
- (8) The GSKs shall be provided to the SEE CCC to be used in the capacity calculation for each bidding zone and also the time interval for which the GSKs shall be valid. The SEE TSOs shall make ex-post analysis of GSK regularly (including the testing periods) and if considered necessary request to change it.
- (9) SEE TSOs shall review and update the application of the generation shift keys methodology, on a yearly basis in accordance with Article 16.

Article 8

Methodology for remedial actions in capacity calculation

- (1) The RAs defined by each SEE TSOs shall be either preventive (pre-fault) or curative (post-fault), i.e. affecting all CNECs or only pre-defined contingency cases, respectively. The capacity calculation process may only take into account those non-costly RAs which can be modelled. The SEE TSOs may use the following non-costly RAs, but are not limited to:
- a. changing the tap position of a PST,
 - b. topological action: opening or closing of one or more line(s), cable(s), transformer(s), bus bar coupler(s), or switching of one or more network element(s) from one bus bar to another,

connection/disconnection of reactor(s), capacitor(s).

- (2) The SEE TSOs shall use the RA during updates of CGMs with the latest available outage plan in line with Article 9 or during local validation in line with Article 11.
- (3) The SEE TSOs will not use the RA during TTC calculation in line with Article 10.

Article 9 Scenarios

- (1) In accordance with Article 19 of the FCA Regulation, referring to article 10 of the FCA Regulation, all TSOs in CCRs shall jointly develop a common set of scenarios to be used in the common grid model for each long-term capacity calculation time frame;
- (2) In order to meet the above requirements, the SEE TSOs shall use the annually created ENTSO-E year-ahead reference scenarios (i.e. default scenarios), in accordance with Article 3.1 of CGMM for FCA in conjunction with Article 65 of the SO Regulation. This Pan-European process is based on the CGMM as developed in accordance with Article 18 of the FCA Regulation and respecting the merging and alignment processes developed in accordance with Article 27 of the CACM Regulation;
- (3) Each SEE TSO will update the year-ahead reference scenarios for the monthly capacity calculation, in which the SEE CCC shall incorporate the latest available information as regard to the generation pattern and topology (due to grid element commissioning or decommissioning);
- (4) The SEE CCC shall implement the latest available outage plans, together with the associated default RAs related to the scenarios mentioned in this Article for each selected timestamp in order to use the most recent capacity calculation inputs;
- (5) The SEE CCC will perform a first computation, the so called congestion check, in order to verify the operational security fulfillment before starting capacity calculation for the long term timeframe using the CGMs which include the latest available outage plans.

Article 10 Mathematical description of the long term capacity calculation approach

- (1) The CNTC computation is a centralized calculation based on AC load flow which delivers the main parameter needed for the definition of CNTC domain: TTC. The TTC represent the maximum power exchange on a bidding zone border and calculation shall according to the following procedure: use the common grid model, generation shift keys, and list of CNECs defined to calculate maximum power exchange on bidding zone borders, which shall equal the maximum calculated exchange between two bidding zones on either side of the bidding zone border respecting operational security limits;
- (2) The SEE CCC shall define the values of TTC for each time-frame for the north Greek borders, BG-GR border, south Romanian borders, BG-RO border. On these values each SEE TSO can apply reduction periods and the final values shall be provided to SEE TSOs for validation of BG-RO and BG-GR borders.
- (3) The *TTC* on the BG-GR direction is a ratio of the total *TTC* value calculated from all north Greek systems (power systems of Albania, FYROM, Bulgaria and Turkey) to the Greek system:

$$TTC_{BG-GR} = k_{BG-GR} \cdot TTC_{north\ GR\ systems-GR}$$

with

$$TTC_{BG-GR}$$

TTC on the BG-GR direction
splitting factor for BG-GR direction

$$k_{BG-GR}$$

$TTC_{north\ GR\ systems-GR}$ TTC from all north Greek systems to the Greek system

- (4) The TTC on the GR-BG direction is a ratio of the total TTC value calculated from the Greek system to all north Greek systems (power systems of Albania, FYROM, Bulgaria and Turkey):

$$TTC_{GR-BG} = k_{GR-BG} \cdot TTC_{GR-north\ GR\ systems}$$

with

TTC_{GR-BG} TTC on the GR-BG direction
 k_{GR-BG} splitting factor for GR-BG direction
 $TTC_{GR-north\ GR\ systems}$ TTC from the Greek system to all north Greek systems

- (5) The TTC on the BG-RO direction is a ratio of the total TTC value calculated from all south Romanian systems (power systems of Bulgaria and Serbia) to the Romanian system:

$$TTC_{BG-RO} = k_{BG-RO} \cdot TTC_{south\ RO\ systems-RO}$$

with

TTC_{BG-RO} TTC on the BG-RO direction
 k_{BG-RO} splitting factor for BG-RO direction
 $TTC_{south\ RO\ systems-RO}$ TTC from all south Romanian systems to the Romanian system

- (6) The TTC on the RO-BG direction is a ratio of the total TTC value calculated from the Romanian system to all south Romanian systems (power systems of Bulgaria and Serbia):

$$TTC_{RO-BG} = k_{RO-BG} \cdot TTC_{RO-south\ RO\ systems}$$

with

TTC_{RO-BG} TTC on the RO-BG direction
 k_{RO-BG} splitting factor for RO-BG direction
 $TTC_{RO-south\ RO\ systems}$ TTC from the Romanian system to all south Romania systems

- (7) The splitting factor used for year-ahead and month-ahead capacity calculation in the year Y will be based on the NTC values from the last two years. This approach is based on the Article 3(e) of the FCA Regulation that contributes to the objective of respecting the need for a fair and orderly market and price formation and ensures a fair distribution of costs and benefits between the involved TSOs. Moreover the approach is in line with the distribution of the congestion income (as defined in the Article 73 of CACM Regulation and Article 57 of FCA Regulation) collected by the TSOs, and thus do not alter the signals for investments to TSOs given by the congestion income. The splitting factors used at the NTC computation will comply with the security operation in accordance with Article 3(c) of the CACM Regulation, will not alter the signals for investments to TSOs given by the congestion income and allow reasonable financial planning according with Article 73 of the CACM Regulation.

- (8) The splitting factor for BG-GR direction is determined with the following equation:

$$k_{BG-GR} = NTC_{BG-GR} / NTC_{north\ GR\ systems-GR}$$

where:

k_{BG-GR} splitting factor as percentage to be applied for BG-GR direction for year-ahead and month-ahead capacity calculation in the year Y
 NTC_{BG-GR} Average value of the NTC for the direction BG-GR (excluding the period when the tie-line BG-GR was out of operation for maintenance) in the last two years
 $NTC_{north\ GR\ systems-GR}$ Average value of the total NTC for the direction north GR systems -GR (excluding the period when the tie-line BG-GR was out of operation for maintenance) in the last two years

- (9) The splitting factor for GR-BG direction is determined with the following equation:

$$k_{GR-BG} = NTC_{GR-BG} / NTC_{GR-north\ GR\ systems}$$

where:

k_{GR-BG}	splitting factor as percentage to be applied for GR-BG direction for year-ahead and month-ahead capacity calculation in the year Y
NTC_{GR-BG}	Average value of the NTC for the direction GR-BG (excluding the period when the tie-line BG-GR was out of operation for maintenance) in the last two years
$NTC_{GR-north GR systems}$	Average value of the total NTC for the direction GR-north GR systems (excluding the period when the tie-line BG-GR was out of operation for maintenance) in the last two years

(10) The splitting factor for BG-RO direction is determined with the following equation:

$$k_{BG-RO} = NTC_{BG-RO} / NTC_{south RO systems-RO}$$

where:

k_{BG-RO}	splitting factor as percentage to be applied for BG-RO direction for year-ahead and month-ahead capacity calculation in the year Y
NTC_{BG-RO}	Average value of the NTC for the direction BG-RO in the last two years
$NTC_{south RO systems-RO}$	Average value of the total NTC for the direction south RO systems-RO in the last two years

(11) The splitting factor for RO-BG direction is determined with the following equation:

$$k_{RO-BG} = NTC_{RO-BG} / NTC_{RO-south RO systems}$$

where:

k_{RO-BG}	splitting factor as percentage to be applied for RO-BG direction for year-ahead and month-ahead capacity calculation in the year Y
NTC_{RO-BG}	Average value of the NTC for the direction RO-BG in the last two years
$NTC_{RO-south RO systems}$	Average value of the total NTC for the direction RO-south RO systems in the last two years

(12) The CCC of the SEE CCR shall provide to the SEE TSOs with the validated *NTCs* values after application of the *RM*s defined in accordance with Article 5 for the BG-RO and BG-GR borders.

(13) The NTC on the BG-GR border is determined with the following equations:

$$NTC_{BG-GR} = TTC_{BG-GR} - RM_{BG-GR}$$

$$NTC_{GR-BG} = TTC_{GR-BG} - RM_{GR-BG}$$

with

NTC_{BG-GR}	<i>NTC</i> on the BG-GR direction
NTC_{GR-BG}	<i>NTC</i> on the GR-BG direction
TTC_{BG-GR}	<i>TTC</i> on the BG-GR direction
TTC_{GR-BG}	<i>TTC</i> on the GR-BG direction
RM_{BG-GR}	<i>RM</i> on the BG-GR direction
RM_{GR-BG}	<i>RM</i> on the GR-BG direction

(14) The NTC on the BG-RO border is determined with the following equations:

$$NTC_{BG-RO} = TTC_{BG-RO} - RM_{BG-RO}$$

$$NTC_{RO-BG} = TTC_{RO-BG} - RM_{RO-BG}$$

with

NTC_{BG-RO}	<i>NTC</i> on the BG-RO direction
NTC_{RO-BG}	<i>NTC</i> on the RO-BG direction
TTC_{BG-RO}	<i>TTC</i> on the BG-RO direction

TTC_{RO-BG}	<i>TTC on the RO-BG direction</i>
RM_{BG-RO}	<i>RM on the BG-RO direction</i>
RM_{RO-BG}	<i>RM on the RO-BG direction</i>

Article 11

Cross-zonal capacity validation methodology

- (1) Each TSO of the SEE CCR shall, in accordance with Article 15 of FCA Regulation, referring to Article 26 of the CACM Regulation, validate and have the right to correct cross-zonal capacity relevant to the TSO's bidding zone borders for reasons of operational security during the validation process. In exceptional situations cross-zonal capacities can be decreased by TSOs. These situations are:
 - a. an occurrence of an exceptional contingency or forced outage pursuant to Article 3 of SO Regulation;
 - b. when RAs, that are needed to ensure the calculated capacity, are not sufficient to ensure operational security;
 - c. extremely low demand of a SEE TSO which leads to low system inertia and high voltage conditions and so require a minimum number of power plants on the grid;
 - d. a mistake in input data, that leads to an overestimation of cross-zonal capacity from an operational security perspective.
- (2) When performing the validation, the SEE TSOs shall consider operational security limits, taking into account new and relevant information obtained during or after the most recent capacity calculation. Therefore, SEE TSOs shall use tools developed by the SEE CCC for analysis, but may also employ verification tools not available to the SEE CCC.
- (3) If SEE TSOs find errors in cross-zonal capacity provided for validation, the relevant SEE TSO shall provide updated inputs to the SEE CCC for recalculations of cross-zonal capacities. The SEE CCC shall repeat calculation with updated inputs and send the recalculated cross-zonal capacities for another validation.
- (4) When one or more SEE TSOs do not validate the cross-zonal capacity calculated, the concerned TSOs shall provide the SEE CCC with the updated amount of cross-zonal capacities for the border considered and the reasons for the reduction. The final cross-zonal capacity is the minimum value sent by the SEE TSOs of the border considered.
- (5) Any reduction of cross-zonal capacities during the validation process shall be communicated and justified to market participants and to the SEE national regulatory authorities. The SEE CCC shall issue a quarterly report to regulatory authorities that shall include the amount of reduction in cross-zonal capacity and reason for reduction. In cases of reduction the report shall include information for each bidding zone border and direction affected by a reduction (i.e. the identification of the border and direction; the volume of reduction; detailed reasons for reduction, including the security constraint violated, and under which circumstances it was violated; the before and after the contingency values for the NTC; the RAs included in CGM before capacity calculation; in case of reduction due to individual validation, the TSO invoking the reduction) and the proposed measures to avoid similar reductions in the future. The report shall also include at least the following aggregate information: statistics on the number, causes, volume and estimated loss of economic surplus of applied reductions by different SEE TSOs and general measures to avoid capacity reduction in the future.
- (6) The SEE CCC shall coordinate with neighboring CCCs during the validation process, where at least the reductions in cross-zonal capacity are shared among them. Any information on decreased cross-zonal capacity from neighboring CCCs shall be provided to SEE TSOs.

Article 12

Available transmission capacity for yearly and monthly market time-frames

- (1) The *ATC* values for yearly market time-frame are equal with the *NTC* values determined according with Articles 10(13) and (14).
- (2) SEE TSOs, or an entity delegated by SEE TSOs, shall send for each MTU the yearly allocated capacity to the SEE CCC, without undue delay.
- (3) The *ATC* values for monthly market time-frame taking into consideration the *AACs* is determined with the following equations in case of BG – GR border:

$$ATC_{BG-GR} = NTC_{BG-GR} - AAC_{BG-GR}$$

$$ATC_{GR-BG} = NTC_{GR-BG} - AAC_{GR-BG}$$

with

ATC_{BG-GR} *ATC* on the BG-GR direction

NTC_{BG-GR} *NTC* on the BG-GR direction

AAC_{BG-GR} *AAC* on the BG-GR direction

AAC_{GR-BG} *AAC* on the GR-BG direction

ATC_{GR-BG} *ATC* on the GR-BG direction

NTC_{GR-BG} *NTC* on the GR-BG direction

- (4) The *ATC* taking into consideration the *AACs* is determined with the following equations in case of BG – RO border:

$$ATC_{BG-RO} = NTC_{BG-RO} - AAC_{BG-RO}$$

$$ATC_{RO-BG} = NTC_{RO-BG} - AAC_{RO-BG}$$

with

ATC_{BG-RO} *ATC* on the BG-RO direction

NTC_{BG-RO} *NTC* on the BG-RO direction

AAC_{BG-RO} *AAC* on the BG-RO direction

AAC_{RO-BG} *AAC* on the RO-BG direction

ATC_{RO-BG} *ATC* on the RO-BG direction

NTC_{RO-BG} *NTC* on the RO-BG direction

Article 13

Fallback procedures

- (1) In accordance with Article 10(7) of the FCA Regulation, referring to Article 21(3) of the CACM Regulation, in the event that a LT CC process is unable to produce results, a fallback procedure shall be applied.
- (2) For the year-ahead and month-ahead common capacity calculation, where an incident occurs in the capacity calculation process and the SEE CCC is unable to produce results within the allocated time for the calculation process, the SEE TSOs shall bilaterally agree on *NTC* values for the relevant time-frame.
- (3) The SEE CCR TSOs shall use as fallback procedure for yearly process the coordinated yearly values of the previous year as a starting point. Then the SEE TSOs will first bilaterally validate these *NTC* values (this could imply that a *CNTC* will be lower due to different foreseen topology situations); in a second step these values will be discussed and agreed upon in a SEE TSOs coordination meeting (this also qualifies as validation according to Article 15 of the FCA Regulation) the latter ensures that also the fallback *NTCs* are coordinated.
- (4) The fallback procedure for monthly process takes into consideration the remaining capacity of the yearly process for that month and the coordinated monthly values of the previous year of that month. Then the SEE TSOs considering the different foreseen topology situations will bilaterally validate these *NTC* values. The bilaterally agreed values shall be in a second step discussed and agreed upon in a SEE TSOs coordination meeting.
- (5) SEE TSOs provide inputs to the SEE CCC after commonly coordinate and validate the bilaterally agreed *NTC*

values.

Article 14

Consideration of non-SEE CCR bidding zone borders

- (1) In accordance with Article 21(1)(b)(vii) of the CACM Regulation, SEE TSOs take into account the influences of other CCRs by making assumptions on what will be the future non-SEE exchanges in accordance with Article 18(3) of the CACM Regulation and Article 19 of the CGMM.
- (2) The assumptions of non-SEE exchanges are implicitly captured in the relevant CGM by the non-SEE TSOs' best forecasts of net positions and flows for HVDC lines, according to Article 18(3) of CACM Regulation and are used as the basis for the common capacity calculation. In SEE CCR, this constitutes the rule for sharing power flow capabilities among different CCRs.

Article 15

Publication and Timescale for Implementation of the capacity calculation methodology

- (1) The SEE TSOs shall publish this year-ahead and month-ahead capacity calculation methodology without undue delay after all relevant national regulatory authorities have approved the proposed methodology or a decision has been taken by the Agency for the Cooperation of Energy Regulators in accordance with Article 4(9), (10) and (11) of FCA Regulation.
- (2) The SEE TSOs shall implement the LT CCM no later than 01.01.2023. The implementation process shall include the following steps:
 - a. Internal parallel run (4 months period), during which the SEE TSOs shall test the operational processes for capacity calculation inputs, capacity calculation process and capacity validation and develop the appropriate IT tools and infrastructure;
 - b. External parallel run (6 months period), during which the SEE TSOs will continue testing their internal processes and IT tools and infrastructure.
- (3) During the internal and external parallel run, SEE TSOs shall continuously monitor the effects and the performance of the application of this methodology. For this purpose, they shall develop, in coordination with SEE NRAs, the Agency and stakeholders, the monitoring and performance criteria and report on the outcome of this monitoring on a quarterly basis in a quarterly report. After the implementation of this methodology outcome of this monitoring shall be reported in the annual report.

Article 16

Reviews and updates

- (1) Based on Article 3(f) of the FCA Regulation and in accordance with Article 21(3) of the FCA Regulation, referring to Article 27 of the CACM Regulation all TSOs shall regularly and at least once a year review and update the key input and output parameters listed in Article 27(4)(a) to (d) of the CACM Regulation.
- (2) In case the review proves the need of an update of the reliability margins methodology, SEE TSOs shall publish the changes at least 1 month before the implementation.
- (3) In case the review proves the need of an update of the operational security limits, critical network elements and contingencies used for capacity calculation inputs pursuant to Article 6, SEE TSOs shall publish the changes at least 1 week before the implementation.

- (4) In case the review proves the need for updating the application of the methodologies for determining generation shift keys, operational security limits, critical network elements and contingencies referred to in Articles 12 to 13 of the FCA Regulation, changes have to be published at least 3 months before the final implementation.
- (5) Any changes of parameters listed in Article 27(4) of the CACM Regulation have to be communicated to market participants, SEE NRAs and the Agency.
- (6) The impact of any changes of the parameters listed in Article 27(4)(d) of the CACM Regulation have to be communicated to market participants, SEE regulatory authorities and the Agency. If any change leads to an adaptation of this methodology, SEE TSOs will amend this methodology according to Article 4(12) of the FCA Regulation.

Article 17 **Publication of data**

- (1) In accordance with Article 3(f) of the FCA Regulation aiming at ensuring and enhancing the transparency and reliability of information to the regulatory authorities and market participants, SEE TSOs and SEE CCC shall regularly publish the data on the capacity calculation process pursuant to this methodology on a dedicated online communication platform representing all SEE TSOs. To enable market participants to have a clear understanding of the published data, SEE TSOs and SEE CCC shall develop a handbook and published it on this communication platform. This handbook shall include at least a description of each data item, including its unit and underlying convention.
- (2) SEE TSOs and SEE CCC shall publish the following data items (in addition to the data items and definitions of Commission Regulation (EU) No 543/2013 on submission and publication of data in electricity markets), except point i):
 - a. NTC values determined for year and monthly market time-frames;
 - b. RMs for each direction of the SEE CCR borders;
 - c. Limiting CNECs;
 - d. For each CNEC the EIC code of CNE and Contingency;
 - e. Real names of CNECs;
 - f. The following forecast information contained in the CGM and bidding zone of the SEE CCR:
 - i). Load
 - ii). Production
 - iii). Net position
- (3) Individual SEE TSO may withhold the publication of information disclosing the locational information referred to in paragraph (2) c), (2) d), (2) e), (2) f), if required by a competent regulatory authority or by relevant national legislation on the grounds of protecting the critical infrastructure. In such case, the information referred to in paragraph (2) d) and e) shall be replaced with an anonymous identifier which shall be stable for each CNEC across all market time units. The anonymous identifier shall also be used in the other TSO communications related to the CNEC, including when communicating about an outage or an investment in infrastructure. The list of data items withheld pursuant to this paragraph shall be published on the communication platform referred to in paragraph (1).
- (4) Any change in the identifiers used in paragraphs (2) d) and (3) shall be publicly notified at least one month before its entry into force. The notification shall at least include the day of entry into force of the new identifiers and the correspondence between the old and the new identifier for each CNEC.
- (5) Regulatory authorities may request additional information to be published by the TSOs. The relevant TSOs shall publish this information if requested by their competent regulatory authority. All regulatory authorities

shall coordinate their requests among themselves, the relevant stakeholders and the Agency.

Article 18

Quality of the data published

- (1) No later than six months before the implementation of this methodology, SEE TSOs shall jointly establish and publish a common procedure for monitoring and ensuring the quality and availability of the data. When doing so, they shall coordinate with relevant stakeholders and SEE CCR regulatory authorities.
- (2) The procedure pursuant to paragraph (1) shall be applied by the CCC, and shall consist of continuous monitoring process and reporting in the annual report. The continuous monitoring process shall monitor the following elements:
 - a. individually for each TSO and for the SEE CCR as a whole: data quality indicators, describing the precision, accuracy, representativeness, data completeness, comparability and sensitivity of the data;
 - b. the ease-of-use of the data retrieval, for both manual and automated purposes;
 - c. perform automated data checks, which shall be conducted in order to automatically accept or reject individual data items before publication based on required data attributes (e.g. data type, lower/upper value bound, etc.).

The quality indicators shall be monitored in daily operation and shall be made available on the platform for each dataset and data provider such that users are able to take this information into account when accessing and using the data.

- (3) The SEE CCC shall provide in the annual report at least the following:
 - a. the summary of the quality of the data provided by each data provider;
 - b. the assessment of the ease-of-use of data retrieval (both manual and automated);
 - c. the results of the satisfaction survey performed annually with stakeholders and regulatory authorities;
 - d. the suggestions for improving the quality of the provided data and/or the ease-of-use of data retrieval.
- (4) The SEE TSOs shall commit to a minimum value for at least some of the indicators mentioned in paragraph (2), to be achieved by each TSO individually on average on a monthly basis. Should a TSO fail to fulfil at least one of the data quality requirements, this TSO shall provide to the SEE CCC within 1 month following the infringement of the threshold, detailing reasons for the failure to provide information, as well as an action plan to correct past errors and prevent future errors. No later than three months after the infringement, this action plan shall fully be implemented and the issue resolved. This information shall be published on the online communication platform and in the annual report.

Article 19

Monitoring, reporting and information to regulatory authorities

- (1) With reference to the Whereas and Article 26(5) of the CACM Regulation, monitoring data shall be provided towards the SEE NRAs as basis for supervising a non-discriminatory and efficient SEE congestion management.
- (2) The provided monitoring data shall also be the basis for the biennial report to be provided according to Article 26 of the FCA Regulation.
- (3) The SEE CCC, with the support of SEE TSOs where relevant, shall draft and publish an annual report and a quarterly report satisfying the reporting obligations set in this methodology.
- (4) The final, exhaustive and binding list of all monitoring items, respective templates and the data access point

shall be developed by the SEE TSOs in cooperation with SEE NRAs. An agreement between the SEE NRAs and SEE TSOs shall be reached no later than three months before the implementation of this methodology.

- (5) All technical and statistical information related to this methodology shall be made available upon request to the NRAs in the SEE CCR.

Article 20 Language

- (1) The reference language for this methodology shall be English. For the avoidance of doubt, where TSOs need to translate this methodology into their national language(s), in the event of inconsistencies between the English version published by TSOs in accordance with Article 4(13) of the FCA Regulation and any version in another language, the relevant TSOs shall, in accordance with national legislation, provide the relevant national regulatory authorities with an revised translation of the methodology.