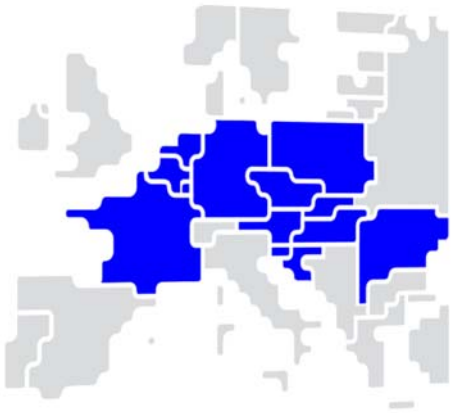
ACER
European Union Agency for the Cooperation of Energy Regulators

~~Core TSOs common coordinated long-term capacity calculation methodology in accordance with article 10 of Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation~~

~~November 2020~~



~~Table of Contents~~

~~Whereas ..... 3~~

~~TITLE 1: ..... General Provisions ..... 6~~

~~Article 1 Subject, Matter and Scope ..... 6~~

~~Article 2 Definitions and Interpretation ..... 6~~

~~Article 3 Long-Term Capacity Calculation Process ..... 8~~

~~TITLE 2: ..... Treatment of Input ..... 9~~

~~Article 4 Reliability Margin Methodology ..... 9~~

~~Article 5 Methodologies for Operational Security Limits ..... 9~~

~~Article 6 Methodology for Allocation Constraints ..... 10~~

~~Article 7 Methodology for Critical Network Elements and Contingencies Selection ..... 11~~

~~Article 8 Generation Shift Keys Methodology ..... 11~~

~~Article 9 Methodology for Remedial Actions in Capacity Calculation ..... 12~~

~~Article 10 Scenarios and Calculation Timestamps ..... 12~~

~~Article 11 Integration of Cross-Zonal HVDC Interconnectors Located within the Core CCR ..... 14~~

~~TITLE 3: ..... Description of the Capacity Calculation Process ..... 15~~

~~Article 12 Description of the CC inputs and outputs ..... 15~~

~~Article 13 Computation of Power Transfer Distribution Factors ..... 16~~

~~Article 14 Computation of the available margins on critical network elements ..... 17~~

~~Article 15 Consideration of Non-Core CCR Bidding Zone Borders ..... 18~~

~~Article 16 Fallback Procedures ..... 18~~

~~TITLE 4: ..... Validation process ..... 19~~

~~Article 17 Validation Methodology ..... 19~~

~~TITLE 5: ..... Updates ..... 20~~

~~Article 18 Review and Updates ..... 20~~

~~TITLE 6: ..... Report ..... 21~~

~~Article 19 Publication of Data ..... 21~~

~~Article 20 Monitoring and Information to Regulatory Authorities ..... 21~~

~~TITLE 7: ..... Implementation and language ..... 23~~

~~Article 21 Timescale for Implementation ..... 23~~

~~Article 22 Language ..... 23~~

~~Annex 1: Justification for Calculation of External Constraints and its Application ..... 24~~

~~ALL TSOS OF THE CORE CCR TAKING INTO ACCOUNT THE FOLLOWING,~~

ACER Decision on the long-term capacity calculation methodology of the Core capacity calculation region: Annex I

Long-term capacity calculation methodology of the Core capacity calculation region

in accordance with Article 10 of Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation

3 November 2021

Contents

Whereas 5
TITLE 1: GENERAL PROVISIONS 10
Article 1 Subject matter and scope 10
Article 2 Definitions 10
Article 3 Long-Term Capacity Calculation Process 14
TITLE 2: CAPACITY CALCULATION INPUTS 17
Article 4 Reliability Margin Methodology 17
Article 5 Methodology for Operational Security Limits 17
Article 6 Methodology for Allocation Constraints 18
Article 7 Methodology for Critical Network Elements and Contingencies Selection 19
Article 8 Generation Shift Keys Methodology 20
Article 9 Application of Remedial Actions 21
Article 10 Common Grid Models 21
Article 11 Integration of HVDC Interconnectors at the Core Bidding Zone Borders 24
TITLE 3: CAPACITY CALCULATION PROCESS 26
Article 12 Description of the CC inputs and outputs 26
Article 13 Computation of Power Transfer Distribution Factors 27
Article 14 Computation of Remaining Available Margin 28
Article 15 Consideration of Non-Core CCR Bidding Zone Borders 32
Article 16 Fallback Procedure 32
TITLE 4: VALIDATION PROCESS 34
Article 17 Validation Methodology 34
TITLE 5: UPDATES 38
Article 18 Review and Updates 38
TITLE 6: GOVERNANCE 40
Article 19 Rules Concerning Governance and Decision Making Among the Core TSOs 40
TITLE 7: REPORTING 41
Article 20 Publication of Data 41
Article 21 Monitoring and Reporting to the National Regulatory Authorities 42
TITLE 8: IMPLEMENTATION AND LANGUAGE 45
Article 22 Timescale for Implementation 45
Article 23 Language 45

Whereas

(1) This document ~~sets out~~is the common coordinated long-term capacity calculation methodology (‘LT CCM’ or ‘this methodology’) for the Core capacity calculation region (‘Core CCR’) in accordance with Article 10 ~~seq.~~ of Commission Regulation (EU) 2016/1719 ~~of 26 September 2016~~ establishing a guideline on Forward Capacity Allocation ~~(hereafter referred to as the “~~(‘FCA ~~Regulation”). This methodology is hereafter referred to as the "Long-Term Capacity Calculation Methodology" (LT CCM~~Regulation’).

~~1.~~ The LT CCM takes into account ~~the general principles and goals set in the FCA Regulation as well as~~ Regulation (EC) No 2019/943 ~~of the European Parliament and of the Council of 5 June 2019~~ on the internal market for electricity ~~(hereafter referred to as "Regulation (EC) No 2019/943”.~~

(2) ~~The LT CCM serves the objective of promoting effective long-term cross-zonal trade with long-term cross-zonal hedging opportunities for market participants (~~(‘Electricity Regulation’), the general principles of forward capacity allocation set out in Article 10 of the FCA Regulation and the objectives listed in Article 3~~(a~~ of the FCA Regulation.

(3) Pursuant to Article 10(2) of the FCA Regulation, the LT CCM uses the flow-based approach.

(4) Pursuant to Article 10(3) of the FCA Regulation~~) by taking~~, the LT CCM is compatible with the day-ahead and intraday capacity calculation methodologies established in accordance with Article 21(1) of Commission Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management (‘CACM Regulation’).

(5) Pursuant to Article 10(4)(a) of the FCA Regulation, the LT CCM takes into account the ~~hedging~~uncertainty associated with long-term capacity calculation time frames when applying a security analysis based on multiple scenarios i.e. Common Grid Models (CGM) and using the capacity calculation inputs, the capacity calculation approach referred to in Article 21(1)(b) of the CACM Regulation and the validation of cross-zonal capacity referred to in Article 21(1)(c) of the CACM Regulation.

(6) Pursuant to Article 10(5) of the FCA Regulation, the LT CCM applies the flow-based approach since:

(a) the flow-based approach leads to an increase of economic efficiency in the Core CCR with the same level of system security;

(b) the transparency and accuracy of the flow-based results have been confirmed in Core CCR; and

(c) the implementation timeframe provided in the methodology is sufficient for the market participants to adapt their processes[1];

(7) Pursuant to Article 10(6) of the FCA Regulation, as the LT CCM applies a security analysis based on multiple scenarios, it also applies the requirements for the capacity calculation inputs, the capacity calculation approach and the validation of cross zonal capacity as provided for in Article 21(1) of the CACM Regulation, except Article 21(1)(a)(iv) where relevant.

(8) Pursuant to Article 10(7) of the FCA Regulation, the LT CCM takes into account the requirements for the fallback procedures and the requirement provided for in Article 21(3) of the CACM Regulation.

(9) The LT CCM covers the yearly and monthly long-term time frames pursuant to Article 9 of the FCA Regulation.

[1] The fulfilment of these three conditions is discussed in section 6.2.1.2 of ACER’s Decision: *Assessment of the general requirements (Article 10 of the FCA Regulation).*

(10) The LT CCM provides yearly and monthly capacity calculation outputs. Splitting of long-term capacity is subject to a separate methodology for splitting long-term cross-zonal capacity developed pursuant to Article 16 of the FCA Regulation, and is not addressed in this LT CCM. Splitting of long-term capacity may reduce the yearly capacity calculation outputs in order to provide more capacity at a monthly level.

(11) During the development of the LT CCM, it has been recognised that outputs of the common grid model methodology ('CGMM') are insufficient for the Core LT CCM, which requires higher granularity of common grid models ('CGM') and a flexibility in defining the timestamps for additional CGMs, as well as the application of planned outages, to properly represent the network for the capacity calculation. In addition, in order to ensure a coordinated approach for the long-term network modelling, the CGMM needs ~~of~~to be amended to incorporate the common elements of the Core temporary procedure. The temporary procedure in Core may be applied only until such amendment of the CGMM takes place. After that, the Core LT CCM should apply the amended CGMM.

(12) In line with Article 37(1)(a) of the Electricity Regulation, the regional coordination centres ('RCCs') need to carry out the coordinated capacity calculation in accordance with the methodologies developed pursuant to the capacity allocation and congestion management guideline adopted on the basis of Article 18(5) of Regulation (EC) No 714/2009. Article 35(2) of the Electricity Regulation requires that RCCs enter into operation by 1 July 2022. Thereby, as of this date, RCCs of the Core CCR will take over the role of the coordinated capacity calculator ('CCC') as referred to in this LT CCM.

(13) The LT CCM contributes to the achievement of the objectives of forward capacity allocation listed in Article 3 of the FCA Regulation. In particular, this LT CCM:

(a) Takes into account the hedging needs of electricity market participants by calculating reliable capacities at an early stage and making them available to market participants, which makes long-term planning possible. Thus it is promoting effective long-term cross-zonal trade with long-term cross-zonal hedging opportunities for electricity market participants in accordance with Article 3(a) of the FCA Regulation;

~~(b) The LT CCM contributes to the optimal calculation of long-term capacity (article 3(b) of the FCA Regulation) since it~~ Takes 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 the Core TSOs and the ~~Coordinated Capacity Calculator of Core (~~Core CCC~~).~~. The ~~optimal~~flow-based capacity calculation is a result of a close cooperation ~~and establishment of a smooth interface between capacity calculation by Core~~ of TSOs and ~~allocation of~~ the CCC and establishes a reliable and coordinated input towards the capacity allocation process for market ~~parties.~~

~~(c) The LT CCM contributes to the objective of providing non-discriminatory access to long-term cross-zonal capacity (article 3(c) of the FCA Regulation) by allowing each market~~ participants ~~to access and participate to Long-Term (LT) Auctions organized transparently by the Singe Allocation Platform (SAP) operator. The Core TSOs ensure 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 Core CCR, thereby framing a non-discriminatory playing field amongst market participants.~~

~~(d) The LT CCM is designed to ensure a fair and non-discriminatory treatment of Core TSOs, ACER, 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. Transparency and monitoring of capacity calculation are essential for ensuring its efficiency and understanding. This methodology establishes significant requirements for Core TSOs to publish the information required by market participants, to report the information to regulatory authorities and to analyse the impact of capacity calculation on the market functioning.~~

~~(e) This LT CCM also 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.~~

~~(f) The LT CCM requires Core TSOs to provide market participants with reliable information on cross-zonal capacities and import/export limits for year and month ahead allocation in a transparent and continuous way by publication of the validated results at the Transparency Platform. 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).~~

~~(g) Finally, the LT CCM 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).~~

~~(h) The LT CCM covers the annual and monthly long-term time frames pursuant to article 9 of the FCA Regulation.~~

~~(i) In August 2019, the Core TSOs reached the situation described on the article 4(4) of the FCA Regulation. Starting from this date, an iterative process took place, involving Core TSOs, National Regulatory Authorities (NRAs), ACER, the European Commission (EC) for designing an acceptable methodology for all parties. Following the guidance of ACER, this LT CCM considers the flow-based calculation as a target.~~

~~(j)~~(b) ~~The LT CCM for the Core CCR is composed of a~~. The flow-based ~~(FB)~~ approach ~~in accordance with article 10(5) of the FCA Regulation. In accordance with article 10(5)(a) of the FCA Regulation the FB approach leads to an increase of economic efficiency in the capacity calculation region with the same level of system security. The LT CCM calculates the annual and monthly cross-zonal capacities based on selected timestamps corresponding to different scenarios. Each timestamp delivers for each Critical Network Element and Contingency (CNEC), aside its Power Transfer Distribution Factors (PTDFs) for each of the Core Bidding Zone Borders (BZBs), the Remaining Available Margin (RAM) respecting the operational security limits (in accordance with Article 5 subject to Article 4 describing the Flow Reliability Margin). Those PTDFs and RAM values form identical inputs to perform either a coordinated Net Transfer Capacity (cNTC) extraction or a FB allocation. Therefore, a FB approach clearly respects the same level of security for the grid. Additionally, a FB approach will allocate~~allocates the cross-zonal capacities by putting the different ~~BZBs~~bidding zone borders in competition with each other in order to receive a portion of the remaining available margin (RAM) of ~~the~~ a critical network element with contingency (CNEC) and therefore ~~lead to a better~~increases economic efficiency. In ~~opposite, a cNTC extraction~~contrast, the application of net transmission capacity (NTC) is based on a fixed ~~and predefined formula to distribute the RAM~~ distribution of capacities of each CNEC over the interdependent borders ~~before converting them into NTC values for each border~~. Consequently, these NTCs are allocated independently on each interdependent border which essentially limits

the competition between interdependent borders. Lack of competition ~~between~~among borders for the capacity of ~~network elements~~CNECs, which these borders are significantly impacting, inevitably~~,~~ leads to loss of economic efficiency in allocating the capacity of such network elements. Thus, by applying the flow-based approach this LT CCM contributes to the optimisation of the calculation and allocation of long-term cross-zonal capacity in Core, in accordance with Article ~~10(5)~~(3(b) of the FCA Regulation ~~the transparency and accuracy of the flow-based results shall have been confirmed in the capacity calculation region. The LT CC Methodology foresees the reporting and publication of the FB results in accordance with Article 19 and Article 20 in order to obtain a full transparency and accuracy. In accordance with article 10(5)(c) of the FCA Regulation Core TSOs will provide market participants with at least six months to adapt their processes. ~~;

~~(k) The LT CCM is structured in three consecutive stages: (i) the definition and provision of capacity calculation inputs by the Core TSOs, (ii) the capacity calculation process by the Core CCC in coordination with the Core TSOs, and (iii) the capacity validation by the Core TSOs in coordination with the Core CCC.~~

(c) ~~Core TSOs determine the final capacity values~~Applies equally to ~~meet the form of product regulated in the Core Design of Long-Term Transmission Rights (in accordance with article 31(3) of the FCA Regulation). Those capacity values are subject to the Core Methodology for splitting~~ all market participants on all respective bidding zone borders in the Core CCR, thereby ensuring a level playing field amongst market participants, and providing non-discriminatory access to long-term cross-zonal capacity ~~(in~~ in accordance with Article 3(c) of the FCA Regulation;

~~(l)~~(d) Has been developed and adopted in a transparent process involving all the relevant stakeholders. This ensures fair and non-discriminatory treatment of the TSOs, ACER, regulatory authorities and market participants in accordance with Article ~~16~~3(d) of the FCA Regulation~~).~~;

~~(m) The LT CCM is based on forecast models~~Allows timely release of ~~the transmission 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 (DA)~~information about cross-zonal capacities and provides a backup solution when capacity calculation ~~methodology (CCM). The aim of the reliability margin is to cover the risk induced by these forecast errors.~~

~~(n) Core TSOs remain responsible for maintaining operational security regardless of whether there is a coordinated application of~~fails to provide results. In this way, it respects the need for a fair and orderly forward capacity ~~calculation or not. For this reason, they need to validate the calculated capacities to ensure that they do not violate operational security limits. This step may lead to reductions of the values given by the LT CC process. In order to avoid undue discrimination these measures of reduction have to be performed in a coordinated way. In case of missing coordination, the results might be that a Core TSO might have more capacities to the detrimental effect (operational security issues) of another Core TSO.~~

~~**(o)** SUBMIT THE FOLLOWING LT CCM TO THE NATIONAL REGULATORY AUTHORITIES OF THE CORE CCR:~~

~~(p) General Provisions~~

~~(q)Subject, Matter~~allocation and ~~Scope~~

~~(r)~~(e) ~~The long-term common capacity calculation methodology as determined in this LT CCM is the common proposal of all Core Transmission System Operators (hereafter referred to as "Core TSOs")~~orderly price formation in accordance with Article ~~10 seq.~~3(e) of the FCA Regulation~~ and shall cover the BZBs of the Capacity Calculation Region Core (hereafter referred to as "the Core CCR" – as established by the determination of capacity calculation regions pursuant to article 15 of the CACM Regulation).~~;

(f) Requires the Core TSOs to provide market participants with reliable information on cross-zonal capacities for the forward allocation in a transparent and continuous way by publication of the validated results. This ~~LT CCM applies solely to the long-term capacity calculations~~includes regular reporting on specific processes within capacity calculation. As such, it ensures and enhances the transparency and reliability of information on forward capacity allocation in accordance with Article 3(f) of the FCA Regulation;

(g) Enables the allocation of long-term cross-zonal capacities and this provides long-term price signals and hedging and thus facilitates efficient investments in transmission, generation and consumption and contributes to the efficient long-term operation and development of the electricity transmission system and electricity sector in the Union in accordance with Article 3(g) of the FCA Regulation.

TITLE 1: GENERAL PROVISIONS

Article 1
Subject matter and scope

1. This LT CCM is the methodology pursuant to Article 10 of the FCA Regulation and applies to the bidding zone borders of the Core CCR.

~~1.~~2. This LT CCM applies to the long-term capacity calculation within the Core CCR and covers the ~~annual~~yearly and monthly long-term time frames pursuant to Article 9 of the FCA Regulation and in line with the regional design ~~for LTTR~~of the long-term transmission rights in the Core CCR. ~~Common capacity calculation methodologies within other capacity calculation regions or other timeframes are outside the scope of this proposal.~~

~~1. The methodology for splitting long-term capacity is out of scope of this LT CCM, but in the scope of the methodology pursuant to article 16 of the FCA Regulation.~~

3. This LT CCM applies to all TSOs and CCC within the Core CCR.

Article 2
Definitions ~~and Interpretation~~

1. For the ~~purposes~~purpose of the LT CCM, the ~~terms used shall have the meaning given to them~~definitions in Article 2 of the Electricity Regulation ~~(EC) 2019/943,~~, Article 2 of the FCA Regulation, Article 2 of the CACM Regulation as well as Article 2 of Regulation (EC) 2013/543 of 14 June 2013 on submission and publication of data in electricity markets, ~~article 2 of Regulation (EC) 2015/1222 establishing a guideline on Capacity Allocation and Congestion Management (hereafter referred to as the "CACM Regulation") and article 2 of the FCA Regulations~~shall apply.

2. In addition, the following ~~definitions,~~abbreviations shall apply. In the event of any inconsistency between the following abbreviations and ~~notations shall apply:~~the definitions pursuant to paragraph (1),[2] the latter shall prevail.

~~ACER~~	~~Agency for the Cooperation of Energy Regulators~~
~~AHC~~	~~Advanced Hybrid Coupling~~
~~AMR~~	~~Adjustment of Minimum RAM~~
~~BZBs~~	~~Bidding Zone Border standing also for set of BZBs~~
~~C~~	~~Contingency~~
~~CACM Regulation~~	~~Capacity Allocation and Congestion Management Regulation~~
~~CC~~	~~Capacity Calculation~~
~~CCC~~	~~Coordinated Capacity Calculator, as defined in article 2(11) of the CACM Regulation~~

[2] References to paragraphs are to be read as references to paragraphs within a given Article of Annex I, unless explicitly stated otherwise.

~~CCM~~	~~Capacity Calculation Methodology~~
~~CCR~~	~~Capacity Calculation Region, as defined in article 2(3) of the CACM Regulation~~
~~CHP~~	~~Combined Heat and Power plant~~
~~CGM~~	~~Common Grid Model, as defined in article 2(2) of the CACM Regulation~~
~~CGMM~~	~~Common Grid Model Methodology~~
~~CNE~~	~~Critical Network Element~~
~~CNEC~~	~~Critical Network Element and Contingency~~
~~eNTC~~	~~Coordinated Net Transfer Capacity~~
~~DA~~	~~Day-Ahead, as defined in article 2(34) of the CACM Regulation~~
~~DA CCM~~	~~Day-Ahead Capacity Calculation Methodology~~
~~EC~~	~~European Commission~~
~~EIC~~	~~Energy Identification Code~~
~~ENTSO-E~~	~~European Network of Transmission System Operators for Electricity~~
~~EU~~	~~European Union~~
~~FCA Regulation~~	~~Forward Capacity Allocation Regulation~~
~~FB~~	~~Flow Based~~
~~F_{max}~~	~~Maximum Admissible Power Flow~~
~~F_{ref}~~	~~Reference Flow~~
~~$F_{0, Core}$~~	~~Flow without commercial exchanges within Core CCR~~
~~FRM~~	~~Flow Reliability Margin~~
~~GSK~~	~~Generation Shift Key, as defined in article 2(12) of the CACM Regulation~~
~~HVDC~~	~~High-Voltage Direct Current~~
~~IGM~~	~~Individual Grid Model, as defined in article 2(1) of the CACM Regulation~~
~~I_{max}~~	~~Maximum Admissible Current~~
~~LT~~	~~Long-Term~~

~~LTCC~~	~~Long-Term Capacity Calculation~~
~~LT CCM~~	~~Common Coordinated Long-Term Capacity Calculation Methodology~~
~~kA~~	~~Kilo-Ampère~~
~~kV~~	~~Kilo-Volt~~
~~minRAM~~	~~Minimum Remaining Available Margin~~
~~MPTC~~	~~The Maximum Permanent Technical Capacity represents the maximum continuous active power an HVDC element is capable of transmitting, taking into account potential reduced availability due to planned outages of the interconnector asset. This parameter is defined by the interconnector's asset operators.~~
~~MTU~~	~~Market Time Unit~~
~~MW~~	~~Megawatt~~
~~NP~~	~~Net Position~~
~~NRA~~	~~National Regulatory Authority~~
~~NTC~~	~~Net Transfer Capacity~~
~~OPC~~	~~Outage Planning Coordination~~
~~OPDE~~	~~Operational Planning Data Environment, as defined in article 3(74) of the SO GL Regulation~~
~~PTDF~~	~~Power Transfer Distribution Factor~~
~~PST~~	~~Phase-Shifting Transformer~~
~~R_{amr}~~	~~Minimum RAM factor~~
~~RA~~	~~Remedial Action, as defined in article 2(13) of the CACM Regulation~~
~~RAM~~	~~Remaining Available Margin~~
~~RG CE~~	~~Regional Group Continental Europe~~
~~RM~~	~~Reliability Margin~~
~~SAP~~	~~Single Allocation Platform~~
~~SCED~~	~~Security Constrained Economic Dispatch~~
~~SCUC~~	~~Security Constrained Unit Commitment~~

(a) 'AC' means: Alternating Current;

(b) 'AHC' means: Advanced Hybrid Coupling;

(c) 'AMR' means: Adjustment of Minimum RAM;

(d) 'CC' means: Capacity Calculation;

(e) 'CCC' means: Coordinated Capacity Calculator, as defined in Article 2(11) of the CACM Regulation;

(f) 'CCM' means: Capacity Calculation Methodology;

(g) 'CCR' means: Capacity Calculation Region, as defined in Article 2(3) of the CACM Regulation;

(h) 'CGM' means: Common Grid Model, as defined in Article 2(2) of the CACM Regulation;

(i) 'CGMES' means: Common Grid Model Exchange Standard, developed by ENTSO-E pursuant to the CGMM;

(j) 'CGMM' means: Common Grid Model Methodology pursuant to Article 18 of the FCA Regulation;

(k) 'CNE' means: Critical Network Element;

(l) 'CNEC' means: Critical Network Element and Contingency;

(m) 'cNTC' means: coordinated Net Transmission Capacity;

(n) 'DA' means: Day-Ahead, as defined in Article 2(34) of the CACM Regulation;

(o) 'DA CCM' means: Day-Ahead Capacity Calculation Methodology approved under Article 20 of the CACM Regulation;

(p) 'DC' means: Direct Current

(q) 'EFB' means: Evolved Flow Based

(r) 'EIC' means: Energy Identification Code;

(s) 'ENTSO-E' means: European Network of Transmission System Operators for Electricity;

(t) 'FB' means: Flow Based;

(u) 'Fmax' means: Maximum Admissible Power Flow;

(v) 'Fref' means: Reference Flow;

(w) 'FRM' means: Flow Reliability Margin;

(x) 'F0,Core' means: Flow without commercial exchanges within Core CCR;

(y) 'GSK' means: Generation Shift Key, as defined in Article 2(12) of the CACM Regulation;

(z) 'HVDC' means: High-Voltage Direct Current;

(aa) 'IGM' means: Individual Grid Model, as defined in Article 2(1) of the CACM Regulation;

(bb) 'Imax' means: Maximum Admissible Current;

(cc) 'LF' means: Load Flow;

(dd) 'LT' means: Long-Term;

(ee) ‘LTCC’ means: Long-Term Capacity Calculation;

(ff) ‘LT CCM’ means: Long-Term Capacity Calculation Methodology;

(gg) ‘kA’ means: Kilo Ampère;

(hh) ‘kV’ means: Kilo Volt;

(ii) ‘minRAM’ means: Minimum Remaining Available Margin;

(jj) ‘MPTC’ means: Maximum Permanent Technical Capacity;

(kk) ‘MTU’ means: Market Time Unit;

(ll) ‘MW’ means: Megawatt;

(mm) ‘NP’ means: Net Position;

(nn) ‘NRA’ means: National Regulatory Authority;

(oo) ‘NTC’ means: Net Transfer Capacity;

(pp) ‘OPC’ means: Outage Planning Coordination;

(qq) ‘OPDE’ means: Operational Planning Data Environment, as defined in Article 3(74) of the SO Regulation;

(rr) ‘PST’ means: Phase-Shifting Transformer;

(ss) ‘PTDF’ means: Power Transfer Distribution Factor;

(tt) ‘RA’ means: Remedial Action, as defined in Article 2(13) of the CACM Regulation;

(uu) ‘RAM’ means: Remaining Available Margin;

(vv) ‘Ramr’ means: Minimum RAM factor;

(ww) ‘RM’ means: Reliability Margin;

(xx) ‘RCC’ means: Regional Coordination Centre;

(yy) ‘SAP’ means: Single Allocation Platform;

(zz) ‘SO’ means: System Operation;

(aaa) ‘SO Regulation’ means: Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation;

3. In this LT CCM, unless the context ~~requires~~clearly indicates otherwise:

   (a) the singular ~~indicates~~also includes the plural and vice versa;

   (b) headings are inserted for convenience only and do not affect the interpretation of this LT CCM; 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
Long-Term Capacity Calculation Process

1. The capacity calculation process for the long-term time ~~frame~~frames in the Core CCR shall apply the FB approach, pursuant to Article 10(1) of the FCA Regulation.

2. The year-ahead and month-ahead capacity calculation process shall consist of three main stages:

(a) the creation of capacity calculation inputs by the Core TSOs, in accordance with Title 2;[3]

(b) the capacity calculation process by the Core CCC, in accordance with Title 3; and

(c) the capacity validation by the Core TSOs in coordination with the Core CCC, in accordance with Title 4.

~~1. In accordance with article 24 of the FCA Regulation, each Core TSOs shall validate the results.~~

[3] References to Titles and/or Articles are to be read as references to Titles and/or Articles of Annex I, unless explicitly stated otherwise.

1. Treatment of Input

TITLE 2: CAPACITY CALCULATION INPUTS

Article 4
Reliability Margin Methodology

1. ~~The Core TSOs shall use the latest available Flow-~~The uncertainty associated with long-term capacity calculation shall be taken into account by the application of multiple scenarios i.e. CGMs pursuant to Article 10. The capacity calculation outputs obtained based on these CGMs shall represent the joint set of constraints to the long-term allocation pursuant to Article 12(6). For this reason, the flow reliability margin (FRM) for long-term capacity calculation shall correspond to the values from the DA ~~timeframe.~~time frame, according to paragraph 2.

~~1.~~2. For all CNECs, the Core TSOs shall use the latest available FRM from the DA time frame. The latest available FRMs are the yearly updated FRMs as defined per CNEC in ~~article 8(11) of~~ the Core DA CCM and in accordance with Article 22 of the CACM Regulation. They ~~are~~shall be applied for all yearly and monthly capacity calculations. In case the FRM considered in the DA CC have been updated between the yearly and the monthly capacity calculation, the latest FRM ~~is~~shall be considered in the subsequent monthly capacity calculation.

3. ~~As stated in article 8 of~~For the new CNEs coming into operation during the forthcoming long-term capacity calculation period, the initial FRM shall be equal to 10% of Fmax.

~~2.~~4. As provided in the Core DA CCM, the FRM is a ~~percentage~~portion of Fmax of a CNEC given in megawatts, which covers the uncertainties within capacity calculation.

~~1. Referring to Article 18(1)(2), Core TSOs shall regularly review the FRMs following Article 4(1)(2) and if needed change the FRMs for LT timeframe in order to ensure at least the consistency with their neighbouring CCRs and to ensure an adequate consideration of the uncertainties in the capacity calculation for the long-term timeframes.~~

5. ~~Methodologies~~The Core TSOs, with support of the Core CCC, shall review and update the methodology for reliability margin in accordance with Article 18(5).

Article 5
Methodology for Operational Security Limits

1. In accordance with Article 12 of the FCA Regulation, referring to Article 23 of the CACM Regulation, each Core ~~TSOs~~TSO shall respect in the LT ~~CCM~~CC the operational security limits ~~in line with article 72 of the SO GL Regulation.~~Critical Network Elements (CNEs). The operational security limits used in the LT CCM are the same as those used in the operational security analysis. In particular:

   (a) to take into account the thermal limits of ~~Critical Network Elements (~~CNEs~~),~~, the Core TSOs shall use the maximum admissible current limit (~~I_{max}~~Imax) which is the physical limit of a CNE according to the operational security limits in line with Article 25 of the SO ~~GL~~ Regulation. The maximum admissible current can be defined by:

      i. fixed limits for all ~~timestamps~~CGMs in the case of CNEs which are transformers ~~and~~or certain types of conductors which are not sensitive to ambient conditions;

      ii. fixed limits for all ~~timestamps~~CGMs of a specific season~~. Fixed limits are determined separately~~ for ~~each of the seasons.~~all other CNEs.

   (b) when applicable, ~~I_{max}~~Imax shall be defined as a temporary current limit of ~~the~~a CNE in accordance with Article 25 of the SO ~~GL~~ Regulation. A temporary current limit means that an overload is only allowed for a certain finite duration.

(c) ~~I_{max}~~Imax is not reduced by any security margin, as all uncertainties in the LT CCM are covered on each CNEC by the reliability margin in accordance with Article 4.

2. The Fmax value ~~F_{max}~~, expressed in MW, describes the maximum admissible active power flow on a CNE. ~~F_{max}~~Fmax is calculated by the Core CCC ~~from I_{max}~~on the basis of Imax by the given formula:

$$F_{max} = \sqrt{3} \cdot I_{max} \cdot U \cdot \text{~~cos(φ)~~} \cos \varphi \qquad (1)$$

~~where I_{max} is the maximum admissible current in kA of a CNE, U is a fixed reference voltage in kV for each CNE, and cos(φ) the power factor. Core CCC shall assume that the share of the CNE loading by reactive power is negligible (i.e. the angle φ = 0). Thus, factor cos φ equals 1, which means that the element is assumed to be loaded only by active power.~~

With:

Imax	maximum admissible current of a CNE, in kA
U	average voltage, expressed in kV, on two connecting nodes of a CNE resulting from AC load flow calculation with applied reactive power constraints; It shall not be lower than 95% of reference voltage of the CNE; $U = \max(U_{average}, 0.95 \cdot Uref)$ For transformers, voltages shall be normalised to the side of a transformer for which Imax is defined;
cos φ	average power factor on two connecting nodes of a CNE resulting from AC load flow calculation and shall not be lower than 0.95 $\cos \varphi = \max(\cos \varphi_{average}, 0.95)$

In case that either AC load flow without reactive power constraints or DC load flow have to be applied for a CGM as a fallback pursuant to Article 14, U [kV] shall be equal to reference voltage, and cos φ shall be equal to 1.

3. The Core TSOs shall aim towards determining the maximum admissible current using seasonal limits pursuant to ~~Article 5(1)(a)(ii). If a~~paragraph (1)(a)(ii). The Core ~~TSO uses the seasonal limits of Imax, this Core TSO has to~~TSOs shall insert this information into the list of CNECs where ~~I_{max}~~Imax of a CNE is defined.

~~1. For each CNEC the respective I_{max} and the respective F_{max} of the CNE is used.~~

4. The Core TSOs, with support of the Core CCC, shall review and update the values and methodology for operational security limits in accordance with Article 18~~(5)~~.

Article 6
Methodology for Allocation Constraints

1. In case operational security limits cannot be transformed efficiently into ~~I_{max}~~ Imax pursuant to Article 5, the Core TSOs may transform them into allocation constraints. For this purpose, the Core TSOs may only use external constraints as a specific type of allocation constraint that limits the maximum import and/or export of a given Core bidding zone.

2. For the implementation of the LT CCM,Borders with existing external constraints are applied by TenneT TSO B.V. and PSE during a transition period of two years followingat the day-ahead level may be also subject to the application of external constraints at the implementation of this LT CCM in accordance with Article 21(2),long-term level, but only as specified in Annex 1 to this LT CCM, explaining long as the reasons and external constraints at the methodology forlong-term level serve to accommodate the existing day-ahead external constraints.

3. The TSOs applying the long-term external constraints shall:

   a) update the calculation of external constraints. During the transition period for allocation constraints, the concerned Core TSOs shall calculate the value of external constraints on a yearly and monthly basis for all allocation periods (for PSE only) or at least on a quarterly basis; and publish

   a)b)provide to all Core TSOs and NRAs the detailed calculation and its results as described in Article 19 of the underlying analysis (this obligation is for TenneT TSO B.V. only).upon each update of the external constraints' values.

1. In case Core TSOs could not find and implement alternative solutions referred to in the previous paragraphs, they may, by eighteen months after the implementation of this LT CCM in accordance with Article 21(2), together with all other Core TSOs, submit to all Core NRAs a proposal for amendment of this LT CCM in accordance with article 4(12) of FCA Regulation. Such a proposal shall include the following:

1. the technical and legal justification for the need to continue using the external constraints or introducing external constraints indicating the underlying operational security limits and why they cannot be transformed efficiently into I_{max} and F_{max};
2. the methodology to calculate the value of external constraints including the frequency of recalculation.

In case such a proposal has been submitted by all Core TSOs, the transition period for allocation constraints referred to in paragraph 3 shall be extended until the decision on the proposal is taken by all Core NRAs.

2.4. A Core TSO may discontinue the use of an external constraintconstraints. The concerned Core TSO shall communicate this change to the other Core TSOs, to all Core NRAs, and to the market participants at least one month before discontinuation.

3.5. The Core TSOs, with support of the Core CCC, shall review and update the methodology for allocation constraints in accordance with Article 18.(5).

Article 7
Methodology for Critical Network Elements and Contingencies Selection

1. Each Core TSO shall provide a list of CNEs, including by default all cross zonal network elements and a list of associated contingencies (Cs) of its own control area based on operational experience to the Core CCC. The result of the process will be an initial pool of CNECs in all subsequent steps of the common Long-Term Capacity Calculation (LTCC).

1. Only those CNECs of the initial pool are considered by each Core TSO for the common LTCC that are marked by the Core CCC to be significantly influenced by the changes in bidding zone Net Positions (NPs) in accordance with article 23(2) of the FCA Regulation.

~~2. The CNECs shall have a maximum zone-to-zone PTDF higher than a common threshold of 5%. The CNECs of this category will be taken into account by the Core TSOs in all subsequent steps of the common capacity calculation and will determine the long-term capacity.~~

~~3. The list of CNEs and the associated Cs can be updated monthly by the respective Core TSOs and published in accordance with Article 19(2).~~

1. The Core TSOs shall use the latest available initial CNEC list from the DA time frame defined according to the Core DA CCM, for each subsequent long-term capacity calculation, as an initial list.

2. New network elements coming into operation during the subsequent time frame of yearly or monthly auctions, may be included in the initial CNEC list according to the principles set out in Article 5 of the Core DA CCM.

3. The Core TSOs, with support of the Core CCC, shall review and update the application of the methodology for determining CNECs in accordance with Article 18(5).

Article 8
Generation Shift Keys Methodology

1. In ~~accordance~~line with Article 13 of the FCA Regulation, the Core TSOs ~~developed the following methodology to~~shall determine ~~the~~ common Generation Shift ~~Key~~ Keys(GSK~~):~~) according to the following methodology:

   (a) each Core TSO shall define for its bidding zone and for each ~~timestamp~~CGM a GSK, which translates a Net Position (NP) change of a given bidding zone into estimated specific injection increases or decreases in the Common Grid Model (CGM). A GSK shall have fixed values, which means that the relative contribution of generation or load to the change in the bidding zone NP shall remain the same, regardless of the volume of the change;

   (b) the Core TSOs shall take into account the actual information on generation, load and/or ~~load~~other elements connected to the network, such as storage equipment, 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~~shall contribute to the GSK;

   (c) each Core TSO shall ~~aim to~~ apply a GSK that resembles the dispatch and the corresponding flow pattern~~, thereby contributing to minimizing~~ ;

      ~~1. the FRMs;~~

   ~~(c)~~(d) Core TSOs shall define a GSK for ~~the~~ each long-term calculation ~~period~~time frame. This GSK created by each Core TSO can be different for each ~~timestamp~~CGM or can be the same for all ~~timestamps;~~ CGMs of a calculation time frame; and

   ~~(d)~~(e) the Core TSOs belonging to the same bidding zone shall jointly define a common GSK for that bidding zone and shall agree on a methodology for such coordination. For Germany and Luxembourg, each TSO shall ~~calculate~~define its individual GSK and the Core CCC shall combine them into a single GSK for the whole German-Luxembourgian bidding zone, by assigning relative weights to each ~~Core TSO's~~country's GSK. The German and Luxembourgian TSOs shall agree on these weights, based on the share of ~~the~~ generation in each Core TSO's control area ~~that~~which is responsive to changes in NP, and provide them to the Core CCC.

2. ~~When the proposal for~~Not later than twelve months after implementation of the amendment related to further harmonization of the GSK methodology ~~as listed~~ , referred to in Article 9(6) of the Core DA CCM ~~is implemented, then no later than twelve months after~~, the Core TSOs shall ~~use this GSK methodology as a basis to~~ submit to ~~all~~the Core NRAs a proposal for amendment of this LT CCM in accordance with Article 4(12) of the FCA Regulation~~.~~ for which the Core TSOs shall use the DA GSK methodology as the basis. The proposal shall include at least ~~include~~:

   (a) the criteria and metrics for defining the efficiency and performance of GSKs and allowing for quantitative comparison of different GSKs; and

   (b) a harmonised GSK methodology combined with, where necessary, rules and criteria for TSOs to deviate from the harmonised GSK methodology.

~~Methodology for~~

Article 9
Application of Remedial Actions

~~2.~~ The Core TSOs shall not apply remedial actions in ~~Capacity Calculation~~

1. ~~Each Core TSO may define a set of available Remedial Actions (RAs), which is located in its control area. For transparency reasons, all~~ the Core ~~TSOs have to be informed about this set of RAs in advance~~LT CC.

~~1. Only the following RAs are considered:~~

~~1. opening or closing of one or more line(s), cable(s), transformer(s), bus bar coupler(s);~~

~~2. switching of one or more network element(s) from one bus bar to another;~~

~~3. transformer and Phase Shifting Transformer (PST) tap adjustment.~~

2. ~~During the implementation timeline as described in Article 21(2), all~~ The Core TSOs, with ~~the~~ support of the Core CCC ~~will define a common procedure to handle~~, shall review the ~~use of RAs defined~~approach to applying remedial actions in the LT CC in accordance with Article ~~9(1).~~ 18(5).

~~1. Scenarios and Calculation Timestamps~~

Article 10
Common Grid Models

~~1.~~ In accordance with Article 19 of the FCA Regulation, ~~referring to article 10(4)(a) of the FCA Regulation, all TSOs in the CCRs shall jointly develop a common set of scenarios to be used in the CGM~~the Core TSOs shall use the ENTSO-E CGMs for each LTCC time frame~~.~~

1. ~~In order to meet the above requirements, for each LTCC time frame the Core 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 Regulation in conjunction with article 65 of the SO GL Regulation. This Pan-European process is based~~, provided 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~~basis of the CGMM for FCA.

~~1. For the month-ahead capacity calculation timeframe, in case of a considerable change such as for example a change in generation pattern following untypical climate and hydrological conditions, compared to the~~

~~Individual Grid Model (IGM) for the ENTSO-E year-ahead reference scenario, in the grid of a Core TSO, this Core TSO shall update its IGM by incorporating the latest available information as regard to the generation pattern and topology (due to grid element commissioning or decommissioning), while the NP of the bidding zone is maintained unchanged when changing the generation pattern/topology. Therefore, the described updating process with the latest available data does not imply creation of a new scenario for the monthly timeframe and hence does not require approval process specified in article 3(5) of CGMM for FCA Regulation.~~

~~1. For each calculation timestamp the Core CCC shall implement the latest available outage plans on the (updated) ENTSO-E CGM by applying the relevant planned outages together with the associated topological switches related to a planned outage using the Outage Planning Coordination (OPC) database (foreseen to be replaced by the Operational Planning Data Environment (OPDE) in accordance with Title 7 of the SO GL Regulation), where all ENTSO-E RG CE TSOs' planned outages and the associated topological switches are stored and regularly updated pursuant to the articles 99 and 100 of the SO GL Regulation.~~

2. ~~Based on the database mentioned in the previous~~ For the needs of the Core LT CCM, the Core TSOs may establish a temporary procedure of building the CGMs suitable for the Core LT CCM, with respect to:

~~2. The~~ Providing the non-available yearly and monthly CGMs from paragraph ~~the selection of calculation timestamp is as follows:~~

~~1. two timestamps will be selected per~~ (1), or increasing the granularity of ~~the concerned period, one peak and one valley. This granularity is fixed in advance and is as following:~~

~~1.~~ CGMs from paragraph (1~~ month for the year-ahead timeframe;~~

~~2. 1 week for the month-ahead timeframe.~~

~~2. the selected~~), assuming additional calculation timestamps ~~are the ones with the biggest simultaneous amount~~on top of ~~planned relevant grid element outages within~~those defined in the CGMM. The Core ~~CCR.~~

~~3. Core TSO~~TSOs may ~~require to~~ include additional ~~planned outages to the~~calculation timestamps on top of those defined in CGMM, up to 24 calculation timestamps for yearly auctions (2 calculation ~~process if they are critical and not contained within the set of outages selected based on the Article 10(4)(5).~~

a) ~~The Core CCC shall generate, after each long-term~~timestamps a month) and up to 10 calculation~~, a reporting of the base case quality of the CGM for each~~ timestamps for monthly auctions (2 calculation ~~timestamp after the application of the planned outages pursuant Article 10(4) and Article 10(6). This report shall consist of and include at least the following CNECs per calculated timestamp:~~timestamps a week);

~~1. the overloaded CNE(C)s and its level of overload in base case before the application of Minimum Available Remaining Margin (minRAM), i.e. the negative RAM occurred pursuant Article 14 but before application of minRAM pursuant Article 14(4);~~

~~1.the pre-solved branches that were not subject to minRAM.~~

~~4. Following the report specified in Article 10(7), Core TSOs shall commonly take necessary actions in a timely manner to improve the base case quality.~~

5. This improvement of this base case may be achieved by adjusting among others the following settings in Article 10(9) (i-iv), based on a unanimous agreement among Core TSOs:
    1. the minRAM threshold pursuant to Article 14;
    2. the application of RA pursuant to Article 9;
    3. the sensitivity threshold pursuant to Article 13(3);
    4. the topological switches related to a planned outage pursuant Article 10(4).

    The aforementioned measures influence the size of FB domain without impact on NPs and therefore increase the available margin for trading.
6. Core CCC will report on base case quality of each calculated timestamp pursuant to Article 20(4)(5).

b) Application of outage topologies. The Core TSOs may adjust all applied CGMs, by applying the planned outages from the Outage Planning Coordination (OPC) database at reference timestamps.

3. The temporary procedure referred to in paragraph 2 shall be replaced by the first next CGMM amendment in that regard. As soon as the relevant amendment is implemented, the Core TSOs shall use the CGMs pursuant to the amended CGMM for FCA.

4. The Core TSOs, with support of the Core CCC, shall review and update the methodology for the usage of CGMs in the LT CC either in accordance with Article 18(5) or following the implementation of the CGMM amendment referred to in paragraph 3, whichever comes first.

Article 11
Integration of ~~Cross-Zonal~~ HVDC Interconnectors ~~Located within~~at the Core ~~CCR~~Bidding Zone Borders

1. The Core TSOs shall provide information on the capacity of their High-Voltage Direct Current (HVDC) interconnector located within the Core CCR ~~at~~in the long-term ~~timeframe~~time frame, the so-called maximum permanent technical capacity (MPTC).

2. ~~In order to calculate the~~ The calculation of impact of ~~the~~ cross-zonal exchange over ~~a~~an HVDC interconnector on the CNECs~~,~~ relies on the evolved flow-based (EFB) concept ~~is applied as a basis. Due to~~. Based on this concept, the converter stations of the cross-zonal HVDC shall be modelled as two virtual hubs~~,~~ which function equivalently as bidding zones. Then, the impact of an exchange between two real bidding zones A and B over such HVDC interconnector shall be expressed as an exchange from the bidding zone A to the virtual hub representing the sending end of the HVDC interconnector plus an exchange from the virtual hub representing the receiving end of the interconnector to the bidding zone B:

$$PTDF_{A\rightarrow B,l} = (PTDF_{A,l} - PTDF_{VH\_1,l}) + (PTDF_{VH\_2,l} - PTDF_{B,l}) \quad (2)$$

With:

$PTDF_{VH\_1,l}$ zone-to-slack $PTDF$ of Virtual hub 1 on a CNEC l, with virtual hub 1 representing the converter station at the sending end of the HVDC interconnector located in bidding zone A

$PTDF_{VH\_2,l}$ zone-to-slack $PTDF$ of Virtual hub 2 on a CNEC l, with virtual hub 2 representing the converter station at the receiving end of the HVDC interconnector located in bidding zone B

3. The PTDFs for the two virtual hubs $PTDF_{VH\_1,l}$ and $PTDF_{VH\_2,l}$ are calculated for each CNEC considered during the calculation and they are added as two additional columns (representing two additional virtual bidding zones) to the existing PTDF matrix, one for each virtual hub.

~~1. In case of a planned outage of the respective HVDC interconnector, the MPTC will be set to zero.~~

~~2. Description of the Capacity Calculation Process~~

4. The exchange over the respective HVDC shall be limited to the value of its MPTC, which represents the maximum continuous active power an HVDC element is capable of transmitting, taking into account potential reduced availability due to planned outages of the interconnector asset. This parameter is defined by the interconnector's asset operators. In case of a planned outage of the HVDC interconnector, the MPTC shall be set to zero.

TITLE 3: CAPACITY CALCULATION PROCESS

Article 12
Description of the CC inputs and outputs

1. For each calculation ~~timestamp~~time frame and CGM, the Core TSOs shall provide the Core CCC with the following inputs:

   (a) GSKs in accordance with ~~Article 8;~~Article 8;

   (b) ~~MPTC~~MPTCs of ~~HVDC~~HVDCs inside the Core CCR in accordance with Article 11;

   (c) ~~CNEs and C(s)~~CNECs in accordance with ~~Article 7;~~Article 7;

   (d) Reliability margin in accordance with ~~Article 4;~~Article 4;

   (e) ~~*Imax*~~Imax per CNE in accordance with ~~Article 5(~~Article 5(1)(a);

~~1. RAs in accordance with Article 9;~~

   (f) ~~allocation~~External constraints in accordance with ~~Article 6.~~Article 6; and

   (g) OPC data in accordance with Article 10.

2. For each calculation ~~timestamp~~time frame, the Core CCC shall provide the following inputs:

   (a) CGMs for each ~~selected timestamp and the outage planning from OPC~~ calculation time frame in accordance with ~~Article 10;~~Article 10;

   (b) for monthly auctions, the already allocated capacities (AAC) from the Single Allocation Platform (SAP) operator of ~~previous timeframes;~~the preceding yearly auction and the portion of AAC returned before the monthly auction; and

   (c) the ~~F_{max}~~Fmax per CNE pursuant to Article 5(~~1)(d~~2).

~~1.~~ For each calculation ~~timestamp~~time frame, the Core CCC shall use the ~~following calculation parameters:~~

3. ~~the minRAM~~R_{amr} threshold for the adjustment of the minimum Remaining Available Margin (minRAM) pursuant to Article 14~~;~~.

   ~~1. the sensitivity threshold pursuant to Article 13(3).~~

4. When providing the capacity calculation inputs pursuant to ~~Article 12(~~paragraph (1), the Core TSOs shall respect the formats commonly agreed between the Core TSOs and the Core CCC while fulfilling the requirements and guidance ~~defined~~provided in the CGMM ~~developed in accordance with Section 2~~pursuant to Article 18 of the FCA Regulation.

5. ~~For each~~The capacity calculation ~~timestamp~~ process shall be performed by the Core CCC and shall provide the ~~FB~~calculated flow-based parameters, ~~RAM and PTDFs~~ computed in accordance with Article 13 and Article 14 respectively, ~~for TSOs~~subject to the Core TSOs' validation in accordance with Article 17.

6. As the capacity calculation outputs, the calculated flow-based parameters shall be provided by the Core CCC in the following form:

   a) the CNECs with calculated Remaining Available Margin (RAM) and PTDFs from all CGMs (scenarios) of a calculation period (yearly or monthly), as a union of constraints, before removing redundant CNECs; and

b) the non-redundant CNECs from point a) remaining after removing the redundant CNECs. This non-redundant set of CNECs with associated RAM and PTDFs shall be provided to the long-term capacity auction operator (SAP) as a union of constraints for each related auction.

Article 13
Computation of Power Transfer Distribution Factors

1. For each calculation ~~timestamp~~time frame using the associated CGM, CNECs and GSKs, the Core CCC shall calculate for each CNEC its PTDFs for each Core ~~BZB~~bidding zone representing the influence of a variation of a commercial exchange between bidding zones on a CNEC. The calculation process is mathematically described below. Firstly, zone-to-slack PTDFs shall be derived as follows:

$$\mathbf{PTDF}_{\text{zone-to-slack}} = \mathbf{PTDF}_{\text{node-to-slack}} * \mathbf{GSK}_{\text{node-to-zone}} \quad (3)$$

With:

~~$\mathbf{PTDF}_{zone-to-slack}$ matrix of zone-to-slack $PTDFs$ (columns: bidding zones; rows: CNECs)~~

~~$\mathbf{PTDF}_{node-to-slack}$ matrix of node-to-slack $PTDFs$ (columns: nodes; rows: CNECs)~~

~~$\mathbf{GSK}_{node-to-zone}$ matrix containing the $GSKs$ of all bidding zones (columns: bidding zones; rows: nodes; sum of each column equal to one).~~

$\mathbf{PTDF}_{\text{zone-to-slack}}$	matrix of zone-to-slack PTDFs (columns: bidding zones; rows: CNECs)
$\mathbf{PTDF}_{\text{node-to-slack}}$	matrix of node-to-slack PTDFs (columns: nodes; rows: CNECs)
$\mathbf{GSK}_{\text{node-to-zone}}$	matrix containing the GSKs of all bidding zones (columns: bidding zones; rows: nodes; sum of each column equal to one)

2. The slack node shall be the same node across all CGMs of a capacity calculation time frame.

~~2.~~3. The zone-to-slack ~~$PTDFs$~~PTDFs as calculated above can also be expressed as zone-to-zone ~~$PTDFs$~~PTDFs. A zone-to-slack $PTDF_{A,l}$ represents the influence of a variation of a NP of bidding zone ~~A~~A on a CNEC ~~l~~l and assumes a commercial exchange between a bidding zone and a slack node. A zone-to-zone $PTDF_{A\rightarrow B,l}$ represents the influence of a variation of a commercial exchange from bidding zone A to bidding zone B on CNEC ~~l~~l. The zone-to-zone $PTDF_{A\rightarrow B,l}$ can be derived from the zone-to-slack ~~$PTDFs$~~PTDFs as follows:

$$PTDF_{A\rightarrow B,l} = PTDF_{A,l} - PTDF_{B,l} \quad (4)$$

4. The maximum zone-to-zone $PTDF$ of a CNEC ($PTDF_{z2zmax,l}$) is the maximum influence that any Core exchange has on a respective CNEC, including exchanges over HVDC interconnectors which are integrated pursuant to Article 11.

$$PTDF_{z2zmax,l} = max\left(\max_{A\in BZ}(PTDF_{A,l}) - \min_{A\in BZ}(PTDF_{A,l}), \max_{B\in HVDC}(PTDF_{B,l})\right) \quad (5)$$

With:

$\mathbf{PTDF_{A,l}}$	zone-to-slack $PTDF$ of bidding zone A on a CNEC l
HVDC	set of HVDC interconnectors integrated pursuant to Article 11
BZ	set of all Core bidding zones
$\max_{A\in BZ}(\text{PTDF}_{A,l})$	maximum zone-to-slack PTDF of Core bidding zones on a CNEC l
$\min_{A\in BZ}(\text{PTDF}_{A,l})$	minimum zone-to-slack PTDF of Core bidding zones on a CNEC l

Article 14
Computation of Remaining Available Margin

1. The Core CCC shall use the initial list of CNECs determined pursuant to Article 7, and, by using the CGMs pursuant to Article 10, shall remove those CNECs for which the maximum zone-to-zone Power Transfer Distribution Factor (PTDF) is not higher than 5%. The remaining CNECs shall constitute the final list of CNECs for the actual long-term capacity calculation.

~~1.~~2. Using zone-to-~~zone~~hub PTDFs, the Core CCC shall determine the flow on a CNEC in the situation without commercial exchanges within the Core CCR as follows:

$$\vec{F}_{0,Core} = \vec{F}_{ref} - \mathbf{PTDF_{f}}\ \overrightarrow{Exchanges_{ref,Core}}\mathbf{PTDF_{z2h}}\ \overrightarrow{NP}_{ref,Core} \quad (6)$$

with:

$\vec{F}_{0,Core}$	flow per CNEC in the situation without commercial exchanges within the Core CCR
$\vec{F}_{ref}$	flow per CNEC ~~in the CGM with commercial exchanges~~ obtained ~~using DC load flow for the calculation timestamp~~with the CGM
$\mathbf{PTDF_{f}}\mathbf{PTDF_{z2h}}$	zone-to-~~zone~~-hub power transfer distribution factor matrix for CNECs of the Core CCR
$\overrightarrow{Exchanges_{ref,Core}}\overrightarrow{NP}_{ref,Core}$	The net positions of Core bidding zones calculated from the commercial cross-border exchanges ~~between~~among the Core bidding zones as ~~mentioned~~provided in the reference program associated with the CGMs of the ENTSO-E scenarios

~~2. The Core CCC may apply the common threshold~~The load flow solution for ~~minimum sensitivity of CNECs using the following formula:~~

~~3. If $PTDF_{A\rightarrow B,t} \leq threshold$, then the $PTDF_{A\rightarrow B,t}$ is set to zero before starting the~~ the F_{ref} calculation ~~process.~~

5. Computation of the available margins on critical network elements

6.3. Following the PTDFs' computation of Article 13, the Core CCC shall compute the RAM based on CNEC maximum admissible power flow in accordance with Article 5 at Core zero-balance situation. The uncertainties of flows by using an FRM in accordance with Article 4 should be taken into account. The RAM calculation is mathematically describedbe as follows:

a) $RAM_t^+ = Fmax_t - FRM_t^+ - \vec{F}_{0,Core}$ (6)

a) $RAM_t^- = Fmax_t - FRM_t^- + \vec{F}_{0,Core}$ AC load flow solution with respecting reactive power limits of modelled generation for base (n-0) topology and for contingency topologies, by default;

b) In case of divergence of solution under a) for certain contingency topologies, the AC load flow solution without respecting reactive power limits of modelled generation shall be used for such topologies, as a first fallback;

c) In case of divergence of both solutions under a) and b) for certain contingency topologies, DC load flow shall be used for such topologies as a second fallback, with the active power losses as obtained at the AC load flow of the base (n-0) topology, assigned to the active power-sending node of each branch of the CGM;

d) In case of divergence of AC load flow for the base (n-0) topology, the lossless DC load flow shall be applied as a last resort solution. An imbalance from the expected NP of each modelled area caused by the lack of losses shall be assigned to all area's load nodes in proportion to the amount of a particular load.

4. The flows resulting from previously allocated cross-zonal capacities within the Core CCR in accordance with Article 29(7)(c) of the CACM Regulation:

a) for yearly capacity calculation, they shall be equal to zero for all CNECs;

b) for monthly capacity calculation, they shall be calculated for each CNEC by multiplying the volumes of previously allocated cross-zonal capacities at yearly Core flow-based auctions reduced by the returned AACs, with the positive zone-to-zone $PTDFs$, as follows:

$$\vec{F}_{AAC} = \mathbf{pPTDF_{z2z}} \cdot \overrightarrow{AAC} \quad (7)$$

with:

$RAM_t^+ and FRM_t^+$ RAM and FRM of CNEC l in one direction of monitoring (direction is defined by TSO)

$RAM_t^- and FRM_t^-$ RAM and FRM of CNEC l in direction of monitoring opposite to the previous direction (direction is defined by TSO).

To calculate the minRAM in accordance with Article 14(4), the minRAM factor (R_{amr}) is defined as 20% and will be subject to a review by

$\vec{F}_{AAC}$ flows resulting from previously allocated cross-zonal capacities in Core CCR

$\mathbf{pPTDF_{z2z}}$ positive zone-to-zone power transfer distribution factor matrix

$\overrightarrow{AAC}$ already allocated capacities on Core bidding zone borders

1. All Core TSOs 2 years after the LT CCM go live.

1. The Core CCC shall check ifensure that the RAM for each CNEC determining the cross-zonal capacity is not below the defined minRAM.

2. In case the RAM determined according to Article 14(1) is below the minRAM, the Core CCC shall increase the RAM according to the following process:

The main objective of the minRAM is to ensure that at least a specificis equal or higher than a given percentage of F_{max},Fmax of a minRAM factor (R_{amr})given CNEC of as definedspecified in Article 14(4)(c), of F_{max} is reserved forparagraph 5. For this purpose, the commercial exchanges. Therefore,Core TSOs shall calculate the following equation needs to apply for each CNEC $t$adjustment of minimum RAM:

$$RAM_t \geq R_{amr} * F_{max_t}$$

$$AMR = \max\left(R_{amr} \cdot F_{max} - \left(F_{max} - FRM - F_{0,Core} - F_{AAC}\right), 0\right) \quad (8)$$

1. The Adjustment of Minimum RAM (AMR) aims to ensure that the previous inequality is always fulfilled; therefore, AMR is added as follows:

$$RAM_t + AMR = R_{amr} * F_{max_t}$$

with:

AMR	adjustment of minimum RAM
R_{amr}	percentage of F_{max} for adjustment of minimum RAM

5. Each Core TSO shall define the minimum percentage of Fmax for RAM for its own CNECs. This value shall be at least 20% of Fmax for the yearly time frame and 10% of Fmax for the monthly time frame. If, during the experimentation, before the implementation of this LT CCM, the Core TSOs experience that the experimentation and its analysis do not reveal network security risks, they shall increase these values pursuant to the decision-making process referred to in Article 19 in order to better achieve the objectives of the FCA Regulation, with upper limits of minimum RAM of 40% of Fmax for the yearly time frame and 20% of the Fmax for the monthly time frame. Before doing so, the Core TSOs shall provide a comprehensive analysis consistent with the objectives listed in Article 3 of the FCA Regulation, and consult the modified minimum RAM with the Core regulatory authorities and stakeholders.

6. Finally, the RAM before validation shall be calculated according to the following equation:

$$\overrightarrow{RAM}_{bv} = \vec{F}_{max} - \overrightarrow{FRM} - \vec{F}_{0,Core} + \overrightarrow{AMR} - F_{AAC} \quad (9)$$

2. The AMR for a CNEC is determined with the following equation:

$$AMR = \max\left(R_{amr} * F_{max_t} - \left(F_{max_t} - FRM - F_{0,Core}\right), 0\right) \quad (10)$$

3. Finally, the RAM will be adjusted due to the following equation:

$$RAM_t = F_{max_t} - FRM - F_{0,Core} + AMR \qquad (11)$$

Article 15
Consideration of Non-Core CCR Bidding Zone Borders

1. Where CNEs within the Core CCR are impacted by electricity exchanges outside the Core CCR, the Core TSOs shall take this impact into account.

2. The Core TSOs shall consider the electricity exchanges ~~on BZBs~~with and among the bidding zones outside the Core CCR as fixed input to the LT CCM, as ~~prepared~~provided in the common set of ENTSO-E ~~year ahead~~yearly and monthly reference scenarios, with unchanged NPs. These electricity exchanges, defined as best forecasts of NPs and flows in the LTCC ~~models~~CGMs, are defined and agreed based on the CGMM ~~as~~ developed in accordance with Article 18 of the FCA Regulation, and ~~are~~ incorporated in the ~~CGM. Uncertainties related to the electricity exchanges forecasts are implicitly considered within the FRM.~~CGMs.

3. Treatment of non-Core ~~CCR BZBs with adjacent CCRs~~bidding zone borders in the LT CCM ~~will~~shall be studied by the Core TSOs in order to take into account ~~non-Core CCR~~their influence in the most efficient and accurate manner, and to heed Article 21(1)(b)(vii) of the CACM Regulation. The Core TSOs ~~will~~shall start to study solutions for considering influence of non-Core CCR ~~BZBs~~bidding zone borders immediately ~~after~~upon the implementation of Advanced Hybrid Coupling (AHC) in the Core DA CCM~~.~~, and shall provide a report with the proposal for the improvements of treatment of non-Core exchanges in the LT CCM within 12 months after AHC implementation in Core DA CCM.

Article 16
Fallback ~~Procedures~~Procedure

1. Taking into account the requirements stipulated in Article 10(7) of the FCA ~~Regulation, and referring to article 21(3) of the CACM~~ Regulation, in the event that a LTCC process is unable to produce results, a fallback procedure shall be applied.

2. In case the initial capacity calculation does not lead to any results, the Core CCC shall try to solve the problem and perform the LTCC again within a new time frame, jointly agreed ~~timeframe to make such calculation.~~ with the Core TSOs.

3. ~~If~~In accordance with Article 42 of the FCA Regulation, in the event that the Core CCC is ~~not able~~unable to produce results, the default fallback procedure shall be the postponement of the forward capacity allocation and a reasonable deadline shall be agreed by the Core TSOs and the Core CCC to retry the calculation.

4. In case the postponement of the forward capacity allocation is not possible, or the new deadline has been reached and the results are still not available, the Core CCC shall deliver the following fallback long-term FB parameters to the SAP ~~within the new timeframe in accordance with Article 19(2), Core TSOs shall bilaterally agree on NTC values~~:

    a) For the yearly capacity calculation, the FB parameters calculated for the ~~relevant~~equivalent CGMs of the previous year shall be used as a basis;

    b) For the monthly capacity calculation, the FB parameters calculated for the corresponding time ~~frame(s).~~horizon at the preceding yearly auction shall be used as a basis;

~~3.~~5. The fallback FB parameters under paragraph (4) shall be commonly validated by the Core TSOs ~~shall commonly coordinate and validate these bilaterally agreed NTC values.~~ and the Core CCC.

~~The Core CCC shall send the NTC values following~~

TITLE 4: VALIDATION PROCESS

~~1.~~ Article ~~19(3) to the SAP.~~

~~2. Validation process~~

17
Validation Methodology

1. In accordance with Article 15 and Article 24 of the FCA Regulation, referring to Article 26 of the CACM Regulation, the Core TSOs shall have the right to correct long-term capacity relevant to ~~the Core TSO's BZBs~~their bidding zone borders for reasons of operational security during the validation process. ~~In exceptional~~The individual validation adjustments may be done by a Core TSO only in the following situations ~~long-term capacities can be reduced by all Core TSOs. These potential situations are at least~~:

   ~~(a) an occurrence of an exceptional contingency or forced outage as defined in article 3 of the SO GL Regulation;~~

   ~~(a) when RAs, pursuant to Article 9, that are needed to ensure the calculated capacity on all CNECs, are not sufficient;~~

   ~~(b)~~(d) a mistake in the input data~~, that leads to an overestimation~~ has occurred, resulting in a wrong estimation of long-term capacity from an operational security perspective~~, occurred~~;

   ~~(c)~~(e) there is a potential need to ~~cover reactive power flows~~reconsider voltage or cosφ on certain CNECs~~.~~; or

   ~~(d)~~(f) the ~~validation process refers to the outcomes~~TSO requiring an adjustment provides justification that the calculated level of ~~the long-term~~a RAM is unable to ensure operational security, which cannot be modelled via the input data for the capacity calculation process ~~within the Core CCR. The validation process is composed of two parts and explained in more detail in Article 17(3)(4):~~.

   ~~1. individual~~This verification ~~of the calculated capacities for each calculated timestamp after the change of input parameters in accordance with Article 17(3);~~

   ~~1. coordinated validation of the final capacities.~~

2. ~~The Core TSOs~~ shall ~~analyse individually whether the calculated capacity could violate operational security limits, and whether they have sufficient measures to avoid such violations. The verification is~~ be performed as follows:

   (a) in case of a required reduction due to situations ~~as~~ defined in ~~Article 17~~paragraph (1~~)(a),~~), points (b) and (~~d~~c), a Core TSO may ~~correct its initial FRM in accordance with Article 4; or~~ decrease RAM~~, even below the minRAM threshold in accordance with Article 14(2) if necessary,~~ for its own CNECs, even below the minimum RAM specified in Article 14(5), if necessary;

   ~~(b)~~ in case of a situation as defined in ~~Article 17~~paragraph (1~~)~~(), point (a), each Core ~~TSOs using external constraints~~TSO or the Core CCC may ~~also request to adapt the external constraints to reduce the capacity for its BZBs;~~

   ~~(c) in case of a situation as defined in Article 17(1)(c), Core TSOs may also request~~ request a common decision by all Core TSOs to calculate capacities with the correct input data.

   ~~(d)~~(b) ~~When the process of individual verification of the calculated capacities is completed~~ If the TSOs find errors in cross-zonal capacity provided for validation, the relevant TSOs shall provide updated capacity calculation inputs to the Core CCC for recalculation of cross-zonal capacities. The Core CCC shall repeat calculation with updated capacity calculation inputs

and send the recalculated cross zonal capacity values again for validation. Recalculations shall be executed until the critical process end time. If there is still no result by this time, then the ~~final capacity validation process takes place in a coordinated way, whereby Core TSOs may require a reduction in calculated capacities for reasons of operational security~~fallback process shall be triggered.

3. Pursuant to Article 26(5) of the CACM Regulation, every three months, the Core CCC shall report all reductions made during the validation of cross-zonal capacity to all Core NRAs, including the location, amount and reasons for the reductions.

4. Every year, the Core CCC shall provide the annual report with all the information on the reductions of cross-zonal capacity, as communicated to the CCC by the Core TSOs. The report shall include at least the following information for each CNEC of the pre-solved domain affected by a reduction and for each DA CC MTU:

a) the identification of the CNEC;

b) volume of change of RAM value;

c) the reason(s) for reduction, and the operational security limit(s) that would have been violated without reduction, and under which circumstances they would have been violated;

d) statistics on the estimated loss of economic surplus of applied validation reductions; and

e) general measures to avoid validation reductions in the future.

5. Pursuant to Article 24(5) of the FCA Regulation, upon request of the Core NRAs, the Core TSOs shall provide a report detailing how the value of long-term cross-zonal capacity for a specific long-term capacity calculation time frame has been obtained.

6. The Core TSOs, with support of the Core CCC, shall review and update the validation methodology in the LT CC, also assessing the need for coordinated validation, in accordance with Article 18(5).

TITLE 5: UPDATES

Article 18
Review 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~~the Core 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. Should the operational security limits, CNEs, ~~C~~scontingencies and import/export limits used for the common capacity calculation need to be updated based on this review, the Core TSOs shall publish the changes simultaneously with the update and publication ~~as mentioned in article 24~~requirements of the Core DA CCM.

2. In case the review proves the need of an update of the reliability margins, the Core TSOs shall publish the updated values of the reliability margin at least one month before their implementation.

~~1. The review of the methodology for allocation constraints by the Core TSOs shall take place before the start of each LT capacity calculation timeframe.~~

~~2. The review by the Core TSOs of the set of RAs taken into account in capacity calculation, in accordance with Article 9 shall include at least an evaluation of the efficiency of the RAs applied.~~

3. In case the review proves the need for updating the application of the methodologies for determining GSKs, CNEs, and ~~C~~scontingencies referred to in Articles 12 and 13 of the FCA Regulation, referring respectively to ~~the~~ Articles 23 to 24 of the CACM Regulation, Article 4(12) of the FCA Regulation applies. After approval by the Core NRAs, the Core TSOs shall publish changes made in the methodologies at least three months before their implementation.

4. Any changes of parameters listed in ~~article 27(4) of the CACM Regulation~~paragraphs (1), (2) and (3) have to be communicated to market participants, ACER and the Core NRAs.

5. ~~The impacts of any changes of parameters listed in article 27(4)(d) of~~ Within eighteen months after the ~~CACM Regulation~~go-live of the Core LT CCM in accordance with Article 22, all Core TSOs, with support of the Core CCC, shall review the methodology and ~~of import/export limits have~~, if relevant, submit by the same deadline to ~~be communicated to market participants, ACER and~~ all Core NRAs ~~. If any change leads to an adaption of the methodology, the Core TSOs shall make~~ a proposal for its amendment ~~of this methodology according to~~in accordance with Article 4(12) of the FCA Regulation ~~and submit it~~, and in particular, in the following areas if improvements are possible:

   a) Reliability margin, pursuant to Article 4;

   b) Operational security limits, pursuant to Article 5;

   c) Allocation constraints, pursuant to Article 6;

   d) Critical network elements with contingencies, pursuant to Article 7;

   e) Remedial actions, pursuant to Article 9;

   f) CGMs, pursuant to Article 10;

   g) Remaining Available Margin, including the minimum RAM approach, pursuant to Article 14;

   h) Fallback procedure pursuant to Article 16; and

   i) Validation methodology pursuant to Article 17.

5.6. As defined in Article 8(2), the deadline for approvalthe amendment of GSK methodology is connected to its application in the Core NRAs.DA CCM.

3. In case the following calculation parameters under paragraph 5 are subject to change, the Core TSOs willshall publish and implement the updated calculation parameters after approval by the Core NRAs:

1. minRAM factor according to Article 14(2);

2. PTDF threshold according to Article 7(3).

6.7. Core TSOs shall publish updated set of calculation parameters, not later than three months before their application.

~~3. Report~~

8. The Core TSOs shall assure that CGMES shall be applied in the long-term capacity calculation not later than 12 months after its application in the Core DA CCM.

TITLE 6: GOVERNANCE

Article 19
Rules Concerning Governance and Decision Making Among the Core TSOs

1. All Core TSOs shall cooperate for the implementation and operation of this LT CCM. This cooperation shall be carried out through common bodies where each TSO shall have at least one representative. The members of the common bodies shall aim to make unanimous decisions. Where unanimity cannot be reached, qualified majority voting based on the voting principles established in accordance with Article 4(3) of the FCA Regulation shall apply.
2. For the purpose of paragraph 1, all Core TSOs shall establish at least a steering committee consisting of one representative from each Core TSO. The steering committee shall make binding decisions on any matter or question related to the implementation and operation of this LT CCM. The steering committee shall adopt rules governing its operation.
3. The steering committee shall also act as a body for settlement of disputes among the Core TSOs regarding the implementation and operation of this LT CCM. The steering committee shall solve the problems and disputes regarding, but not limited to, the following issues:
    (a) resolution of disputes on the interpretation of aspects of this LT CCM, which may not be clear;
    (b) resolution of disputes on design choices required for implementation and operation of this LT CCM, which are not defined in this methodology; and
    (c) resolution of possible disputes in the implementation and operation of this LT CCM, including the disputes related to the provisions governing the day-to-day operation, but excluding the day-to-day operation itself.
4. The decisions adopted by the common bodies and the steering committee is without prejudice to any regulatory decision adopted by the competent NRAs.

TITLE 7: REPORTING

Article 20
Publication of Data

~~1. The data as set forth in Article 19(2) shall be published regularly by the Core CCC on a dedicated online communication platform representing all Core TSOs. To enable market participants to have a clear understanding of the published data, the handbook that has been prepared and published by Core TSOs on this communication platform in the framework of article 25(1) of the DA CCM, shall be extended with the information related to the LTCC, using the same format and data platform.~~

1. In accordance with Article 3(f) of the FCA Regulation, the Core CCC shall publish at least the following data items ~~shall be published after each LTCC by the Core CCC~~ , in addition to the data items ~~and definitions of~~set out in Commission Regulation (EU) No 543/2013 on submission and publication of data in electricity markets:

   (a) ~~CNECs~~CNECs' names;

   ~~(b) CNECs EIC codes;~~

   (b) CNECs' Energy Identification Codes (EIC);

   (c) indication if a CNEC is redundant or not, including the information on a CGM;

   (d) GSK relative weights among the TSOs belonging to the same bidding zone;

   ~~(c)~~(e) detailed breakdown of the final FB parameters per CNEC: ~~RAM,~~ Imax, U, cosφ, Fmax, Fref, ~~$F_{0,Core}$, respective reliability margin~~F(0,Core), FRM, F_{AAC}, RAM, minRAM application, zone-to-~~slack~~zone PTDFs;

   ~~(d) allocation constraints;~~

   (f) ~~NTC values~~external constraints including their calculation details (reasoning, methodology and results) in accordance with Article 6;

   ~~(e)~~(g) flow-based parameters applied in case of activation of the fallback procedure in accordance with Article 16(3~~).~~);

   (h) maximum non-simultaneous bilateral exchanges on Core bidding zone borders, pursuant to Article 20(9) of the CACM Regulation;

   (i) forecast information contained in the CGM:

      i. vertical load for each Core bidding zone and each TSO;

      ii. production for each Core bidding zone and each TSO;

      iii. reference net positions of all bidding zones in the synchronous area of Continental Europe and reference exchanges for all HVDC interconnectors within the synchronous area of Continental Europe and between the synchronous area of Continental Europe and other synchronous areas; and

   (j) information about the capacity validation, as provided in Article 17.

2. The Core CCC shall publish the data items listed in paragraph 1 on a monthly basis, after each LTCC, on a dedicated online communication platform representing all Core TSOs. To facilitate the readability of the published data, the Core TSOs shall include the information related to the LTCC in the handbook which is published on the communication platform in the framework of the DA CCM, using the same data format.

~~2.~~3. Any change in the identifiers ~~used~~listed in ~~paragraphs 2~~paragraph 1, point (a) and ~~2~~point (b~~) of Article 19~~), shall be publicly notified at least one month before its entry into force.

~~3.~~4. ~~An individual~~Any Core TSO may withhold the information referred to in paragraph ~~2~~1, point (a) and ~~2~~point (b~~) of Article 19~~ if it is classified as sensitive critical infrastructure protection related information in ~~their~~its Member ~~States~~State 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 referred to in paragraph ~~2~~1, point (a) and ~~2~~point (b~~) of Article 19~~), shall be replaced with an anonymous identifier which shall be ~~stable~~the same for each CNEC across all ~~LTCC timeframes.~~LT CC time frames. The anonymous identifier shall also be used in ~~the other~~all TSO communications related to the CNEC and when communicating about an outage or an investment in infrastructure. The ~~information~~ Core TSOs shall publish the communication about which information has been withheld pursuant to this paragraph ~~shall be published~~, on the communication platform referred to in ~~Article 19(1).~~paragraph 2.

~~4.~~5. The Core NRAs may request additional information to be published by the Core TSOs. For this purpose, all Core NRAs shall coordinate their requests among themselves and consult it with the Core TSOs, ACER and all the relevant stakeholders ~~and ACER. Each~~. Any Core TSO may ~~decide not~~refuse to publish ~~the~~any additional information~~,~~ which ~~was~~has not been requested by its competent NRA.

Article 21
Monitoring and ~~Information~~Reporting to the National Regulatory Authorities

1. The Core TSOs shall provide ~~to Core NRAs~~ data on LTCC to the Core NRAs for the purpose of monitoring its compliance with this methodology and ~~other~~the relevant legislation. The reporting framework shall be developed by the Core TSOs in coordination with the Core NRAs, and reviewed and updated ~~and improved when needed~~as required.

2. The data provided to the Core NRAs shall at least~~,~~ include the information on non-anonymized names of CNECs as referred to in Article ~~19(2)~~(20(1), point (a)~~(~~) and point (b~~) shall be provided to Core NRAs~~):

    a) on a yearly basis for each CNEC after the yearly calculations; and

    b) on a monthly basis for each CNEC after each monthly calculation.

    This information shall be in a format that allows easily to combine the CNEC names with the information published in accordance with Article ~~19(2~~20(1).

~~2.~~3. The Core NRAs may request additional information ~~to be provided by~~ from the Core TSOs. For this purpose, the Core NRAs shall coordinate their requests and forward ~~the~~a single, coordinated request to the Core TSOs. Individual information requests of NRAs, not coordinated ~~requests of one NRA~~with the other Core NRAs, are ~~not in~~beyond the scope of this methodology, and shall be dealt with on a national level.

~~3.~~4. The Core CCC, with ~~the~~ support and after approval of the Core TSOs ~~where relevant~~, shall submit to the Core NRAs an annual monitoring report containing:

~~(a) the RAs in accordance with Article 9 on capacity calculation and in accordance with Article 10 on increasing base case quality;~~

~~(a) additional planned outages with requesting Core TSO names applied in accordance with Article 10(6);~~

~~(b)~~(k) an assessment of the quality of the data published on the dedicated online communication platform ~~as~~ referred to in Article ~~19, with a supporting~~20, accompanied by a detailed analysis of a failure to achieve sufficient data quality standards by the concerned Core TSOs, where relevant;

~~(c)~~(l) the Core TSOs' ~~report~~and the Core CCC's report pursuant to Article 22(4) on their continuous monitoring of the effects and performance of the application of ~~this methodology~~the LT CCM, in a commonly agreed template;

~~(d)~~(m) the monitoring of the accuracy of non-Core ~~exchanges~~exchanges' forecasts in the CGM~~.~~;

(n) ~~The Core CCC shall submit a quarterly monitoring report on capacity validation to the Core NRAs after approval by the Core TSOs. In each quarterly monitoring report, the Core CCC shall provide all the information on the reductions of calculated capacity after individual validation and coordinated validation of capacities according to Article 17(3)(4). The quarterly monitoring report shall include at least the following information for each reduced capacity and for each timestamp~~validation monitoring pursuant to Article 17;

(o) the pre-solved CNECs that were subject to minimum RAM adjustment; and

~~3.1.:~~

~~a) the identification of the CNEC;~~

~~1. the volume of reduction of capacity;~~

~~1. the detailed reason(s) for reduction, including the operational security limit(s) that would have been violated without reductions, and under which circumstances they would have been violated;~~

~~2. the proposed measures to avoid similar reductions in the future.~~

~~2. The quarterly monitoring report of the Core CCC shall also include at least the following aggregated information:~~

~~1.~~ statistics on ~~the number, causes, volume and estimated loss of economic surplus of~~CNECs with minimum RAM applied ~~reductions by different Core TSOs; and~~

~~(e)~~(p) ~~general measures~~pursuant to ~~avoid capacity reductions in the future~~Article 14.

~~3. Core TSOs shall report to the Core NRAs in the situation when no capacity is offered by the Core TSOs via the monthly timeframe. This report shall contain a justification for the difference between the predicted monthly capacity in the yearly timeframe and the actual allocated monthly capacity.~~

4. Implementation and language

TITLE 8: IMPLEMENTATION AND LANGUAGE

Article 22
Timescale for Implementation

1. The Core TSOs shall publish this ~~methodology~~LT CCM without undue delay after ~~it has been approved by the relevant NRAs or a decision has been taken by ACER in accordance with~~ its adoption pursuant to Article 4(~~9~~10) of the FCA Regulation.

~~1. Core TSOs shall implement this FB capacity calculation methodology allowing a FB allocation for LT timeframe within 5 years after approval of this methodology. The implementation process shall start on the date of approval of this methodology. The Core coordinated LT capacities are the ones resulting from the FB capacity calculation process after the implementation of this methodology.~~

2. The Core TSOs shall implement this LT CCM in accordance with processes and deadlines provided in paragraph 3 point (c).

~~2.~~3. The implementation process shall consist of the following steps:

(a) an internal parallel run~~,~~ during which the Core TSOs and the Core CCC shall test the operational processes for the ~~LTCC~~LT CC inputs, the ~~LTCC~~LT CC process and the long-term capacity validation, and develop ~~the~~ appropriate IT tools and infrastructure;

(b) an external parallel run~~,~~ during which the Core TSOs ~~will~~and the Core CCC shall continue testing their internal processes and IT tools and infrastructure. In addition, the Core TSOs ~~will~~shall involve the SAP ~~operator~~ to test the implementation of this methodology, and market participants to test the effects of applying this methodology ~~on~~to the market~~.~~ and allow them to adapt their processes. In accordance with Article 10(5)(c) of the FCA Regulation, this phase shall not be shorter than 6 months~~.~~;

(c) implementation by the following deadlines:

i. a flow-based yearly auction for 2025; and

ii. a flow-based monthly auction for January 2025.

~~3.~~4. During the internal parallel run, the Core TSOs and the Core CCC shall continuously monitor the effects and the performance of the application of ~~this methodology.~~the LT CCM, and shall develop the monitoring and performance criteria, in coordination with the Core NRAs. During the external parallel run the Core TSOs and the Core CCC shall publish the monitoring and performance criteria ~~without undue delay. For this purpose, Core TSOs will develop in coordination with the Core NRAs the monitoring and performance criteria.~~indicators on a monthly basis. After the implementation of this methodology, the outcome of this monitoring shall be ~~summarized~~summarised in an annual report.

~~4.~~5. Until the implementation of this ~~FB methodology~~Core LT CCM, the Core TSOs ~~will~~shall continue to apply the NTC ~~allocation and will improve the coordination at Core CCR level.~~ capacity calculation approach.

Article 23
Language

1. The reference language for this LT CCM shall be English.

2. For the avoidance of doubt, where the Core TSOs need to translate ~~this~~the LT CCM into their national language(s), in the event of inconsistencies between the English version published by the Core TSOs in accordance with Article 4(13) of the FCA Regulation and any version in another

language, the relevant Core TSOs shall ~~be obliged to dispel~~clarify any inconsistencies by providing a revised translation of ~~this~~the LT CCM to their ~~relevant Core~~respective NRAs.

ANNEX 1: JUSTIFICATION FOR CALCULATION OF EXTERNAL CONSTRAINTS AND ITS APPLICATION

The following section depicts in detail the justification of usage and methodology currently used by each Core TSO to design and implement external constraints, if applicable. The legal interpretation on eligibility of using external constraints and the description of their contribution to the objectives of the FCA Regulation is included in the Explanatory Document.

1. Netherlands:

TenneT TSO B.V. may use an external constraint to limit the import and export of the Dutch bidding zone.

Technical and legal justification

The combination of voltage constraints and limitations following from using a linearized GSK make it necessary for TenneT TSO B.V. to apply external constraints. Voltage constraints justify the use of a maximum import constraint, because a certain amount of power needs to be generated within the Netherlands to prevent violation of voltage constraints (i.e. to prevent voltage dropping below the lower safety limit). To prevent the deviations between forecasted and realised values of generation in-feed following from the linear GSK to reach unacceptable levels, it is necessary to limit the feasible net position range for the Dutch import and export net position. This last point is explained in more detail below.

The long-term capacity calculation methodology uses a Generator Shift Key (GSK) to determine how a change in net position is mapped to the generating units in a specific bidding zone. The algorithm requires that the GSK is linear and that by applying the GSK the minimum and maximum net position ('the feasibility range') of a bidding zone can be reached. TenneT TSO B.V. applies a GSK method that aims at establishing a realistic generator schedule for every hour and which is applicable to every possible net position within the flow-based domain. In order to realise this, generators can be divided in three groups based on a merit order: (i) rigid generators that always produce at maximum power output, (ii) idle generators that are out-of-service and (iii) 'swing generators' that provide the 'swing capacity' to reach all intermediate net positions required by the algorithm for a specific grid situation. To reach the maximum net position, all 'swing generators' shall produce at maximum power. To reach the minimum net position, all 'swing generators' shall produce at minimum power. The absolute difference between the minimum and maximum net position thus determines the amount of required 'swing capacity', i.e. the total capacity required from 'swing generators'.

If TenneT TSO B.V. would not apply this limitations and higher import and export net positions would be possible, several generators that in practice operate as rigid generators (e.g. CHPs, coal fired power plants etc.) would need to be modelled as 'swing generators'. In some cases, a switch of a generator from 'idle' to 'swing' or from 'rigid' to 'swing' could mean a jump of roughly 50% in the power output of such a power plant, which in turn has significant impact on the forecasted power flows on the CNECs close to that power plant. This results in a reduced accuracy of the GSK as the generation of these plants is modelled less accurately and the deviations between the forecasted and realised flows on particular CNECs increase to unacceptable levels with significant impact on the capacity domain. The consequence of this would be that higher FRMs need to be applied to partly cover these deviations, which will constantly limit the available capacity for the market. To prevent too large deviations in generation in-feed, the total feasibility range, which should be covered by the GSK, thus needs to be limited with external constraints.

The Netherlands is a small bidding zone with, in comparison to other bidding zones, a lot of interconnection capacity which implies a very large feasibility range compared to the total installed capacity. E.g. TenneT TSO B.V. has applied limit of 5 GW for both the import and export position in the past, already implying a feasibility range of 10 GW on a total of roughly 15 GW generation capacity included in the GSK at that point in time. For other bidding zones with a much higher amount of installed capacity or relatively less interconnection capacity, the relative amount of 'swing capacity' in their GSK is much lower and therefore also the deviations between forecasted and realised generation are lower. Or in other words, the maximum feasibility range which can be covered by the GSK without increasing deviations between forecasted and realised generation to unacceptable levels, is larger than

the total installed interconnection capacity for these bidding zones, making it not necessary to use external constraints as a measure to limit these deviations.

Methodology to calculate the value of external constraints

TenneT TSO B.V. determines the maximum import and export constraints for the Netherlands based on studies, which combine a voltage collapse analysis, stability analysis and an analysis on the increased uncertainty introduced by the (linear) GSK during different extreme import and export situations in accordance to Article 38 of the SO GL Regulation. The studies shall be performed and published at least on an annual basis and updated every time this external constraint had a non-zero shadow price in more than 0.1% of hours in a given quarter.

2. Poland:

PSE may use an external constraint to limit the import and export of the Polish bidding zone.

Technical and legal justification

Implementation of external constraints as applied by PSE is related to integrated scheduling process applied in Poland (also called central dispatching model) and the way how reserve capacity is being procured by PSE. In a central dispatching model, in order to balance generation and demand and ensure secure energy delivery, the TSO dispatches generating units taking into account their operational constraints, transmission constraints and reserve capacity requirements. This is realised in an integrated scheduling process as a single optimisation problem called security constrained unit commitment (SCUC) and economic dispatch (SCED).

The integrated scheduling process starts after the day-ahead capacity calculation and SDAC and continues until real-time. This means that reserve capacity is not blocked by TSO in advance of SDAC and in effect not removed from the wholesale market and SDAC. However, if balancing service providers (generating units) would already sell too much energy in the day-ahead market because of high exports, they may not be able to provide sufficient upward reserve capacity within the integrated scheduling process[4]. Therefore, one way to ensure sufficient reserve capacity within integrated scheduling process is to set a limit to how much electricity can be imported or exported in the SDAC. External constraints are determined for the whole Polish power system, meaning that they are applicable simultaneously for all CCRs in which PSE has at least one bidding zone border (i.e. Core, Baltic and Hansa). This solution is the most efficient. Considering such constraints separately in each CCR would require PSE to split global constraints into CCR-related sub-values, which would be less efficient than maintaining the global value. Moreover, in the hours when Poland is unable to absorb any more power from outside due to violated minimal downward reserve capacity requirements, or when Poland is unable to export any more power due to insufficient upward reserve capacity requirements, Polish transmission infrastructure is still available for cross-border trading between other bidding zones and between different CCRs.

Methodology to calculate the value of external constraints

When determining the external constraints, PSE takes into account the most recent information on the technical characteristics of generation units, forecasted power system load as well as minimum reserve margins required in the whole Polish power system to ensure secure operation and forward import/export contracts that need to be respected from previous capacity allocation time frames. The constraints are calculated according to the below equations:

$$EXPORT_{constraint} = P_{CD} - (P_{NA} + P_{ER}) + P_{NCD} - (P_L + P_{UPres}) \quad (1)$$

$$IMPORT_{constraint} = P_L - P_{DOWNres} - P_{CD_{min}} - P_{NCD} \quad (2)$$

Where:

P_{CD}	Sum of available generating capacities of centrally dispatched units as declared by generators[5]
$P_{CD_{min}}$	Sum of technical minima of available centrally dispatched generating units

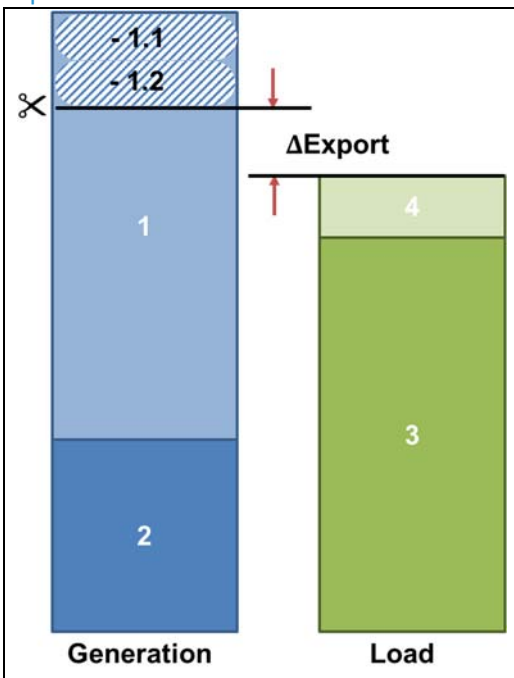
[4] This conclusion equally applies for the case of lack of downward balancing capacity, which would be endangered if balancing service providers (generating units) sell too little energy in the day-ahead market, because of too high imports.

[5] Note that generating units which are kept out of the market on the basis of strategic reserve contracts with the TSO are not taken into account in this calculation.

~~P_{NCD}~~	~~Sum of schedules of generating units that are not centrally dispatched, as provided by generators (for wind farms: forecasted by PSE)~~
~~P_{NA}~~	~~Generation not available due to grid constraints (both planned outage and/or anticipated congestions)~~
~~P_{ER}~~	~~Generation unavailability's adjustment resulting from issues not declared by generators, forecasted by PSE due to exceptional circumstances (e.g. cooling conditions or prolonged overhauls)~~
~~P_{L}~~	~~Demand forecasted by PSE~~
~~P_{UPres}~~	~~Minimum reserve for upward regulation~~
~~$P_{DOWNres}$~~	~~Minimum reserve for downward regulation~~

~~For illustrative purposes, the process of practical determination of external constraints in export direction in the framework of the long-term capacity calculation is illustrated below in Figure 1. The figure illustrate how a forecast of the Polish power balance for the delivery period is developed by PSE in order to determine reserves in generating capacities available for potential exports, for the long-term market.~~

~~External constraint in export direction is applicable if Export is lower than the sum of cross-zonal capacities on all Polish interconnections in export direction.~~



~~1. Sum of available generating capacities of centrally dispatched units as declared by generators, reduced by:~~
   ~~1. Generation not available due to grid constraints~~
   ~~2. Generation unavailability's adjustment resulting from issues not declared by generators, forecasted by PSE due to exceptional circumstances (e.g. cooling conditions or prolonged overhauls)~~
~~2. Sum of schedules of generating units that are not centrally dispatched, as provided by generators (for wind farms: forecasted by PSE)~~
~~3. Demand forecasted by PSE~~
~~4. Minimum necessary reserve for up regulation~~

~~Figure 1 Determination of External constraint in export direction (generating capacities available for potential exports) in the framework of the long-term capacity calculation.~~

~~Frequency of review~~

~~External constraints are determined in a continuous process based on the most recent information, for each capacity allocation time frame.~~