ITALY NORTH CCR

Methodology for a balancing common capacity calculation in accordance with Article 37 of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing within Italy North CCR

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Whereas

(1) This document is the methodology for the common capacity calculation performed for the capacity allocation within the balancing timeframe for Italy North Capacity Calculation Region (hereafter referred to as "Italy North CCR") as required by Article 37 of Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline for Electricity Balancing (hereafter referred to as the "EB GL Regulation"). This methodology is hereafter referred to as "BT CCM". This BT CCM takes into account the general principles and objectives set in the EB GL Regulation, which are listed in Article 3, while also taking into account the principles set in the Regulation (EC) 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) 2019/943"). This BT CCM is also consistent with the cross-zonal capacity calculation methodology applied in the intraday timeframe established under Regulation (EU) 2015/1222 (hereafter referred to as the "CACM Regulation") in accordance with Article 37(3) of EB GL Regulation.

(2) More specifically, contributing to the efficient long-term operation and development of the electricity transmission system and electricity sector in the Union, which are among the objectives of electricity balancing laid down by Article 3 of EB GL Regulation, requires the inclusion of Third Countries' grid elements in the capacity calculation process of Italy North CCR. EB GL Regulation's objectives cannot be achieved in any other way but by including Third Countries' grid elements. This inclusion is in line with Article 13 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereafter referred to as "SOGL Regulation"), providing that EU TSOs must establish "cooperation concerning secure system operation" with non-EU TSOs belonging to the same synchronous area via an agreement with these non-EU TSOs. In order to comply with the requirement laid down by EU Regulation, this methodology includes Third Countries' TSOs as Technical Counterparties. Moreover, the inclusion is also recognized by the additional guidance of the European Commission dated 16/07/2019 regarding the consideration of third countries in capacity calculation.

(3) The inclusion of Third Countries' grid elements is also the most effective way to take into account the effective structure of the network in Italy North CCR. In order to comply with the requirement established by the EU regulation and to adhere to the effective structure of the grid, this methodology includes Third Countries as Technical Counterparties. The already existing TSO-TSO-based contractual framework between the relevant Technical Counterparties and the Italy North CCR TSOs will be adapted accordingly, in the sense that the agreement between Italy North CCR TSOs and the Technical Counterparty will include BT CCM's provisions and ensure that the Technical Counterparty is contractually bound by equivalent obligations as the ones binding upon TSOs of the Italy North CCR by virtue of EU Regulations. Such agreement will govern mutual obligations and responsibilities of the Technical Counterparty with TSOs of Italy North CCR in relation to the capacity calculation process.

(4) Part of the main objectives of EB GL Regulation that are relevant to this BT CCM are the integration of balancing markets, the promotion of the possibilities for exchanges of balancing services while contributing to operational security and the facilitation of the efficient coordination and functioning of day-ahead, intraday and balancing markets. The objectives are listed in Article 3(1) of the EB GL Regulation.

(5) More precisely, Article 3(1)(a) of the EB GL Regulation aims at fostering effective competition, non-discrimination and transparency in balancing markets. The BT CC methodology serves those objectives by defining and establishing a set of harmonised rules and a common coordinated process for capacity calculation which contributes to the effectiveness of the balancing market.

(6) Article 3(1)(b) of the EB GL Regulation aims at enhancing efficiency of balancing as well as

efficiency of European and national balancing markets. The BT CC methodology contributes to the objective of enhancing efficiency of balancing and both European and national balancing market by calculating capacity for the exchange of balancing energy or for operating the imbalance netting process as close as possible to real-time with the latest available inputs, in accordance with Article 24(2) of the EB GL.

(7) Article 3(1)(c) of the EB GL Regulations aims at integrating balancing markets and promoting the possibilities for exchanges of balancing services while contributing to operational security. The BT CC methodology promotes the integration of balancing markets and the possibilities for the exchanges of balancing energy by offering capacity to all. European balancing platforms (TERRE, MARI, PICASSO and IGCC) for the exchange of balancing energy in context of EB GL Regulation and requirements of the European balancing platforms (respecting relevant implementation frameworks and their legal deadline), in accordance with the processes described in Articles 19, 20, 21 and 22 of the EB GL Regulation.

(8) Article 3(1)(d) of the EB GL Regulations aims at contributing to the efficient long-term operation and development of the electricity transmission system and electricity sector in the Union while facilitating the efficient and consistent functioning of day-ahead, intraday and balancing markets. By ensuring consistency between day-ahead, intraday and balancing markets, BT CCM contributes to the long-term operation and development of the electricity transmission system and electricity sector.

(9) For these reasons, to facilitate the achievement of these aims and to offer capacity to the market in the balancing timeframe, it is necessary for TSOs to calculate in a coordinated manner the available cross-border capacity in a way which is consistent with capacity calculation applied in the intraday timeframe (see Article 37 EB GL Regulation). In line with the requirements of the EB GL Regulation, the TSOs of Italy North CCR will strive to cooperate with Capacity Calculation Regions (hereafter referred to as "CCR") connected to Italy North CCR in order to ensure that capacity calculation takes place in the most efficient and thorough way.

(10) Article 37 of the EB GL Regulation constitutes the legal basis for this methodology and defines several specific requirements that the BT CCM should take into account:

"1. After the intraday-cross-zonal gate closure time, TSOs shall continuously update the availability of cross-zonal capacity for the exchange of balancing energy or for operating the imbalance netting process. Cross-zonal capacity shall be updated every time a portion of cross-zonal capacity has been used or when cross-zonal capacity has been recalculated

2. Before the implementation of the capacity calculation methodology pursuant to paragraph 3, TSOs shall use the cross-zonal capacity remaining after the intraday cross-zonal gate closure time.

3. By five years after entry into force of this Regulation, all TSOs of a capacity calculation region shall develop a methodology for cross-zonal capacity calculation within the balancing timeframe for the exchange of balancing energy or for operating the imbalance netting process. Such methodology shall avoid market distortions and shall be consistent with the cross-zonal capacity calculation methodology applied in the intraday timeframe established under regulation (EU) 2015/1222".

(11) Until the entry into force of this BT CCM, the TSOs of the Italy North CCR shall use the cross-zonal capacity remaining after the intraday cross-zonal gate closure time, in line with Article 37(2) EB GL Regulation.

(12) Article 2 of the EB GL regulation defines 'balancing' as "*all actions and processes, on all timelines, through which TSOs ensure, in a continuous way, the maintenance of system*

frequency within a predefined stability range as set out in Article 127 of Regulation (EU) 2017/1485, and compliance with the amount of reserves needed with respect to the required quality, as set out in Part IV Title V, Title VI and Title VII of Regulation (EU) 2017/1485".

(13) Article 2 of the EB GL Regulation defines 'balancing market' as *"the entirety of institutional, commercial and operational arrangements that establish market-based management of balancing".*

(14) Article 36 of the EB GL Regulation identifies the use of cross-zonal capacity, such that *"all TSOs shall use the available cross-zonal capacity, computed according to paragraphs 2 and 3 of Article 37, for the exchange of balancing energy or for operating the imbalance netting process."*

(15) TSOs of Italy North CCR agreed on a first version of BT CC methodology proposing to apply a coordinated net transmission capacity methodology for capacity calculation within the Italy North CCR, without prejudice to the future implementation of a Flow Based approach as the target methodology for the Italy North CCR as foreseen in Article 20(1) of the CACM Regulation.

(16) Article 2(8) of the CACM Regulation defines the coordinated net transmission capacity approach as *"the capacity calculation method based on the principle of assessing and defining ex ante a maximum energy exchange between adjacent bidding zones".*

(17) The balancing capacity calculation will be performed by the coordinated capacity calculators, which are mandated to implement and perform this capacity calculation methodology following the approval of this methodology by NRAs.

(18) Coordinated capacity calculators will take into account the Participating TSOs and Technical Counterparties' remedial actions into coordinated remedial action preparation.

(19) In conclusion, the BT CC methodology contributes to the general objectives of the EB GL Regulation while being compatible with the principles of the EU Regulations mentioned above.

Article 1 Subject matter and scope

1. The BT CCM as determined in this document is the common methodology for the capacity calculation performed for the capacity allocation within the balancing timeframe for Italy North CCR in accordance with Article 37 of the EB Regulation.

2. Considering the structure of the grid, Third Countries' borders are taken into account via a separate agreement in the capacity calculation process.

Article 2 Definitions and interpretation

1. For the purposes of the BT CC methodology, the terms used shall have the meaning given to them in Article 2 of Regulation (EC) 2013/543, Article 2 of Regulation (EC) 2015/1222 and Article 2 of Regulation (EC) 2017/2195 (EBGL Regulation).

2. In addition, the following definitions shall apply:
    a. 'APG' means Austrian Power Grid AG, the Austrian system operator;
    b. 'AT-IT border' means bidding zone border between Austria and Italy;
    c. 'CH-IT border' means bidding zone border between Switzerland and Italy;
    d. 'ELES' means ELES, d.o.o. , the Slovenian system operator;
    e. 'FR-IT border' means bidding zone border between France and Italy;
    f. 'RTE' means Réseau de Transport d'Electricité, the French system operator;
    g. 'SI-IT border' means bidding zone border between Slovenia and Italy;
    h. 'Technical Counterparty' means any non-EU TSO to be included in the procedures of thismethodology through respective agreements;
    i. 'TERNA' means TERNA S.p.A. Rete Elettrica Nazionale, the Italian system operator;
    j. Third Country means country from jurisdiction outside the area referred to in Article 1(2) of Regulation (EC) 2015/1222.
    k. `TSOs of Italy North CCR` include, for the purpose of this methodology, the Technical Counterparty

3. Definition of Acronyms

BT	Balancing Timeframe
CC	Capacity Calculation
CCC	Coordinated Capacity Calculator
CGM	Common Grid Model
CGMES	Common Information Model (CIM) for Grid Model Exchanges
CNE	Critical Network Element
CNEC	Critical Network Element and Contingency. For the purpose of this methodology, the term CNEC also cover the case where a CNE is used in capacity calculation without a specified contingency.
CRA	Curative Remedial Action
CROSA	Coordinated Regional Operational Security Assessment
CZGCT	Cross-Zonal Gate Closure Time
D-2	Two Days Ahead
DA	Day Ahead
DACF	Day Ahead Congestion Forecast
ID	Intraday
IDCF	Intraday Congestion Forecast
IGM	Individual Grid Model

MTU	Market Time Unit
NRAs	National Regulatory Authorities
NTC	Net Transfer Capacity
PRA	Preventive Remedial Action
RA	Remedial Action
RAO	Remedial Action Optimization
RAM	Remaining Available Margin
RCC	Regional Coordination Centre
ROSC	Regional Operational Security Coordination
SO	System Operation
SPS	Special Protection Scheme
TTC	Total Transfer Capacity

4. In this BT CCM, unless the context requires otherwise:
    a. the singular indicates the plural and vice versa;
    b. headings are inserted for convenience only and do not affect the interpretation of this methodology; and
    c. any reference to legislation, regulations, directives, orders, instruments, codes or any other enactment shall include any modification, extension or re-enactment of it when in force.

Article 3 Application of this methodology

1. This methodology applies solely to the common CC for the balancing timeframe based on the coordinated net transmission capacity approach within the Italy North CCR. For the avoidance of doubt the respective or relevant provisions of this methodology apply to any relevant Technical Counterparty of the Italy North CCR, by virtue of separate contracts as mentioned above in Article 1. The BT CC methodology using the flow-based approach, the CCC methodologies within others CCRs and other timeframes are outside the scope of this methodology.

Article 4 Cross-zonal capacities for the balancing timeframe

1. Individual values for cross-zonal capacity shall be delivered to the Balancing platforms per MTU.
2. The cross-zonal capacity calculation shall be performed after each ID CZGCT. Preparatory calculation steps can be performed before ID CZGCT and after the CGM, in accordance with Art. 9 (3) and (4) of this methodology, becomes available.
3. At the time that this methodology is approved, the ID CZGCT is 60 minutes before the start of the relevant intraday market time unit. Should the ID CZGCT be shortened, Italy North TSOs and the Technical Counterparty, shall reassess the feasibility to perform the capacity calculation after each ID CZGCT referred to in (2).

Article 5 Reliability margin methodology

1. For the CC performed in BT, the TSOs of the Italy North CCR and Technical Counterparty shall define the reliability margin in line with Article 22 of the CACM Regulation and based on the analysis of the following data:
    a. unintended deviations of physical electricity flows within a market time unit caused by

the adjustment of electricity flows within and between control areas, to maintain a constant frequency;

b. uncertainties which could affect CC, and which could occur between BT and real time, for the market time unit being considered;
c. uncertainties which affect CC, between the time the CGM becomes available and ID CZGCT due to continuous intraday trading;
d. deviation of assumptions on cross-zonal power exchanges considered in ID CROSA where the Remedial Actions are optimized and the assumption for the cross-zonal exchanges in BT CC based on which the BT NTC is calculated;
e. uncertainties which could affect CC, due to generation shift key assumptions used in BT CC.

2. The reliability margin shall be defined as a fixed value initially set to 500MW based on experience from ID CC, to be reassessed by latest after 2 years of operational BT CC process.

Article 6 Operational security limits, contingencies and allocation constraints

1. For the CC, each TSO of the Italy North CCR and Technical Counterparty shall provide the Coordinated Capacity Calculator with its individual list of CNECs created based on a common contingency list. The Coordinated Capacity Calculator shall then define the merged list of CNECs to be considered during the CC, by merging the individual list of CNECs provided by all TSOs of the Italy North CCR and Technical Counterparties into a single list.

2. Subsequently, the CCC shall use the merged list of CNECs pursuant to paragraph 1 to create the initial list of CNECs to be considered in the CC by selecting only network elements significantly influenced by cross-zonal power exchanges. The selection of these CNECs shall be based on sensitivity analysis performed in accordance with Annex I for each calculated timestamp in the different network states including but not limited to base case, after contingency and after remedial action.

3. Only CNECs with a sensitivity to cross-zonal power exchanges equal to or higher than 2% shall constitute the initial list of CNECs.

4. The TSOs of Italy North and the Technical Counterparty can label elements in the individual CNEC lists as “Whitelisted”. The “Whitelisted” is a set of CNECs that shall be considered in the CC irrespectively of their sensitivity. The “Whitelisted” tag shall be attributed to CNECs which shall be considered in the CC for critical operational security purposes.

5. Subsequently, the CCC shall use the initial list of CNECs pursuant to paragraph 1 and merge it with the “Whitelisted” CNECs pursuant to paragraph 4 to create the final list of CNECs to be considered in the CC in accordance with paragraphs 2, 3 and 4.

6. Where the power flows on CNEs monitored in the CC are influenced by cross-zonal power exchanges in different CCRs, the TSOs of the Italy North CCR and Technical Counterparty shall define the rules for sharing the power flow capabilities of CNEs among different CCRs in order to accommodate these flows. These rules will be detailed in cooperation with the other CCRs during the implementation phase of this methodology.

7. The TSOs of the Italy North CCR and Technical Counterparty shall review the list of CNEs to be monitored in the CC process at least once a year.

8. The Italian operational constraints related to the control of voltage profiles and dynamic stability of Italian system, which are needed to maintain the transmission system within operational security limits but cannot be transformed efficiently into maximum flows on CNEs, shall be

expressed via allocation constraints.

9. Allocation constraints indicated in paragraph 8 will be directly applied to the results of the calculation performed by the coordinated capacity calculator. The unconstrained capacity will be computed in any case and made publicly accessible according to the provisions set in Article 12(3).

10. Allocation constraints will be given with a level of discretization of 50 MW.

Article 7 Generation shift keys

1. The TSOs of Italy North CCR shall define the generation shift keys in accordance with Article 24 of the CACM Regulation.

2. RTE shall define generation shift keys proportional to the base case scenarios for each market time unit with all expected generating units in the IGM, reflecting RTE's best forecast of market behaviour.

3. TERNA shall define generation shift keys proportional to the base case scenarios for each market time unit with all expected generating units in the IGM, reflecting TERNA's best forecast of market behaviour.

4. ELES shall define generation shift keys proportional to the base case scenarios for each market time unitwith all expected generating units and selected loads in the IGM, reflecting ELES's best forecast of market behaviour.

5. APG shall define generation shift keys participation factors to the base case scenarios for each market time unit with all expected generating units in the IGM, reflecting APG's best forecast of market behaviour. To achieve this the shift is done in generation/load nodes (PV or PQ nodes), according to a participation factor. The chosen nodes are evaluated by APG and are nodes with generation/load units that will change along with a market change.

Article 8 Remedial actions in capacity calculation

1. The TSOs of Italy North CCR and the Technical Counterparty shall define the Remedial Actions in accordance with Article 25 of the CACM Regulation.

2. Each TSO of Italy North CCR and the Technical Counterparties shall define individually the Remedial Actions of its responsibility area to be made available in the BT CC within Italy North CCR in accordance with paragraph 5.

3. The available Remedial Actions are those which can be activated within the BT in a coordinated way by the TSOs of Italy North CCR and Technical Counterparty to ensure the operational security.

4. Remedial Actions can be used in preventive and/or curative state. SPS will act only in curative stage, after tripping of grid elements. Due to this there are three different types of Remedial Actions used in the Italy North BT CC process:
    a. PRA: They correspond, in operation, to Remedial Actions to be implemented independently of the occurrence of any outage to relieve the grid. They are also implemented in the CGM.
    b. CRA: Each CRA is associated with a given outage and applied after the outage happened. They are taken into account during the CC process but not implemented in the model.
    c. SPS: This represents an automatic change in grid topology in case of predefined

conditions (e.g.outage of 2 parallel lines) are met. They are taken into account during the CC process but not implemented in the model.

5. The Remedial Actions to be considered in the BT CC are:
    a. all preventive Remedial Actions as determined and validated during day-ahead and intraday Coordinated Regional Operational Security Assessment (CROSA) process. These RAs shall be reflected in the CGMs.
    b. All triggered curative Remedial Actions as determined and validated during day-ahead and intraday Coordinated Regional Operational Security Assessment (CROSA) process. These RAs are not reflected in the CGM therefore shall be provided to BT CC.
    c. SPS (Special Protection Scheme).

6. The only Remedial Actions that will be considered in the BT CC are those actually implemented in CROSA. The list above excludes Remedial Actions that cannot be activated because the activation time is incompatible with the balancing timeframe.

7. The coordinated capacity calculator shall consider the remedial actions referred to in Article 8 (5) of the current methodology.

Article 9 Balancing capacity calculation

1. In accordance with Article 37 (3) of the EB Regulation, the TSOs of Italy North CCR and the Technical Counterparty shall calculate cross-zonal capacities for each bidding-zone border of Italy North CCR in both directions within the balancing timeframe.

2. The TSOs of Italy North CCR and the Technical Counterparty shall provide the CCC with the last updated information on the transmission systems in a timely manner for the BT CC.

3. The CCC shall perform BT CC based on the CGM built in accordance with Article 70 of Commission Regulation (EU) 2017/1485 of 02 August 2017 in CGMES format.

4. The BT CC is comprised of preparatory steps performed before ID CZGCT and the cross-zonal CC performed after ID CZGCT.

5. The CCC shall perform preparatory calculations prior to the CC. These calculations are:
    a) the CNEC selection process in accordance with Article 6 of this methodology
    b) and the calculation of PTDFs for all CNECs in the list of final CNECs in accordance with Article 6 of this methodology.

6. The CCC shall perform the cross-zonal CC which consists of the steps as described in paragraphs 7-17.

7. The reference point of the CC is indicated by the allocation results after ID CZGCT.

8. The netted allocation results after the ID CZGCT define the power exchange direction per bidding zone border of Italy North CCR. The set of these directions for all BZ borders defines the Market Corner. The set of opposite power exchange directions defines the Opposite Corner.

9. The CCC shall calculate the reference flow per CNEC based on the CGM taking into account the allocation results after ID CZGCT and the RAs in accordance with Article 8 of this methodology.

10. The maximum increase of the cross-zonal exchanges in all market directions per bidding zone border of Italy North CCR that does not worsen grid security is calculated using a linear optimization method as following:

$$Max. \sum_{X\to Y\in M} \Delta TTC_{X\to Y}$$

Subject to:

$$Max\left(F_i^{ref}, F_i^{max}\right) \geq F_i^{ref} + \sum_{X\to Y\in M} \Delta \mathrm{TTC}_{X\to Y} \cdot Max\left(PTDF_{i,X\to Y}^{zTz}, 0\right), \qquad \forall i$$

$$Min(F_i^{ref}, F_i^{min}) \leq F_i^{ref} + \sum_{\mathrm{X}\to\mathrm{Y}\in\mathrm{M}} \Delta \mathrm{TTC}_{\mathrm{X}\to\mathrm{Y}} \cdot Min\left(PTDF_{i,X\to Y}^{zTz}, 0\right), \qquad \forall i$$

$$0 \leq \Delta TTC_{X\to Y}, \qquad \forall X\to Y \in M$$

$$\Delta TTC_{X\to Y} \geq \mathrm{W} \cdot SF_{X\to Y}^{MC} \cdot \sum_{X\to Y\in MC} \Delta \mathrm{TTC}_{X\to Y}, \qquad \forall X\to Y \in MC$$

$$\Delta TTC_{X\to Y} \geq \mathrm{W} \cdot SF_{X\to Y}^{OC} \cdot \sum_{X\to Y\in OC} \Delta \mathrm{TTC}_{X\to Y}, \qquad \forall X\to Y \in OC$$

Where

Indices

i	Index of CNECs running from 1 to N_C
X→Y	Index of direction from bidding zone X to BZ Y

Constants

N_C	Number of CNECs in final CNEC list in accordance with Art.
W	Weighting factor
F_i^{ref}	Reference flow of CNEC i calculated in accordance with Art. 9 (9)
F_i^{max}	Maximum admissible active power flow of CNEC i in the defined direction of the CNEC.
F_i^{min}	Minimum admissible active power flow of CNEC i in the defined direction of the CNEC.
$PTDF_{i,X\to Y}^{zTz}$	Zone-to-zone PTDF of CNEC i for power exchange from zone X to zone Y
$SF_{X\to Y}^{MC}$	Splitting factor for power exchange from zone X to zone Y for Market Corner
$SF_{X\to Y}^{OC}$	Splitting factor for power exchange from zone X to zone Y for Opposite Corner

Sets

M	$\Delta TTC_{IT\to AT}, \Delta \mathrm{TTC}_{CH\to IT}, \Delta TTC_{FR\to IT}, \Delta \mathrm{TTC}_{IT\to SI} \Delta \mathrm{TTC}_{AT\to IT}, \cdots$ $\cdots \Delta \mathrm{TTC}_{IT\to CH}, \Delta \mathrm{TTC}_{IT\to FR}, \Delta \mathrm{TTC}_{SI\to IT}$
MC	Subset of M consisting of ΔTTC for the Market Corner in accordance with Art.9 (8)
OC	Subset of M consisting of ΔTTC for the Opposite Corner in accordance with Art. 9 (8)

Variables

$\Delta TTC_{X\to Y}$	Increase of cross-zonal power exchanges

11. The weighting factor shall assign the weight in optimizing the $\Delta TTC_{X\to Y}$ variables respecting the splitting factors. The weighting factor can be in the range of 0 to 1, with 1 reflecting that all the resulting $\Delta TTC_{X\to Y}$ variables per corner are split based on the splitting factors.

12. The value of the weighting factor shall be defined by TSOs of Italy North CCR and the Technical Counterparty.

13. The resulting capacity pursuant to paragraph 10 is checked for its feasibility against operational security constraints.

14. The resulting capacity pursuant to paragraph 10 is reduced by the split Reliability Margin per border and direction, pursuant to Article 5 of this methodology:

$$\Delta NTC_{X\to Y}^{BTCC} = \Delta TTC_{X\to Y}^{BTCC} - TRM_{X\to Y}$$

15. The resulting capacity pursuant to paragraph 14 in the Market Corner and the Opposite Corner shall respect the following Limits:
    a) To gain confidence in the BT CC process and avoid unexpected high results the capacity in the Market Corner is limited by an upper cap that is determined by using the IDCC result plus 500 MW multiplied by the respecting splitting factor. Twelve months after BT CC process becomes operational, this cap shall be removed from the calculation unless Italy North TSOs and the Technical Counterparties in agreement with Italy North NRAs deem necessary the prolongation of the cap.
    b) Italy North TSOs and the Technical Counterparties, shall reassess the value of the cap in accordance with paragraph a prior to the Go-Live of BT CC. The reassessed value will be subject to approval by Italy North NRAs.
    c) In the Opposite Corner the capacity is limited by the results of the IDCC multiplied by a reduction factor that is set initially to 0.5 to avoid too high changes of the power flow close to real time. This factor shall be assessed every two years.
    d) Italy North TSOs and the Technical Counterparties, shall reassess the value of the reduction in accordance with paragraph c prior to the Go-Live of BT CC. The reassessed value will be subject to approval by Italy North NRAs.
    e) The resulting new values of the capacities after the application of the limitations pursuant to paragraphs a and care denoted as $\Delta NTC_{X\to Y}^{BTCC\ cap}$.

16. The resulting capacity pursuant to paragraph 15 is corrected to take into account the constraints associated to voltage profiles and dynamic stability of the Italian system. The resulting new values of the capacities after the application of the constraints pursuant to this paragraph are denoted as:

$$\Delta NTC_{X\to Y}^{BTCC\ final}$$

17. The cross-zonal capacities that shall be provided to the balancing platforms are calculated as following:

$$NTC_{X\to Y}^{BTCC} = NTC_{X\to Y}^{IDCC} + \Delta NTC_{X\to Y}^{BTCC\ final}$$

18. The CCC shall provide the cross-zonal capacity for each Market Time Unit, bidding zone border and direction in the Italy North CCR.

19. In case several CCCs compute the cross-zonal capacity for each market time unit in parallel, the minimum value of the computed cross-zonal capacity is provided to TSOs of the Italy North CCR and Technical Counterparties for validation. The provided value shall respect operational security constraints.

20. The CCC, shall make available the CGM with the BT cross-zonal capacities for each bidding-zone border of Italy North CCR to the TSOs of the Italy North CCR and Technical Counterparty for each relevant Market Time Unit.

Article 10 Cross-zonal capacity validation methodology

1. The TSOs of Italy North CCR and the Technical Counterparty shall validate the cross-zonal capacities calculated by the CCC of the Italy North CCR.

2. In case one of the following alternative situations endangers the operational security, the TSOs of Italy North CCR and the Technical Counterparty shall assess and validate a secure capacity value:
    a. Contingencies or critical network elements are missing in the list of CNECs to be monitored in the CC process;
    b. A mistake in an IGM, GSK or a CGM was found (e.g. a wrong topology);
    c. Unplanned outages or a trip of an element in the respective TSO grid occurred;
    d. An issue with the tools used in the CC process occurred;
    e. Expectation of significant changes in the flow distribution due to high discrepancies between forecast in BT CC and the expected real-time market outcome (e.g. change of net positions or market directions) which are not covered by the statistical uncertainty related to the Reliability Margin.

3. Where one or more TSOs of the Italy North CCR or Technical Counterparty do not validate the cross-zonal capacity calculated, the concerned TSO(s) shall provide the updated amount of cross-zonal capacities for the border(s) considered and the reasons for the change. The final cross-zonal capacity is the minimum value sent by the TSOs of the Italy North CCR and the Technical Counterparty.

4. Whenever a TSO of the Italy North CCR or the Technical Counterparties reduces the amount of cross-zonal capacity during the validation, the location and amount of the congestion and further details about the reduction shall be published.

Article 11 Fallback procedures

1. Prior to each CC performed in the BT, the TSOs of Italy North CCR and the Technical Counterparty shall ensure the CCC is provided with the already allocated capacities within the day-ahead and intraday timeframes.

2. For the CC performed in the BT, where an incident occurs in the CC process and the CCC is unable to produce results within the allotted time for the calculation process, the TSOs of the Italy North CCR and the Technical Counterparty shall validate the last coordinated cross-zonal capacities calculated within the intraday timeframe reduced by a factor of 0.5. After this validation step, the CCC, TSOs of the Italy North CCR or the Technical Counterparty where applicable, shall use this coordinated value for the exchange of balancing energy or for operating the imbalance netting process.

3. TSOs of Italy North CCR and the Technical Counterparty, shall reassess the value of the reduction in accordance with paragraph 2 prior to the Go-Live of BT CC. The reassessed value will be subject to approval by Italy North NRAs.

Article 12 Publication of data

1. The TSOs of the Italy North CCR and Technical Counterparties publish the following CC relevant data:
    a. For each market time unit and CNEC:
        i. Timestamp of the associated MTU;
        ii. Clear name and EIC code of both CNE and Contingency;
        iii. Maximum flow of a CNE (FMAX);
        iv. Reference flow in base case scenario (FREF);

v. Sensitivity used for CNEC selection;
vi. Final flow at the end of the CC process (FNTC);
vii. Binary indicator whether the CNEC was limiting the NTC domain;
viii. Zone-to-zone PTDF for all the different borders (Italy – France, Italy – Switzerland, Italy – Austria, Italy – Slovenia) computed in the base case scenario (PTDFREF);
ix. Remaining available margin (RAM);
x. Whitelisted flag

b. For each market time unit and bidding zone:
i. Forecasted vertical load;
ii. Forecasted production;
iii. Forecasted net position;

2. All data listed in paragraph 1 shall be published on a daily basis. As indicated in Article 6(9), the unconstrained capacity will be published as well on a daily basis.

3. For voltage and stability constraints referred to in Article 6(9), TSOs of Italy North CCR publish at least the following elements for each market time unit:
a. the expected total load in the Italian system;
b. the expected total non-dispatchable production in the Italian system;
c. the minimum dispatchable thermal generation needed to grant voltage and system stability in the Italian system.

TSOs of Italy North CCR publish also a feature to provide an estimation of the cross-dependence between the level of the allocation constraint and the parameters listed above.

4. All data mentioned in this Article shall be published on one centralized web-platform (e.g. JAO). based on API (application programming interface) interaction.

Article 13 Reporting

1. The coordinated capacity calculator shall prepare a report about all reductions called during the validation of cross-zonal capacity including the reason of the reductions according to Article 10(2) of this methodology. The report shall be sent to all the NRAs of Italy North CCR on a quarterly basis 10 working days after the end of each quarter.

Article 14 Publication and Implementation of the BT CCM Proposal

1. The TSOs of Italy North CCR and the Technical Counterparty shall publish the BT CC methodology proposal without undue delay after all NRAs of Italy North CCR have approved it.

2. The BTCC shall be performed based on the hourly updated CGMs from ROSC no later than 12 months after the implementation of the day-ahead and intraday Italy North CCR CROSA developed in accordance with Article 76 and 77 of SO Regulation .

3. The BT CC shall be performed based on the remedial actions referred to in Article 8 paragraph 5 of this methodology no later than 12 months after the implementation of the day-ahead and intraday Italy North CCR CROSA developed in accordance with Article 76 and 77 of the SO Regulation.

4. In case of delays on IN CROSA Go-Live beyond Q3 of 2028, the TSOs of Italy North CCR and the Technical Counterparty shall activate a safeguard solution in agreement with IN NRAs.

5. The TSOs of Italy North CCR and the Technical Counterparty shall monitor the go-live of Italy North CROSA on continuous basis and inform the Italy North NRAs within 2 weeks from the

official communication of the delay, in case the IN CROSA delay is beyond the threshold referred to in paragraph 4.

6. The content and process associated to this safeguard solution shall be proposed by the Italy North TSOs and the Technical Counterparty via an amendment of this methodology no longer than 6 months after the agreement with IN NRAs on activating the safeguard solution referred to in paragraph 9.

7. The go-live of the safeguard solution is defined by the time needed for the submission of the amendment referred to in paragraph 6, the time required for IN NRAs to approve the amendment and the estimation of the implementation time.

8. The implementation phase of the safeguard solution shall not be longer than 12 months after the approval of the amendment by NRAs of IN. A longer implementation period can be proposed by TSOs. In this case, it should be duly justified by TSOs and approved by NRAs.

9. Within 4 weeks from the communication referred to in paragraph 5, the TSOs of Italy North CCR, the Technical Counterparty and the Italy North NRAs shall agree on the activation or not of the safeguard solution considering the exceptions referred to in paragraphs 10 and 11.

10. In case the go-live of the safeguard solution referred to in paragraph 7, falls within 2 years prior to the go-live of the target solution referred to in paragraphs 2 and 3, meaning that only 2 years of operation are foreseen for the safeguard solution, the safeguard solution shall not be activated.

11. The TSOs of Italy North and the Technical Counterparty in agreement with Italy North NRAs can decide to not proceed with the activation of the safeguard solution.

12. If TSOs of Italy North CCR and the Technical Counterparty cannot match any of the deadlines set in this Article, they shall inform all the NRAs of Italy North CCR at least 6 months before the affected deadline.

Article 15 Language

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

2. For the avoidance of doubt, where TSOs of the Italy North CCR and the Technical Counterparty need to translate this BT CCC methodology into their national language(s), in the event of inconsistencies between the English version published by TSOs of the Italy North CCR in accordance with Article 9(14) of the CACM Regulation and any version in another language, the relevant TSOs of the Italy North CCR and the Technical Counterparty shall be obliged to dispel any inconsistencies by providing a revised translation of this BT CCC methodology to their relevant national regulatory authorities

Annex I

PTDF computation for the selection of critical network elements

Critical network elements are selected based on their sensitivity to cross-zonal power exchanges, evaluated through a *PTDF* matrix. The elements of this matrix represent the influence of a commercial exchange between bidding zones on power flows on the considered combinations of CNECs. The calculation of the *PTDF* matrix is performed on the basis of the CGM and the GSK.

The nodal *PTDFs* are first calculated by subsequently varying the injection on each node of the CGM. For every single nodal variation, the effect on each CNECs loading is monitored and calculated[1] as a percentage (e.g. if an additional injection of a 100 MW has an effect of 10 MW on a CNEC, the nodal PTDF is 10 %). Then the *GSK* translates the nodal *PTDFs* into zonal *PTDFs* (or zone-to-slack PTDFs) as it converts the zonal variation into an increase of generation in specific nodes.

PTDFs can be defined as zone-to-slack *PTDFs* or zone-to-zone *PTDFs*. A zone-to-slack $PTDF_{A,i}$ represents the influence of a variation of a net-position on a CNEC. A zone-to-zone $PTDF_{A->B,i}$ represents the influence of a variation of a commercial exchange from A to B on a CNEC *i*. The zone-to-zone $PTDF_{A->B,i}$ can be linked to zone-to-slack *PTDFs* as follows:

$$PTDF_{A\rightarrow B,i} = PTDF_{A,i} - PTDF_{B,i} \qquad \textit{Equation 1}$$

Zone-to-zone *PTDFs* must be transitory i.e.

$$PTDF_{A\rightarrow C,i} = PTDF_{A\rightarrow B,i} + PTDF_{B\rightarrow C,i} \qquad \textit{Equation 2}$$

The validity of Equation 2 is ensured by Equation 1.

Once all $PTDF_{A->B,i}$ are computed for each element *i*, all the elements which satisfy the condition:

$$PTDF_{A\rightarrow B,i} \geq threshold \qquad \textit{Equation 3}$$

can be classified as CNEC significantly impacted by cross zonal power exchanges of the Italy North CCR, where A->B represents all borders and directions inside Italy North CCR.

TRM figure computation

The TRM can be determined from a convolution of the distributions of the different factors that can cause uncertainty in the BT CC. A suggested process for deriving a distribution for each factor is given below.

The process for determining the uncertainties due to the forecast ($TRM_{1)}$ could be described as follows:

- Step 1: define the statistical period: one full year.
- Step 2: discard the timestamps (TSs) of the statistical period not useful for the study (e.g. TS where no CC has been performed, etc.).
- Step 3: retrieve the following data for all the selected TS:
  - BT TTC without cap/floor $\Delta TTC_{X\rightarrow Y}^{BTCC}$,
  - the Real time CGM for the selected TS

[1] In this load flow calculation the variation of the injection of the considered node is balanced by an inverse change of the injection at the slack node.

- Step 4: estimate the TTC on the real time CGM, denoted $\Delta TTC_{X\rightarrow Y}^{RT}$, selected after step 3 for all the selected TS. Recalculate BTCC on real time CGM. Then compute all the difference between BT and real-time estimated TTCs ($\Delta TTC_{X\rightarrow Y}^{RT} - \Delta TTC_{X\rightarrow Y}^{BTCC}$) and plot those deltas in a distribution curve

The process for determining the uncertainties due to unintended deviations in control program (TRM_2) could be described as follows:

- Step 1: define the statistical period: one full year.
- Step 2: for the statistical period retrieve the control program errors for the Italy North CCR control areas (difference between the scheduled program and the actual physical exchange in the Italy North CCR).

The process for determining the uncertainties due to unintended deviations in ID trading(TRM_3) could be described as follows:

- Step 1: define the statistical period: one full year.
- Step 2: retrieve schedules corresponding to ID trading, which are not considered in BTCC
- Step 3: Calculate the deviation in capacity due to not considered ID trading

The process for determining the uncertainties due to deviation of assumptions in last CROSA Run (TRM_4) could be described as follows:

- Step 1: define the statistical period: one full year.
- Step 2: derive deviation of assumptions on cross-zonal power exchanges considered in last Remedial Action optimization (last CROSA Run) compared to Real time cross-zonal power exchanges

The process for determining the uncertainties due to error of assumptions on generation shift (TRM_5) could be described as follows:

- Step 1: define the statistical period: one full year.
- Step 2: derive error of assumptions on generation shift by recalculating capacity using different generation shift assumptions

The TRM shall be defined as the percentile of the convolution with 15% risk level (e.g. 85 percentile means 15% risk, 99 percentile 1% risk), taking into account the increased risk due to the limited available Redispatch potential in BT. Additionally when defining the percentile and the risk level, the historical experiences (i.e. TRM of 500 MW) should be taken into account.

Annex II

Generation and Load Shift Keys

A GSK file is defined for:

- an area;
- a time interval: GSK is dedicated to individual daily hours in order to model differences between peak and off-peak conditions per TSO

Generation and Load shift keys are needed to transform any change in the balance of control area into a change of injections in the nodes of that control area. In order to avoid newly formed unrealistic congestions caused by the process of generation shift, TSOs define both generation shift key (GSK) and load shift key (LSK), where GSKs constitute a list specifying those generators that shall contribute to the shift and LSKs constitute a list specifying those load that shall contribute to the shift in order to take into account the contribution of generators connected to lower voltage levels (implicitly contained in the load figures of the nodes connected to the 220 and 400 kV grid). Each TSO can decide how to represent its best generation shift. If GSK and LSK are defined, a participation factor is also given:

- G(a) Participation factor for generation nodes
- L(a) Participation factor for load nodes

The sum of G(a) and L(a) for each area has to be to 1 (i.e. 100%).

Several methods are supported by the process:

- Proportional:
  Shift in defined generation/load nodes, proportionally to the base case generation/load.
  - Pg(n) Active generation in node n, belonging to area a (nodes n defined in GSK list) or
  - Pl(n) Active load in node n, belonging to area a (nodes n defined in LSK list)

  The participation of node n in the shift, among selected gen. nodes (GSK) is given by:

$$Kg(n,a) = G(a) \cdot \frac{Pg(n)}{\sum_n Pg(n)}$$

  The participation of node n in the shift, among selected load nodes (LSK) is given by:

$$Kl(n,a) = L(a) \cdot \frac{Pl(n)}{\sum_n Pl(n)}$$

2. Participation factors:
   Shift in defined generation/load nodes (PV or PQ nodes), according to the participation factors:
   - kg(n) Participation factor for generation in node n, belonging to area a
   - kl(n) Participation factor for load in node n, belonging to area a

   The participation of node n in the shift, among selected gen. nodes (GSK) is given by:

$$Kg(n,a) = G(a) \cdot \frac{kg(n)}{\sum_n kg(n)}; 0 \leq kg(n) \leq 10$$

   The participation of node n in the shift, among selected load nodes (LSK) is given by:

$$Kl(n,a) = L(a) \cdot \frac{kl(n)}{\sum_n kl(n)};\ 0 \leq kl(n) \leq 10$$