
South West Europe TSOs proposal for a common long-term capacity calculation in accordance with Article 10 of Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation

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TSOs of the South West Europe Region, taking into account the following:

Whereas

- (1) This document (hereafter referred to as “South West Europe Borders LT common capacity calculation methodology”), including its annex, is a common proposal developed by all Transmission System Operators (hereafter referred to as “TSOs”) within the South West Europe Capacity Calculation Region (hereafter referred to as “South West Europe Region”) regarding the proposal for the common capacity calculation methodology for long-term time frames. This proposal is required by Article 10 of Regulation (EU) 2016/1719 on Forward Capacity Allocation (the “FCA Regulation”).
- (2) This proposal (hereafter referred to as the “LT CCC methodology proposal”) takes into account the general principles and goals set in Commission Regulation (EU) 2016/1719 establishing a guideline on Forward Capacity Allocation (hereafter referred to as 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 harmonisation of capacity calculation and allocation in the long-term cross-border markets. To facilitate these aims, it is necessary to calculate in a coordinated manner by the TSOs the available cross-border capacity.
- (4) Article 10 of the FCA Regulation constitutes the legal basis for this proposal. It defines several specific requirements that the LT CCC methodology Proposal should take into account, namely the disposal of Article 21 of Regulation (EC) No 2015/1222 of the European Parliament and of the Council of 24 July 2015.
- (5) Article 9 of the FCA Regulation defines the capacity calculation time frames as “*All TSOs in each capacity calculation region shall ensure that long-term cross-zonal capacity is calculated for each forward capacity allocation and at least on annual and monthly time frames*”.
- (6) Article 10 (1) of the FCA Regulation defines the deadline to submit the proposal for a common capacity calculation methodology for long-term time frames 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*.
- (7) Article 10 (2) of the FCA Regulation defines the approach to use in the common capacity calculation methodology shall be either a coordinated net transmission capacity approach or a flow-based approach, and Article 10 (5) of the FCA Regulation specifies that: “*All TSOs in each capacity calculation region may jointly apply the flow-based approach for long-term capacity calculation time frames on the following conditions: (a) the flow-based approach leads to an increase of economic efficiency in the capacity calculation region with the same level of system security; (b) the transparency and accuracy of the flow-based results have been confirmed in the capacity calculation region; (c) the TSOs provide market participants with six months to adapt their processes.*”



- (8) Article 10 (3) of the FCA Regulation requires that *the capacity calculation methodology 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*.
- (9) Article 2 (8) of Regulation (EU) 2015/1222 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”*.
- (10) In the context of this proposal, the definition of “coordinated capacity calculator” is important and is defined in Article 2 (11) of Regulation (EU) 2015/1222 as: *“the entity or entities with the task of calculating transmission capacity, at regional level or above”*.
- (11) Article 4 (8) of the FCA Regulation requires a proposed timescale for the implementation and a description of the expected impact of the LT CCC methodology Proposal on the objectives of the FCA Regulation. The impact is presented below in the point 12 of this Whereas Section.
- (12) The LT CCC methodology Proposal contributes to and does not in any way hinder the achievement of the objectives of Article 3 of the FCA Regulation:

Article 3 (a) of the FCA Regulation aims at *promoting effective long-term cross-zonal trade with long-term cross-zonal hedging opportunities for market participants*.

The LT CCC methodology Proposal serves the objective of promoting effective long-term cross-zonal trade with long-term cross-zonal hedging opportunities for market participants by defining a set of harmonised rules for forward capacity allocation. Establishing common and coordinated processes for the capacity calculations within the long-term market time frames contributes to achieving this aim.

Article 3 (b) of the FCA Regulation aims at *optimising the calculation and allocation of long-term cross-zonal capacity*. By coordinating the timings for the delivery of inputs, calculation approach and validation requirements of the CCC between TSOs and the coordinated capacity calculator, the LT CCC methodology Proposal contributes to the objective of optimising the calculation and allocation of cross-zonal capacity.

Article 3 (c) of the FCA Regulation aims at *providing non-discriminatory access to long-term cross-zonal capacity*. The LT CCC methodology Proposal contributes to the objective of providing non-discriminatory access to long-term cross-zonal capacity by coordinating the capacity calculation with updated inputs for the long-term market time frames at regional level to ensure its reliability.

Article 3 (f) of the FCA Regulation aims at *ensuring and enhancing the transparency and reliability of information on forward capacity allocation*. The LT CCC methodology Proposal contributes to the objective of ensuring and enhancing the transparency and reliability of information on forward capacity allocation by using last available inputs based on the best possible forecast of transmission systems at the time of each capacity calculation, updated in a timely manner.



Article 3 (g) of the FCA Regulation aims at *contributing to the efficient long-term operation and development of the electricity transmission system and electricity sector in the Union*. By using the best possible forecast of the transmission systems at the time of each capacity calculation within the South West Europe region, the results of the coordinated capacity calculation contribute to determine the most limiting grid elements within this region, by then help TSOs for a more efficient development of the electricity transmission system.

- (13) In conclusion, the LT CCC methodology Proposal contributes to the general objectives of the FCA Regulation.

SUBMIT THE FOLLOWING LT CCC METHODOLOGY PROPOSAL TO THE NATIONAL REGULATORY AUTHORITIES OF THE REGION:



Article 1

Subject matter and scope

The long-term common capacity calculation methodology as determined in this LT CCC methodology Proposal is the common proposal of all South West Europe TSOs in accordance with Article 10 of the FCA Regulation.

The participating TSOs to the coordinated capacity calculation are therefore REE (Spain), REN (Portugal) and RTE (France).

Article 2

Definitions and interpretation

1. For the purposes of the LT CCC methodology Proposal, the terms used shall have the meaning given to them in Article 2 of Regulation (EC) 714/2009, Article 2 of Regulation (EC) 2013/543, Article 2 of Regulation (EC) 2015/1222 and Article 2 of Regulation (EC) 2016/1719.
2. In addition, the following definitions shall apply:
 - a. ‘CCC’ means common capacity calculation.
 - b. ‘Common Grid Model’ means the common grid model built for each capacity calculation time frame in accordance with Article 18 of the FCA Regulation.
 - c. ‘ENTSO-E’ means European Network of Transmission System Operators for Electricity.
 - d. ‘IGM’ means Individual Grid Model.
 - e. ‘LT’ means long-term.
 - f. ‘REE’ means Red Eléctrica de España, the Spanish system operator.
 - g. ‘REN’ means Redes Energéticas Nacionais, the Portuguese system operator.
 - h. ‘RTE’ means Réseau de Transport d’Electricité, the French system operator.
 - i. ‘ES-FR border’ means bidding zone border between Spain and France.
 - j. ‘ES-PT border’ means bidding zone border between Spain and Portugal.
 - k. ‘SWE capacity calculation for day-ahead’ means the capacity calculation done in SWE Region for day ahead according with SWE DA&ID CC methodology.
 - l. ‘SWE DA&ID CC methodology’ means South West Europe TSOs proposal of common capacity calculation methodology for the day-ahead and intraday market time frame in accordance with Article 21 of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management.
 - m. ‘FCA Regulation’ means Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation.
 - n. ‘SOGL Regulation’ means Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation.
 - o. ‘TTC’ means Total Transfer Capacity, which is the maximum total exchange program (MW) between adjacent bidding zones in a specific direction complying with the operational security limits, if future network conditions, generation and load patterns are perfectly known in advance.



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- p. 'TRM' means Transmission Reliability Margin, understood as the reliability margin used in coordinated net transmission capacity approach.
- q. 'UD' means unintended deviation, as defined in 'SWE DA&ID CC methodology'
- r. 'UN' means the error due to the uncertainties of the D-2 models, as defined in 'SWE DA&ID CC methodology'
3. In this LT CCC methodology Proposal, unless the context requires otherwise:
- the singular indicates the plural and vice versa;
 - headings are inserted for convenience only and do not affect the interpretation of this proposal; and
 - 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 proposal

This proposal applies solely to the LT common capacity calculation methodology based on the coordinated net transmission capacity approach within the South West Europe Capacity Calculation Region. The common capacity calculation methodologies within other Capacity Calculation regions and other time frames are outside the scope of this proposal.

Article 4

Cross-zonal capacities for the long-term market

For the long-term time frames, values for cross-zonal capacity for each forward capacity allocation and at least on annual and monthly time frames shall be calculated using the LT coordinated capacity calculation methodology.

Article 5

Reliability margin methodology

- The TSOs of SWE Region shall calculate one single TRM value per calculation time frame and border.
- For each capacity calculation time frame and border, the TSOs of SWE will build a probability distribution function obtained from the convolution of the following two probability distribution functions:
 - TTC differences between long-term capacity calculation time frame and the capacity calculation for day-ahead time frame. Details about how this function is built are specified in chapter A of Annex I.
 - Convolution of uncertainties and unintended deviations probability distribution functions, as defined in the TRM Methodology of the SWE DA&ID CC methodology.
- For each capacity calculation time frame and border, the TRM will be calculated as the value in MW corresponding to the percentile 97 of the probability distribution referred in Article 5 (2).



4. The TSOs of SWE Region shall investigate whether a lower percentile could be taken into account for the reliability margin computation while guarantying security of supply. A study will be provided to the relevant regulatory authorities by Q3 2021.
5. The TSOs of SWE Region will review TRM values at least every two years, applying this methodology with the new data available.

Article 6

Methodologies for operational security limits and contingencies

1. The TSOs of SWE Region shall use, for the long-term capacity calculation, the same methodologies and thresholds for operational security limits and contingencies used for the day-ahead SWE capacity calculation methodology.
2. The coordinated capacity calculator shall use the critical network elements for the capacity calculation performed within SWE Region.
3. The methodology to select the monitored elements is in line with article 21(1)(b)(ii) of Regulation (EU) 2015/1222 since it is an objective way to use in the capacity calculation only critical network elements inside bidding zones that are taking part in the cross-zonal exchange. This way cross-zonal and internal exchanges are treated on the same level of importance, avoiding undue discrimination of one over the other.

Article 7

Generation shift keys methodology

1. The TSOs of SWE Region shall define the generation shift keys methodology in accordance with Article 13 of FCA Regulation.
2. RTE shall define generation shift keys proportional for each base case scenario with all expected generating units in the IGM, reflecting RTE's best forecast of generation profiles. This approach is defined in chapter B of Annex I.
3. REE shall define generation and load shift keys based on a merit order list, reflecting the best forecast of load and generation profiles with all available loads that are enabled to participate in balancing markets, and all available generation. This approach is defined in chapter B of Annex I.
4. REN shall define generation and load shift keys based on a merit order list, reflecting the best forecast of load and generation profiles with all available loads that are enabled to participate in balancing markets, and all available generation. This approach is defined in chapter B of Annex I.



Article 8

Methodology for remedial actions in capacity calculation

1. The TSOs of SWE Region shall define the remedial actions in accordance with Article 14 of FCA Regulation.
2. Each TSO of SWE Region shall define individually the remedial actions of its responsibility area to be used in the capacity calculation within SWE Region for each calculation scenario.
3. The remedial actions to be defined by each TSO of SWE Region shall be either preventive (pre-fault) or curative (post-fault). The TSOs of SWE Region may use the following remedial actions:
 - a. Changing the tap position of a phase shifter transformer.
 - b. Topology measure: opening or closing of a line, cable, transformer, bus bar coupler or switching of a network element from one bus bar to another.
 - c. HVDC modulation.
 - d. Modification of generation.
 - e. Activation/deactivation of FACTS, reactance(s), capacitor(s).
4. The TSOs of SWE Region shall review the list of the remedial actions that can be used in the capacity calculation within SWE Region at least once a year.
5. For each calculation scenario, in order to improve computation time and precision, SWE TSOs can adapt the list of available remedial actions offered for the capacity calculation. These remedial actions are adapted to the grid situation and forecast.
6. Each TSO of SWE Region shall inform the coordinated capacity calculator in a timely manner on any change in its remedial actions within SWE Region to ensure an efficient capacity calculation.
7. RTE and REE shall coordinate, prior to the capacity calculation, the remedial actions that can be shared with each other to maximize the available cross-zonal capacities for the ES-FR border.
8. REN and REE shall coordinate, prior to the capacity calculation, the remedial actions that can be shared with each other to maximize the available cross-zonal capacities for the ES-PT border.
9. Each TSO of the SWE Region may decide, based on regulation, to make available costly remedial actions. Where a costly remedial action is used in the capacity calculation process, it shall be performed in accordance with the provisions of the methodology for coordinated redispatching and countertrading with cross-border relevance as defined in Article 35 of Regulation (EU) 2015/1222. It shall also be applied only when economically relevant at Union level.
10. Based on expertise and experience, SWE TSOs can identify a costly remedial action which effects can be economically and technically relevant at Union Level in order to include it in the list of available remedial actions. To prove so, SWE TSOs will then proceed with the following steps:
 - a. SWE TSOs will compare the potential statistical cost of this identified curative remedial action over a year with the average gain in global welfare over a year applying this remedial action, estimated over 4 representing timestamps.



- b. If the gain in welfare is higher than the cost, the remedial action can be used in the capacity calculation.
- c. Once a year, or when a significant change will impact the remedial action effectiveness or cost, the economic and technical relevance of the remedial action is reassessed and the remedial action is removed from the capacity calculation if it is not efficient anymore.

Article 9

Cross-zonal capacity validation methodology and reporting

1. The TSOs of SWE Region shall validate the TTC values calculated by the coordinated capacity calculator of the SWE Region.
2. The coordinated capacity calculator shall make available the common grid model for SWE Region in the extreme scenarios for the relevant calculation scenarios to the TSOs of SWE Region.
3. Where required, TSOs can validate the cross-zonal capacities calculated by performing security analysis with grid models provided in accordance with Article 9.2.
4. Where one or more SWE TSOs do not validate the cross-zonal capacity calculated, the concerned TSO(s) shall provide the coordinated capacity calculator with the updated amount of cross-zonal capacities for the border considered and the reasons for the new value. The final cross-zonal capacity is the minimum value sent by the SWE TSOs of the border considered.
5. In accordance with Article 15 of FCA regulation and the referred Article 26 (5) of CACM regulation, the coordinated capacity calculator shall, every three months, report all reductions made during the validation of cross-zonal capacity to all regulatory authorities of the SWE region. This report shall include the location and amount of any reduction in cross-zonal capacity and shall give reasons for the reductions.
6. In addition, the TSOs will disclose every three months a public reporting on the cross zonal capacity calculation and on the reductions in the period. Potential sensitive information regarding critical network elements will be protected if needed according to national legal frameworks.

Article 10

Long-term capacity calculation

1. The TSOs of SWE Region shall ensure that the coordinated capacity calculator calculates cross-zonal capacities for each bidding-zone border of SWE Region.
2. The TSOs of SWE Region shall provide the coordinated capacity calculator the last updated information on the transmission systems in a timely manner for each LT capacity calculation.
3. The TSOs of SWE Region shall provide the coordinated capacity calculator with the previously allocated cross-zonal capacities on each border of the SWE Region when applicable.
4. The coordinated capacity calculator shall retrieve the most recent common grid model for the corresponding time frame. Until the common grid model is available at ENTSO-E level, or for those



time frames not covered by common grid model methodology according with All TSOs' proposal for a common grid model methodology in accordance with Article 18 of FCA, the coordinated capacity calculator shall merge the individual grid models provided by each TSO of the SWE Region. During the merging process, quality checks of the information provided by each TSO of the SWE Region shall be performed by the coordinated capacity calculator.

5. The coordinated capacity calculator shall calculate TTC values on a set of calculation scenarios, defined as the product of combining the CGMs with the availability plans, the seasonal operational security limits and the remedial actions sent by the TSOs.
6. The availability plans to be taken into consideration in the capacity calculation shall include the outages of assets identified as relevant for outage coordination in the SWE Region, in accordance with the methodology for assessing the relevance of assets for outage coordination referred in Article 84 of SOGL Regulation. Before November 1st of each calendar year, each SWE TSO shall provide to the neighbouring TSO(s) the preliminary year-ahead availability plans for the following calendar year, enabling a jointly coordination and validation of the year-ahead availability plans for capacity calculation. The availability plans shall be updated by the SWE TSOs on a monthly basis.
7. The capacity calculation process is based on a Remedial Action Optimization methodology which aims to find the higher secure capacity based on the inputs provided by the TSOs and applying a dichotomy. The algorithm tests several levels of cross-zonal exchange and determines if each exchange is safe after the occurrence of all the monitored contingencies, applying available remedial actions when necessary. The TSOs of the SWE Region will use a precision of 50 MW for the calculation in order to maintain a good balance between operationally acceptable calculation time and market needs.
8. The coordinated capacity calculator shall define the TTC values for each calculation scenario up to the first unsecured situation. These values shall be provided to TSOs of the SWE Region for validation according to Article 9.
9. The TSOs of SWE can provide updated inputs and ask the coordinated capacity calculator to launch a second calculation, if they detect new relevant conditions that were not identified before the first provision of inputs according to Article 10 (2).
10. The coordinated capacity calculator of the SWE Region shall provide with the validated NTC values after application of the reliability margin defined in accordance with Article 5 for each bidding-zone border of SWE Region.

$$NTC = TTC - TRM$$

Article 11

Fallback procedures

1. Prior to each long-term capacity calculation time frame, the TSOs of SWE Region shall ensure the coordinated capacity calculator is provided with the last coordinated cross-zonal capacity values calculated within the previous long-term capacity calculation.



2. For the capacity calculation performed in yearly time frame, where an incident occurs in the capacity calculation process and the coordinated capacity calculator is unable to produce results within the allotted time for the calculation process, the SWE TSOs shall validate the last coordinated cross-zonal capacities calculated for the previous year time frame and review them where relevant.
3. For the capacity calculation performed in other time frames, where an incident occurs in the capacity calculation process and the coordinated capacity calculator is unable to produce results within the allotted time for the calculation process, the SWE TSOs shall validate the last coordinated cross-zonal capacities calculated within the corresponding superior long-term capacity calculation time frame and review them where relevant.

Article 12

Publication and Implementation of the LT CCC methodology Proposal

1. The TSOs of SWE Region shall publish the CCC methodology Proposal without undue delay after all national regulatory authorities have approved the proposed CCC methodology or a decision has been taken by the Agency for the Cooperation of Energy Regulators in accordance with Article 4 (9), Article 4 (10) and 4 (11) of the FCA Regulation.
2. The TSOs of SWE Region shall implement the long-term CCC methodology Proposal no later than Q2 2022.

Article 13

Language

1. The reference language for this common capacity calculation Proposal shall be English.
2. For the avoidance of doubt, where TSOs need to translate this LT CCC methodology Proposal 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 be obliged to dispel any inconsistencies by providing a revised translation of this LT CCC methodology Proposal to their relevant national regulatory authorities.

Annex I

A. Reliability margin

The probability distribution function to be used to obtain the reliability margin is built as the convolution of two probability distribution functions.

The process to build the probability distribution function defined in Article 5.2.a for a given border and a given calculation time frame has the following steps:

1. Choose the period to be studied. At least 3 years of data will be taken.
2. Retrieve the long-term TTC values (MW) of the capacity calculation for each hour¹ (*TTC long-term*). Two values per hour are obtained, one per direction.
3. Retrieve the day-ahead TTC values (MW) of the capacity calculation for each hour (*TTC day-ahead*). Two values per hour are obtained, one per direction.
4. Calculate ΔTTC (MW) defined as the difference between *TTC long-term* and *TTC day-ahead*²

$$\Delta TTC = TTC_{long-term} - TTC_{day-ahead}$$

5. Build the distribution by compiling all ΔTTC values.

The probability distribution function stated in Article 5.2.b for a given border is defined in Article 6 of the SWE DA&ID CC methodology as the convolution of the probability distribution functions of the variables UN and UD.

The TRM for a given border and calculation time frame is the chosen percentile³ of the convolution of the two probability distribution functions.

¹ For long term capacity calculations, SWE TSOs do not calculate a TTC for every hour, but an extrapolation is done by distributing peak and valley values within each day.

² For three years data, $3 \times 365 \times 24 \times 2 = 52560$ values of *Error* are obtained.

³ Referred in Article 5(3)

B. Generation and load shift keys

Generation and load shift keys (GLSKs) are defined to transform any change in the balance of one bidding zone into a change of injections in the nodes of that area. GLSKs are elaborated on the basis of the forecasted information about the generating units and loads.

Two different types of GLSKs are used in this methodology: proportional approach and merit order list approach.

1. Proportional to base case generation approach

The GSK for a given area⁴ contains a list of generation nodes which participates in the generation shift. The shift in the defined generation nodes is proportional to the base case generation within the area. Being $P_g(n, a)$ the active generation in node n belonging to area a , the participation of node n in the shift, among selected generation nodes (GSK) is given by:

$$Kg(n, a) = G(a) \cdot \frac{Pg(n)}{\sum_{m \in GSK} Pg(m)}$$

The sum of $G(a)$ for each area is to be equal to 1 (i.e. 100%).

2. Merit order list approach

The defined generation nodes⁵ shift up or down according to the merit order defined in the lists called *Upward list* and *Downward list*.

- *Upward list* contains the generation nodes which performs the total positive shift in a given area⁶.
- *Downward list* contains the generation nodes which performs the total negative shift in a given area.

Each generation node of each list has a merit order position, i.e. it is the order to be applied to generation nodes to be shifted simultaneously. It means that the first group (number defined with a specific merit order position) of generation nodes are shifted together and if it is not sufficient, the next group generation nodes are used to complete the total shift, and so on. The total shift is distributed to the last group of merit order position generation nodes proportionally to their available margin as defined for reserve shift.

⁴ E.g. French electrical system.

⁵ For simplicity reasons, it is written “generation nodes”. As load nodes can also participate in the shift of the net position in the capacity calculation according to Article 7 provisions, it must be understood as “generation or load nodes”.

⁶ E.g. Spanish or Portuguese electrical systems.