Italy North TSOs proposal for long-term cross-zonal capacity calculation in accordance with Article 10 of the Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a Guideline on Forward Capacity Allocation

May 2020

Contents

TSOs of Italy North, taking into account the following:

WHEREAS

1. This document sets out the common coordinated capacity calculation methodology 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 "Italy North TSOs proposal for long-term cross-zonal capacity calculation" (LT CCM).
2. 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”).
3. In addition, this proposal takes into account the effective structure of the grid and the borders between Italy and third countries by establishing TSO-TSO based contractual frameworks to include third countries as Technical Counterparties. Therefore, this proposal is developed by Italy North TSOs taking into account Technical Counterparties' grid elements.
4. According to Article 4(8) of the FCA Regulation, the expected impact of the LT CCM on the objectives of the FCA Regulation has to be described and is presented below.
5. The LT CCM serves the objective of promoting effective long-term cross-zonal trade with long-term cross-zonal hedging opportunities for market participants (Article 3(a) of the FCA Regulation) by taking into account the hedging needs of market participants by calculating reliable capacities at an early stage and making them available to market participants, which makes long-term planning possible since it ensures that the cross-zonal capacity is calculated in such a way that the same LT CCM will apply to all market participants on all respective bidding zone borders in the Italy North CCR, thereby ensuring a level playing field amongst market participants.
6. This proposal takes into account the effective structure of the grid and the borders between Italy and Third Countries by establishing TSO-TSO based contractual frameworks to include Third Countries as Technical Counterparties. Therefore, this proposal is developed by TSOs of the Italy North Region, taking into account Technical Counterparties' grid elements.

7. This proposal takes into account the general principles and goals set in Regulation (EU) 2015/1222 on Capacity Allocation and Congestion Management (hereafter referred to as the “CACM Regulation”), to which FCA Regulation explicitly refers. Ensuring optimal use of the transmission infrastructure and operational security, which are among the objectives of capacity allocation and congestion management cooperation, laid down by Article 3 of CACM Regulation, requires the inclusion of Third Countries’ grid elements in the capacity calculation process of Italy North Region. CACM 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 will include Third Countries as Technical Counterparties.

8. Coordinated capacity calculators will take into account the whole Area of Common Interest (hereafter referred to as "ACI") of the Italy North Region and include Technical Counterparties' remedial actions into coordinated remedial actions' preparation and the optimization procedure. TSOs of Italy North Region will conclude an agreement with relevant Technical Counterparties. In order to be taken into consideration in the capacity calculation process and enter into a TSO-TSO based contractual framework, Technical Counterparties must fulfil the conditions laid down by Article 1.3 of the "*All TSOs' proposal for a common grid model methodology in accordance with Article 18 of Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation*", applicable to TSOs from jurisdictions outside the area referred to in Article 1(2) of CACM Regulation. The agreement between Italy North Region TSOs and the Technical Counterparty will include LT CCM methodology's provisions and ensure that the Technical Counterparty is contractually bound by the same obligations as the ones binding upon TSOs of the Italy North Region by virtue of EU Regulations. Such agreement will govern mutual obligations and responsibilities of the Technical Counterparty with TSOs of Italy North Region in relation to the capacity calculation process on all elements of the Area of Common Interest.

9. The LT CCM contributes to the optimal calculation of long-term capacity (Article 3(b) of the FCA Regulation) since it takes into account historical data, outages and new grid elements. It provides a calculation approach, coordinates the timings of input delivery and validation requirements of the capacity calculation between Italy North TSOs, the Technical Counterparty and the Coordinated Capacity Calculator of Italy North (CCC of Italy North).
10. 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 adhering to the rules of the Single Allocation Platform and by publication of the results, hence ensuring non-discrimination between market participants.
11. The LT CCM is designed to ensure a fair and non-discriminatory treatment of Italy North TSOs and the Technical Counterparty, the Agency for the Cooperation of Energy Regulators (hereafter referred to as "ACER"), National Regulatory Authorities (hereafter referred to as "NRAs") 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.
12. 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.
13. The LT CCM enables Italy North 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 way and at the same time. This includes regular reporting on specific processes within capacity

calculation. The LT CCM therefore contributes to the objective of transparency and reliability of information (Article 3(f) of the FCA Regulation).

14. 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).
15. In conclusion, the LT CCM contributes to the general objectives of the FCA Regulation to the benefit of all market participants and electricity end consumers.
16. The LT CCM covers the annual and monthly long-term time frames (pursuant to Article 9 of the FCA Regulation).
17. Italy North TSOs and the Technical Counterparty determine the final capacity values to meet the form of product regulated in the Italy North Design of Long-Term Transmission Rights (in accordance with Article 31.3 of the FCA Regulation). Those capacity values are subject to the Italy North Methodology for splitting long-term cross-zonal capacity (in accordance with Article 16 of the FCA regulation).
18. The LT CCM is based on forecast models 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 capacity calculation methodology. The aim of the reliability margin is to cover the risk induced by these forecast errors.
19. The LT CCM shall be compatible with the day-ahead and intraday capacity calculation methodologies (Article 10 (3) of the FCA Regulation). This compatibility is achieved by considering historical inputs from the day-ahead or intraday capacity calculation methodology.
20. Italy North TSOs and the Technical Counterparty remain responsible for maintaining operational security regardless of whether there is a coordinated application of capacity calculation or not. For this reason, they need to validate the calculated cross-zonal capacities to ensure that they do not violate operational security limits. This validation is performed in a coordinated way to verify whether a coordinated application of remedial actions can address possible operational security issues. This step may lead to reductions of cross-zonal capacities below the values originally calculated. 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 an Italy North TSO or the Technical Counterparty might have more capacities to the detrimental effect (operational security issues) of another...
21. Transparency and monitoring of capacity calculation are essential for ensuring its efficiency and understanding. This methodology establishes significant requirements for Italy North TSOs and the Technical Counterparty 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.

SUBMIT THE FOLLOWING LONG-TERM CAPACITY CALCULATION METHODOLOGY PROPOSAL TO THE NATIONAL REGULATORY AUTHORITIES OF THE ITALY NORTH REGION:

GENERAL PROVISIONS

Article 1 :
Subject matter and scope

1. The long-term common capacity calculation methodology as determined in this LT CCM is the common proposal of all Italy North TSOs and the Technical Counterparty in accordance with Article 10 seq. of the FCA Regulation.

   Considering the structure of the grid, Third Countries' borders are taken into account via a separate agreement in the capacity calculation process and referred to, in this methodology proposal, as Technical Counterparties, as indicated by the additional guidance of the EC dated 16/07/2019 regarding the consideration of third countries in capacity calculation

Article 2 :
Definitions and interpretation

1. For the purposes of the LT CCM, the terms used shall have the meaning given to them in Article 2 of Regulation (EC) 2019/943, Article 2 of Regulation (EC) 2013/543 of 14 June 2013 on submission and publication of data in electricity markets and amending Annex I to Regulation (EC) No 2019/943 of the European Parliament and of the Council, Article 2 of Commission Regulation (EC) 2015/1222 establishing a guideline on Capacity Calculation and Congestion Management (hereafter referred to as the "CACM Regulation") and Article 2 of the FCA Regulation.
2. In addition, the following definitions, abbreviations and notations shall apply:

ACER	Agency for the Cooperation of Energy Regulators
BZB	Bidding Zone Border standing also for set of BZB (i.e. technical profiles) where applicable for avoidance of doubt including the Swiss border
CACM	Capacity Allocation and Congestion Management
CC	Capacity Calculation
CCC	Coordinated Capacity Calculator, as defined in article 2(11) of the CACM Regulation
CCM	Capacity Calculation Methodology
CCR	Capacity Calculation Region, as defined in article 2(3) of the CACM Regulation
D-2	Two days ahead
EC	European Commission
ENTSO-E	European Network of Transmission System Operators for Electricity
EU	European Union
ID	Intraday
LT	Long-Term
LTCC	Long-Term Capacity Calculation
LT CCM	Long-Term Capacity Calculation Methodology
NRA	National Regulatory Authority
NTC	Net Transfer Capacity
OPC	Outage Planning Coordination
SOGL	System Operation Guidelines
TSO	Transmission System Operator
TTC	Total Transfer Capacity

3. In addition, the following definitions shall apply:
    a. 'TERNA' is the Italian Transmission System Operator;
    b. 'RTE' is the French Transmission System Operator;
    c. 'APG' is the Austrian Transmission System Operator;
    d. 'ELES' is the Slovenian Transmission System Operator;
    e. 'Technical Counterparty' is any non-EU TSO to be included in the procedures of this methodology through respective agreements;
    f. 'Third Country' means country from jurisdiction outside the area referred to in Article 1(2) of the FCA Regulation.
    g. 'Y-1' means the year before the year of delivery;
    h. 'M-1' means the month before the month of delivery;
    i. Allocation Constraints means the constraints to be respected during capacity allocation to maintain the transmission system within operational security limits and have not been translated into cross-zonal capacity or that are needed to increase the efficiency of capacity allocation;
    j. 'CNTC' means Coordinated Net Transfer Capacity approach for capacity calculation;
    k. 'NTC' means the net transfer capacity that amounts to the maximum total exchange program (MW) for commercial purposes between adjacent bidding zones for each market time unit in a specific direction. NTC is obtained by subtracting the reliability margin from the TTC;
    l. 'TTC' means the total transfer capacity that amounts to the maximum total exchange program (MW) complying with the operational security limits between adjacent bidding zones for each market time unit in a specific direction.
    m. 'Season' means a part of the year with similar weather conditions. For the scope of this document, the year is conventionally composed by two seasons: SUMMER (from the 1st of May till 30th of September) and WINTER (from the 1st of October till the 30th of April).
    n. 'Peak Hours' means the hours from 08.00 at 19.59 from Monday to Friday.
    o. 'Off-Peak Hours' means the hours from 20.00 at 07.59 from Monday to Friday and all hours for Saturday, Sunday.
    p. Season(s) and Peak/Off-Peak Hours(s) can be combined as four Seasonal Period(s):
        i. Winter peak
        ii. Winter Off-peak
        iii. Summer peak
        iv. Summer Off-peak

4. In this LT CCM, unless the context requires otherwise:
    a. the singular indicates the plural and vice versa;
    b. headings are inserted for convenience only and do not affect the interpretation of this 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.

METHODOLOGY FOR LONG-TERM CROSS-ZONAL CAPACITY CALCULATION

Article 3 :
Application of this methodology

This proposal applies solely to the common capacity calculation methodology for long-term within the Italy North Region. For the avoidance of doubt, respective or relevant provisions of this proposal apply to any relevant Technical Counterparty of the Italy North CCR, by virtue of separate contracts as mentioned above in Article 1 :. Common capacity calculation methodologies for long-term within other Capacity Calculation Regions or other timeframes are outside the scope of this proposal.

Article 4 :
Capacity Calculation Approach

1. A statistical approach based on historical cross-zonal capacity for day-ahead or intraday timeframes calculated in a coordinated manner in the Italy North Region is applied in order to properly take into account all sources of uncertainty related to the long-term capacity calculation timeframes.
2. As input for the long-term capacity calculation timeframes, the latest available historical NTC values will be used, coming from either the D-2 or ID CC which are based on the CNTC approach according to the D-2 & ID CCMs, as described in Article 5(2)d.

Article 5 :
Selection of historical day-ahead or intraday cross-zonal capacity data

1. In order to allow the CCC to perform the relevant CCC-FCA process, the following relevant input data shall be gathered:
   a. the allocated NTC time series of the past three years for each border/direction of the TSOs of the Italy North Region and the Technical Counterparty In order to minimize the uncertainty in the allocated NTC timeseries, the most recent NTC sample coming from D-2 and ID capacity calculation processes will be considered for each historical market time unit;
   b. the NTC reductions (maintenance and additional constraint) time series of the past three years for each Italy North and Technical Counterparty's border/direction;
   c. Commissioning date of new investments during the past years for each Italy North and the Technical Counterparty border;
   d. the real time reduction and capacity curtailment time series of the past three years for each border/direction. Such data will be used for filtering out NTC samples affected by reduction in real time and curtailments (for which TSOs will assume that allocated capacity was not secure at all);
   e. Exceptional unplanned outage periods over the past three years. Such data will be used for filtering out NTC samples affected by such exceptional situation;
   f. Additional information linked to the D-2 and ID capacity calculation processes such as red flags, triggering of export corner and process fails time series that will be considered as filtering parameters in the statistical analysis;

2. After the needed inputs described in the Article 5.1 have been gathered, the historical data selection can be applied and summarized as follow:
   a. Create the historical hourly allocated NTC profile and match each sample with the respective hourly NTC reductions (maintenance and additional constraint) and the eventual real time reduction/curtailment, red flags, triggering of export corner and process fails linked to D-2 and ID processes;
   b. Separate the historical allocated NTC profile for each Seasonal Period.
   c. Exclude non-relevant samples which may reflect problems in the calculations which lead to unrealistic results as mentioned in Article 6.1(b).
   d. The time window to be used for statistical analysis is the last three years.

Article 6 : Statistical analysis of historical data

1. Before the duration curve is created, a statistical analysis of historical data is achieved by the following steps below:
   a. The initial dataset for long-term capacity calculation is composed of historical cross zonal capacity values per border in both directions (import and export) as described in Article 5.
   b. All NTC values which correspond to non-representative hours in the Italy North CCR are excluded from the dataset, in particular timestamps impacted by:
      - Allocation Constraints,
      - real time capacity reductions,
      - capacity curtailments,
      - exceptional unplanned outage periods,
      - triggering of export corner
      - D-2 and ID capacity calculation process fails
   c. For each historical NTC value per border, the associated NTC reduction per border (if any) is added in order to obtain a capacity corresponding to a full grid situation (without maintenance which could limit the capacity).
   d. New grid elements commissioned during the historical time window are specifically considered in order to include their impact on the NTC values.
   e. The initial dataset is divided in four different Seasonal Periods.
2. For each Seasonal Period and border/direction, NTC values are ordered to obtain historical Italy North's full grid NTC duration curves.
3. A risk level of 3% is fixed to allow the four values selection of long-term capacity per border for each Seasonal Period.
4. The Italy North TSOs and the Technical Counterparty will perform every year an analysis on the historical data of the applied curtailment over the last three years as already mentioned in the Article

5.2(d). Then, the risk level can be updated by considering the hours in which curtailments have been applied in the time window considered for the statistical analysis.

a. The hourly bilateral NTC reduction profile (which reflects the maintenance plan of the relevant grid elements for the Italy North and the Technical Counterparty bidding zone borders) and the Allocation Constraints profiles for each respective border/direction is computed as follows:

b. The maintenance NTC reduction profile is calculated considering the historical NTC reduction values of unavailability which have been coordinated during the past weekly and monthly Operational Planning Coordination processes;

c. The Low Consumption NTC reduction profile is calculated considering the best hourly forecast the Italy North TSOs and the Technical Counterparty can do at yearly and monthly stage and using the last available information. Such reduction refers to maximum import value linked to voltage regulation and dynamic stability issues that happens during the so-called low consumption hours. Such profile will be provided by each of the Italy North TSOs and the Technical Counterparty per season and border/direction.

d. Each new grid investment will not be considered in the first year of the commissioning. As a consequence, yearly capacity calculation will be 0 for the first year.

5. The new grid investments will be treated taking as a reference its respective D-2 NTC reduction value, calculating a percentage X% of this value to include in the monthly computation. This percentage is defined for each season, period, border and direction as the ratio between the selected long-term capacity value corresponding to a risk level as referred to in Article 6.2 of this methodology and the and the capacity value corresponding to a risk level of 70 %.

   a. Such investment value is added on top of hourly NTC import/export profiles that already consider maintenances and additional constraints.

   b. For each new investment a maintenance plan will be also considered in order to properly compute the new NTC profile for each border/direction also considering when such new elements will be out of service during the delivery period.

Article 7 :
Reliability margin methodology

1. Reliability margin long-term capacity calculation approach is taken into account by statistical assessment based on historical cross-zonal capacity for day-ahead or intraday timeframes calculated in a coordinated manner in the Italy North CCR. Italy North TSOs and the Technical Counterparty shall not apply any additional reliability margin in the long-term market time frames. Since the statistical approach the most recent NTC values between Day-Ahead and Intraday timeframes are considered, the D-2 and ID TRM values are implicitly taken into account, thus covering uncertainties from the real time to D-2/ID timeframes. Then, the definition of a proper risk level covers uncertainties from D-2/ID to yearly and monthly timeframes, related to the volatility of the considered D-2 and ID NTC samples.

Article 8 :
The yearly capacity calculation

1. The hourly profile for the bilateral yearly NTC, as detailed in Annex 1, is computed by considering:
   a. the full-grid NTC value for each season obtained from the statistical analysis after fixing the risk level.
   b. the hourly bilateral NTC reductions profile (which reflect the hourly outage planning impact on the yearly profile as described in the Article 6.4 of this proposal) and the hourly Allocation Constraint profile coordinated during the yearly OPC process.
   c. Once the effect of a new grid investment is calculated for each season and border/direction, its respective investment value is added on top of hourly NTC import/export profiles that already consider maintenances and additional constraints, as described in Annex 1. For each new investment a maintenance plan will be also considered in order to properly compute the new NTC profile for each border/direction.
2. For the statistical analysis, new grid investments are considered as out of service as described in Article 6 :.5.

Article 9 :
The monthly capacity calculation

1. The monthly timeframe statistical methodology aims at updating the yearly NTC profile already described in the previous paragraphs. As detailed in Annex 1, the monthly NTC profile, will be calculated considering as follows:
   a. The yearly seasonal “full-grid” NTC values: the monthly “full-grid” seasonal NTC will be the value of the corresponding Seasonal Period already calculated in the yearly statistical methodology by fixing a proper risk level.
   b. An updated version of planned maintenance calendar and related NTC bilateral reductions given by OPC processes: in this way it is possible to update the previous yearly NTC profile by considering possible variations in the yearly planned and “extraordinary” out of service combinations.
   c. Recalculated Additional Constraints values based on most updated input data.
2. In the case of the first year of commissioning of a new grid investment, characterised by the absence of previous historical data provided by the D-2 & ID computations, the monthly profile including the new investment(s) is created as follows:
   a. The NTC reduction linked to the unavailability of existing elements and new grid investments has been coordinated during the past yearly, monthly and weekly OPC Processes.
   b. Since the first monthly capacity calculation after the commissioning of the new grid investment, an additional NTC value associated to the new grid investment will be added to the NTC profile as described in Article 6 :.

Article 10 :
Cross-zonal capacity validation methodology

1. In accordance with Article 15 of the FCA Regulation, referring to Article 26 of the CACM Regulation, the Italy North TSOs and the Technical Counterparty shall coordinate the validation and the right to correct cross-zonal capacity relevant to the Italy North TSO's BZBs for reasons of operational security during the validation process. In exceptional situations cross-zonal capacities can be reduced by all Italy North TSOs and the Technical Counterparty. These potential situations are at least:
   a. an occurrence of an exceptional contingency or forced outage as defined in article 3 of the SOGL Regulation;
   b. an occurrence of a mistake in the input data, that leads to an overestimation of cross-zonal capacity from an operational security perspective.
2. In each quarterly report, the Italy North CCC shall publish on the reductions of cross-zonal capacity, separately for coordinated and individual validations. The quarterly report shall include at least the following information:
   a. the identification of exceptional contingencies or forced outages;
   b. the volume of reduction of cross-zonal capacity;
   c. the detailed reason(s) for reduction.
3. The Italy North CCC shall coordinate with neighbouring CCCs during the validation process, where at least the reductions in cross-zonal capacity are shared among them. The Italy North CCC shall provide to Italy North TSOs and the Technical Counterparty any information on decreased cross-zonal capacity from neighbouring CCCs. Italy North TSOs and the Technical Counterparty may then apply the appropriate reductions of cross-zonal capacities as described in Article 15(1).

FINAL PROVISIONS

Article 11 :
Fallback procedures

1. If the CCC fails to provide the yearly capacity in due time each TSO of Italy North Region and the Technical counterparty should determine the yearly NTC for its relevant borders on their own. Finally, the lower of both NTC values is chosen per border.
2. If the CCC fails to provide the monthly capacity in due time each TSO of Italy North Region and the Technical Counterparty should determine the monthly NTC for its relevant borders on their own taking into account the yearly NTC and the changes in the outage planning, if any. Finally, the lower of both NTC values is chosen per border.

Article 12 :
Publication and Implementation of the CCC-FCA methodology Proposal

1. The TSOs of Italy North Region and the Technical Counterparty shall publish the LT CC methodology proposal without undue delay after all NRAs have approved the proposed LT CC methodology or a decision has been taken by ACER in accordance with Article 4(9) of the FCA Regulation.
2. The TSOs of Italy North Region shall start implementing this LT CC methodology proposal as soon as the NRAs of the Italy North Region approve it and will complete the implementation process no later than 12 months after approval. The same obligation shall apply to the Technical Counterparty pursuant to an agreement according to Art. 1 of this methodology. The implementation process shall consist of the development of the appropriate IT tools and infrastructure, design of operational processes and at least an internal test and external parallel run if applicable.
3. Once the LT CC methodology proposal is implemented, the TSOs of the Italy North region and the Technical Counterparty will publish the following information before each long-term auction:
    a. the duration curve of the yearly and monthly NTC full grid profile relevant to determine the long-term capacity, highlighting the value associated to the chosen risk level;
    b. the NTC bilateral hourly profile for both yearly and monthly timeframes, computed starting from NTC full grid and by deducting maintenances and adding new investments; maintenances profile (along with the associated outages) and new investments profile (along with the associate network reinforcements) shall be made available.
4. The TSOs of Italy North Region and the Technical Counterparty shall publicly make available the following reports:
    a. a yearly report issued by mid-December Y-1, providing the distribution of the samples relevant for long term capacity calculation in Y, the chosen risk level and the appropriate justifications, the correction to the samples to take into account historical planned outages and the new investments, the estimated profile of future planned outages in Y and the estimated profile of allocation constraints;
    b. a yearly report issued by January Y+1 comparing the estimated profile of planned outages and allocation constraints adopted for long term capacity calculation with the effective profile of such outages and constraints occurred in Y;

c. a specific report to be sent in case a fallback procedure is triggered either in yearly or monthly capacity calculation.

Article 13 :
Improved efficiency of statistical approach

According to FCA Regulation Art 10.4(b), the long-term capacity calculation methodology in the Italy North CCR increases the economic efficiency of the capacity calculation. The uncertainties in long-term cross-zonal capacity calculation are better addressed with the same level of system security:

a. The statistical approach directly benefits from the better forecasts in the short-term process, whenever an improvement on short-term CCM is implemented.
b. The same high level of firmness for a scenario-based approach would lead to a higher reliability margin value and consequently a lower final capacity than the statistical approach, as described in Annex 2.
c. Italy North TSOs and the Technical Counterparty are obliged to use reference scenarios (in accordance with FCA Regulation). Such scenarios only refer to ad-hoc cases created for the whole continental Europe and referring to generic scenarios, but do not represent any situations which may be meaningful for a long-term CC in the Italy North CCR. This could possibly lead to reduced capacities in the region. To cover such specific cases, several additional scenarios for NTC calculation would be needed and approved at ENTSO-E level with the process in force.
d. An improvement on the reference scenarios, supposed to be congestion free, is always necessary. As a consequence, the Remedial Action Optimization process would have to be adapted for the long-term timeframe, which requires an unreasonable technical effort, as shown in cost estimations in Annex 1. Besides, the availability of the remedial actions applied during real-time is difficult to ensure so far ahead.

Article 14 :
Language

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

Annex 1

High level business processes: Yearly and Monthly capacity calculation

The business process is described as follows:

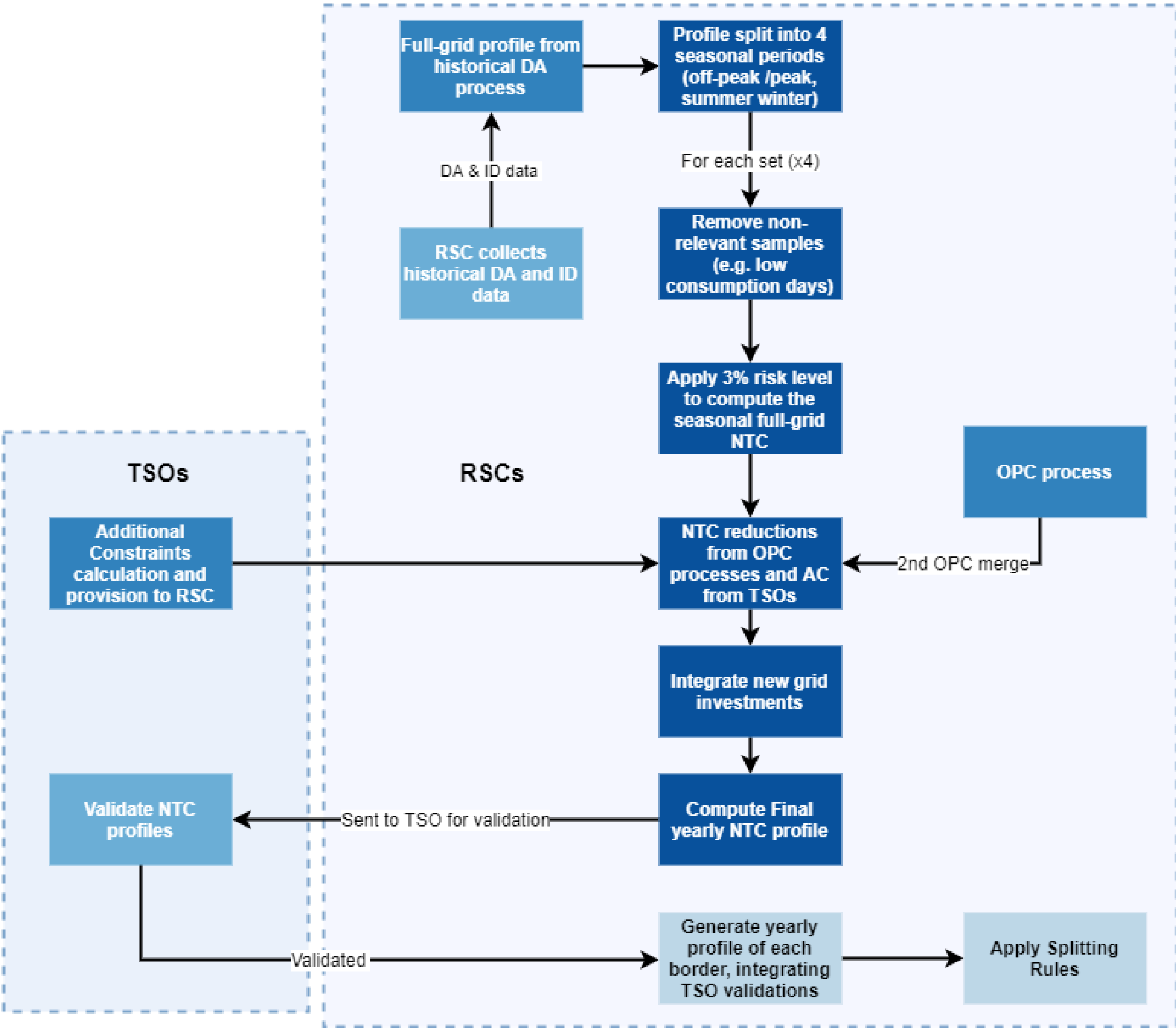

Figure 1: High-Level Business Process of the yearly capacity calculation

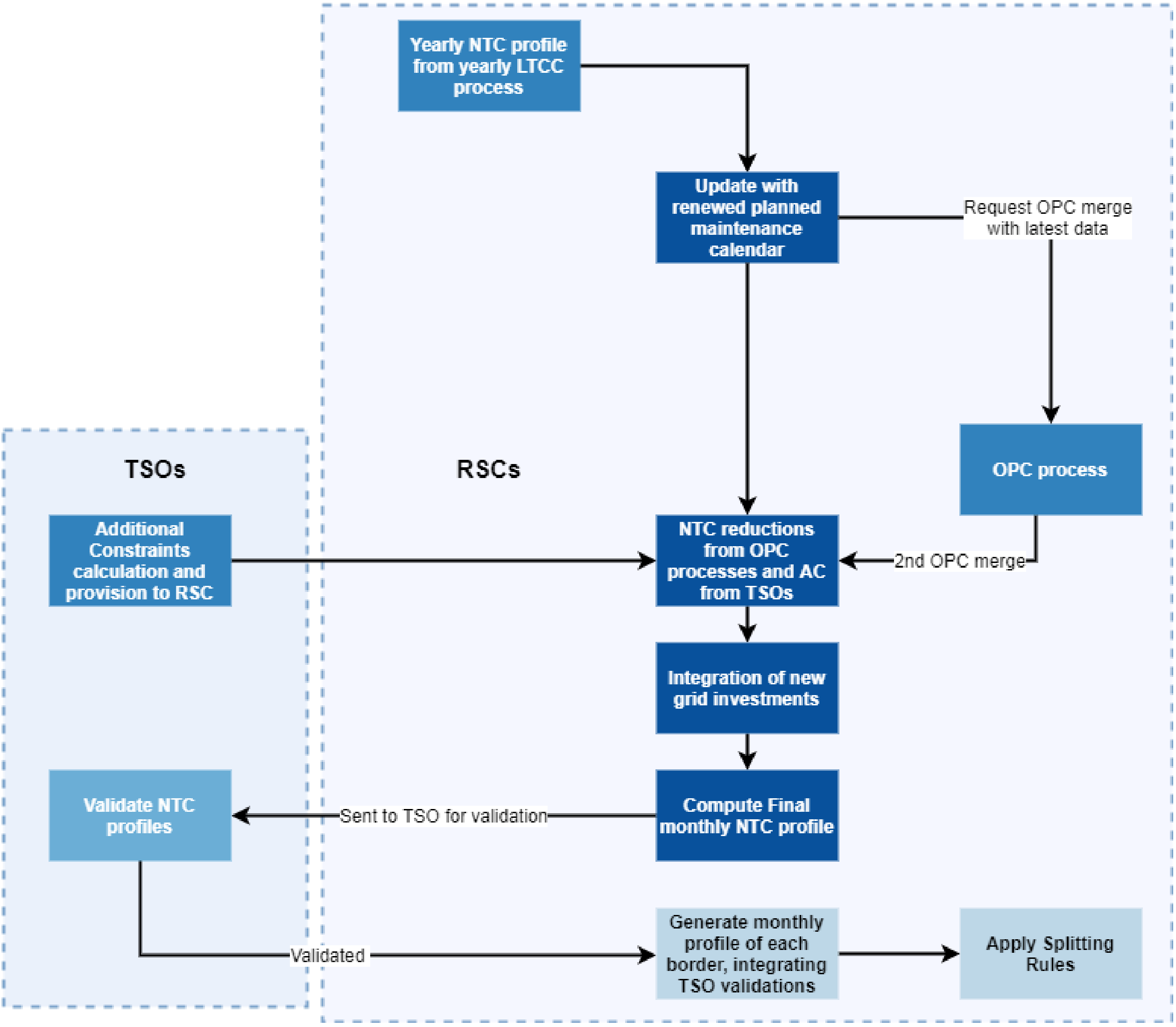

Figure 2: High-Level Business process of the monthly capacity calculation

Statistical analysis of historical data

Building of historical full-grid NTC duration curve

Before that the duration curve creation is done, a statistical analysis of historical data is achieved following the computation steps below:

1. The initial dataset for long-term capacity calculation is composed of historical cross zonal capacity values per border in both directions (import and export) as described in Article 5 :.
2. All NTC values which correspond to a non-representative hour in the Italy North CCR (i.e. Italian Low Consumption Periods, real time capacity reductions, capacity curtailment and capacity calculation process failed) are excluded from the dataset.
3. In order to make all NTC samples comparable in the statistic, the values are converted to full-grid values. The conversion is performed by adding to the final NTC the value of the daily NTC reductions corresponding to the outages planned for each hour of the past days:

$$NTC_{final,full-grid,h} = NTC_{final,h} + NTC_{daily\ reduction,h} \quad (1)$$

Where $NTC_{final,h}$= final Italy North NTC or bilateral NTC given to the market for the generic hour "h" and $NTC_{daily\ reduction,h}$ = total or bilateral daily NTC reduction for the generic hour "h" of the past years. In this way all the hourly NTC values theoretically refer to a grid without any outage (see Figure 3).

1. Once the full-grid NTC profile has been obtained, all the samples are ordered in a duration curve (from the lowest one to the highest one), thus creating seasonal full-grid NTCs curve as function of the selected risk level (see Figure 4).
2. The risk level is defined as the percentage of time where the actual NTC is lower than the determined value, i.e. in the timeframe of X% TSOs will not be able to guarantee the computed NTC. When the risk level is higher, the chance increases the computed NTC values are not reached, being lower level of firmness.

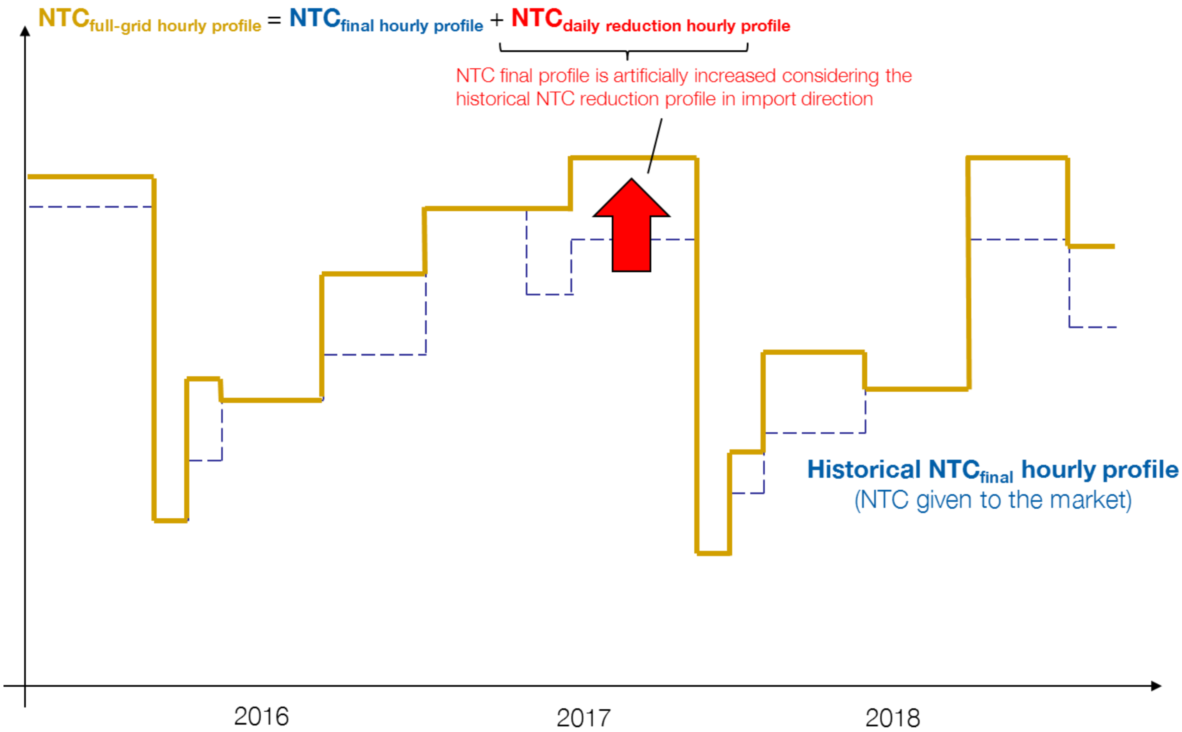

Figure 3: historical full-grid NTC hourly profile computation considering a time window 2016-2018

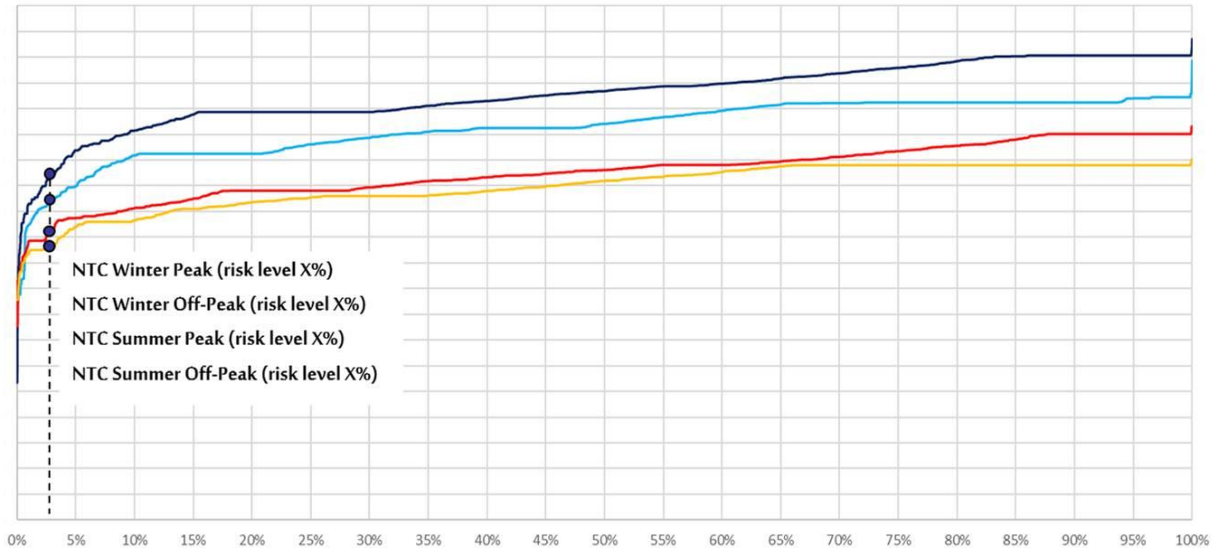

Figure 4: Duration Curve computed for the four Seasonal Periods

New grid investments

The new grid investments will be treated by taking into account NTC increase value already defined with the identified NTC reduction value for each New Grid Investment during the operational planning processes (e.g. OPC). Samples before the commissioning date shall be treated as cases with "New Grid Investments out of service" for which the above-mentioned New Investments' NTC reductions has to be added on top of the final NTC given to the market (as already done for normal out of services cases to obtain the full-grid profile).

$$I_{\text{value}} = NTC_{red,new\ grid\ investment} \quad (2)$$

Treatment of Go Live of new grid elements for the yearly/monthly profile computation

Yearly profile computation: The New Investment Value(s) shall not be considered in the first year of commissioning.

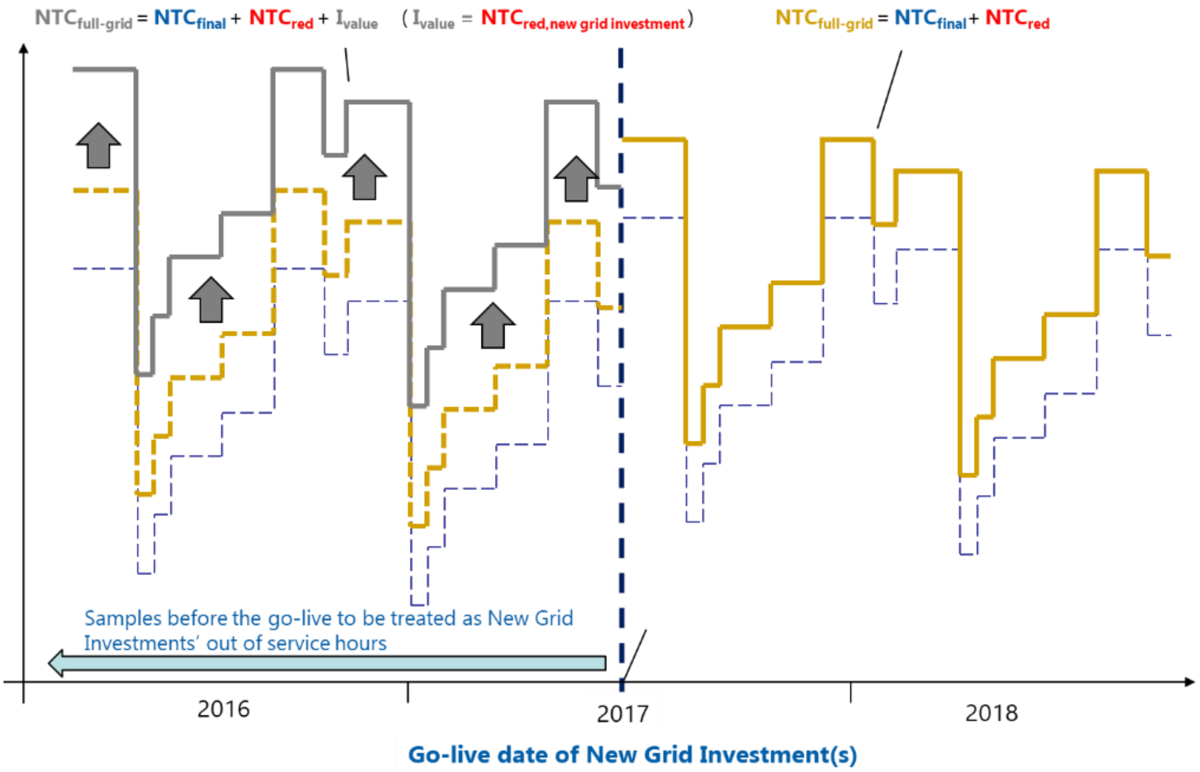

Figure 5: Treatment of New Grid Investment(s) after and before its respective Go-Live date in the historical data

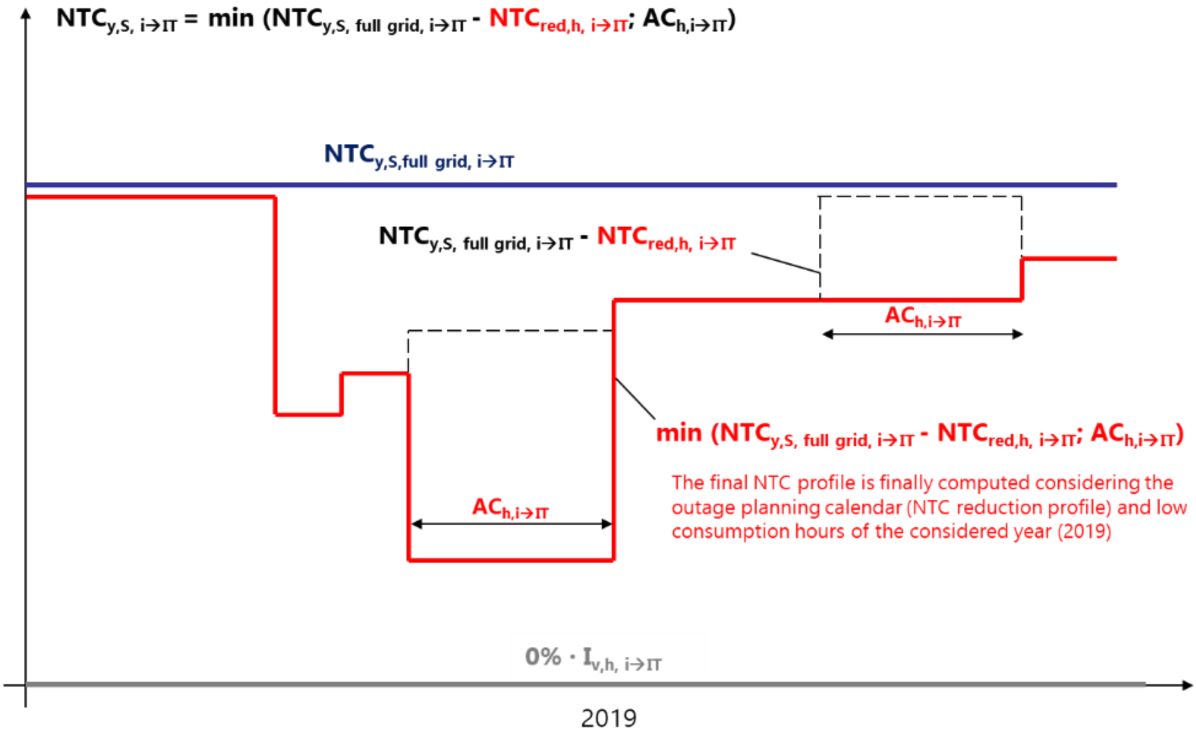

Figure 6: Treatment of Go Live of New Grid Investment(s) for the yearly profile computation.

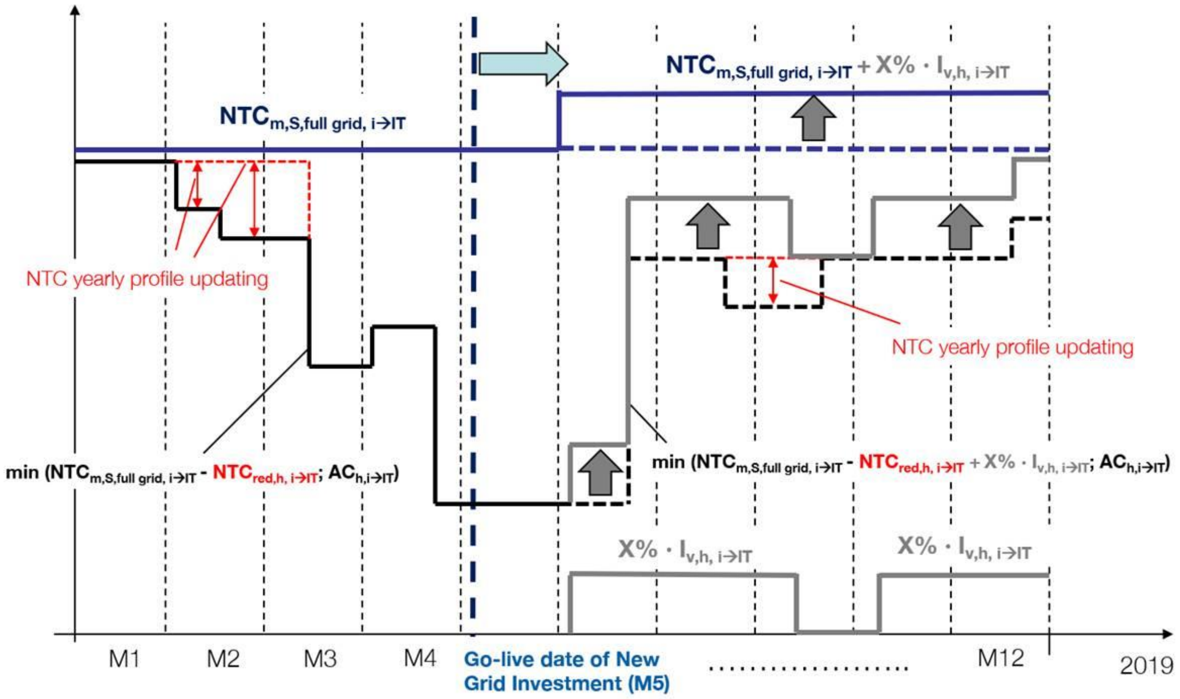

Figure 7: Treatment of Go Live of New Grid Investment(s) for the monthly profile computation

Monthly profile computation: The X% of the New Investment's Value shall be considered in the months after the commissioning until the end of such year. The monthly New Investment's value shall be a percentage of its respective NTC reduction value that should be available at that time (value already agreed among respective operational planning departments and already used during the D-2 processes of the previous weeks/months).

The X% of the New Investment's Value shall be considered in the months after the commissioning until the end of such year. The monthly New Investment's value shall be a percentage of its respective NTC reduction value that should be available at that time (value already agreed among respective operational planning departments, coordinated through the previous weekly/monthly OPC processes and already used during the D-2 processes of the previous weeks/months).

The New Grid Investments' NTC reductions values originate from the operational planning and D-2 process of the previous considered years. Due to lack of historical values of the New Grid Investment, these values are not proven as secure in all situations to come since operational conditions could change radically in the future. Chosen portion of X% for the consideration of the New Grid Investments is thus based on the consideration that the long-term Investment Values are supposed to cover at least 30% of the cases, hence associated to a risk level of 70%. In order to associate a duration curve to each New Grid Investments value, the following monthly factor is computed as a function of the risk level (RL):

$$k_{m,S,i\to IT}(RL) = \frac{NTC_{m,full-grid,S,i\to IT}(RL)}{NTC_{m,full-grid,S,i\to IT}(RL=70\%)} \quad (3)$$

Where:

- m = month of the computation
- S = season Winter Peak/Off-Peak and Summer Peak/Off-Peak
- RL = risk level
- $NTC_{m,full-grid,S,i\to IT}(RL)$ = seasonal full-grid NTC of a generic border

i for a generic risk level and $k_{m,S,i\to IT}(RL)$ represents the seasonal full-grid NTC duration curve of a generic border i→IT normalized on the corresponding long-term capacity value with a risk level of 70%. Figure 8 shows the factor curve as a function of the selected risk level.

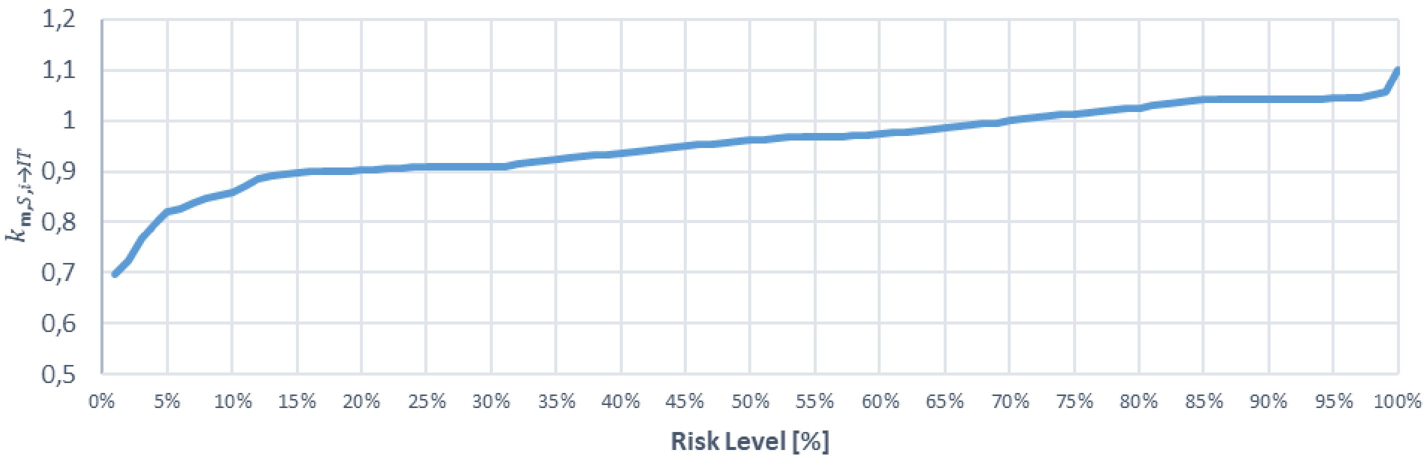

Figure 8 : Duration curve of $k_{m,S,i\to IT}$ factor

For the monthly computation of month m, the New Grid Investments value duration curve is defined as follow:

$$X_m\%(RL) = k_{m,S,i\rightarrow IT}\,(RL) * 100 \tag{4}$$

$$Iv_{m,S,i\rightarrow IT}(RL) = \frac{X_m\%(RL)*NTC_{red,new\ grid\ investment,i\rightarrow IT}}{100} \tag{5}$$

Where:

- m = month of the computation
- S = season Winter Peak/Off-Peak and Summer Peak/Off-Peak
- RL = risk level, $NTC_{red,new\ grid\ investment,i\rightarrow IT}$ = D-2 Investment NTC reduction on the border i→IT
- $Iv_{m,S,i\rightarrow IT}(RL)$ = seasonal Investment Value duration curve for a generic risk level on the border i→IT.

Then, the New Grid Investment chosen portion X% for each season, period, border and direction is defined as follows:

$$X_m\% = k_{m,S,i\rightarrow IT}\,(RL = 3\%) * 100 \tag{6}$$

$$Iv_{m,S,i\rightarrow IT}(RL = 3\%) = \frac{X_m\%(RL=3\%)*NTC_{red,new\ grid\ investment,i\rightarrow IT}}{100} \tag{7}$$

In this way, the chosen Investment value for the monthly computations presents a level of firmness equivalent to the one of the selected long-term capacity value corresponding to a risk level of 3%: $NTC_{y,full-grid,S,i\rightarrow IT}(RL = 3\%)$ (see example in Figure 9).

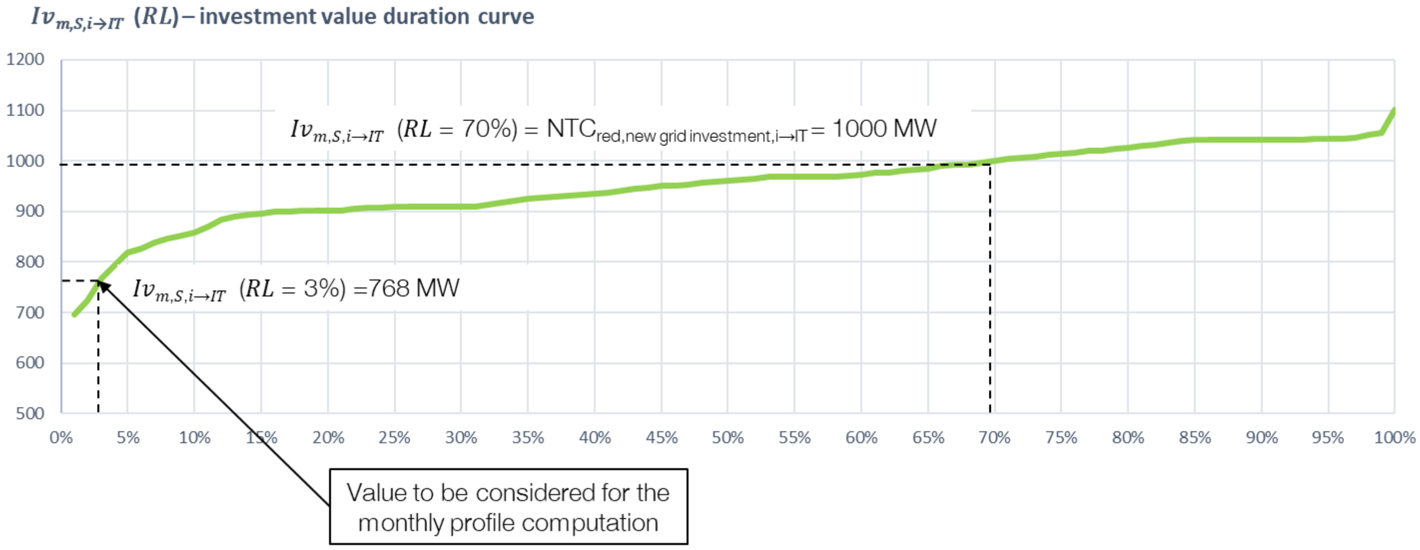

Figure 9 : Example of new grid investment duration curve (as function of Risk Level), considering a $NTC_{red,new\ grid\ investment,i\rightarrow IT}$ = 1000 MW.

The yearly capacity calculation

The hourly NTC profile computation for the yearly timeframe

The hourly profile for the Bilateral NTCs is computed by considering the hourly bilateral NTC reductions profile of the hourly Low Consumption profile as follow:

$$NTC_{y,h,IT\rightarrow i} = \min(NTC_{y,full-grid,S,IT\rightarrow i} - NTC_{red,h,IT\rightarrow i}\ ;\ AC_{h,IT\rightarrow i}) \quad (8)$$

Where $NTC_{y,full-grid,S,IT\rightarrow i}$ = yearly "full grid" NTC of a generic border i and generic season/period S (value obtained from the duration curves after fixing the risk level), $NTC_{red,h,IT\rightarrow i}$ = NTC reduction value for the generic border i and hour h (which reflect the hourly outage planning) and $AC_{h,IT\rightarrow i}$ = Allocation Constraint planned for the generic border i and the generic hour h (see Figure 10).

For each hour, the NTC reduction values are determined taking into account the latest updates from the OPC process.

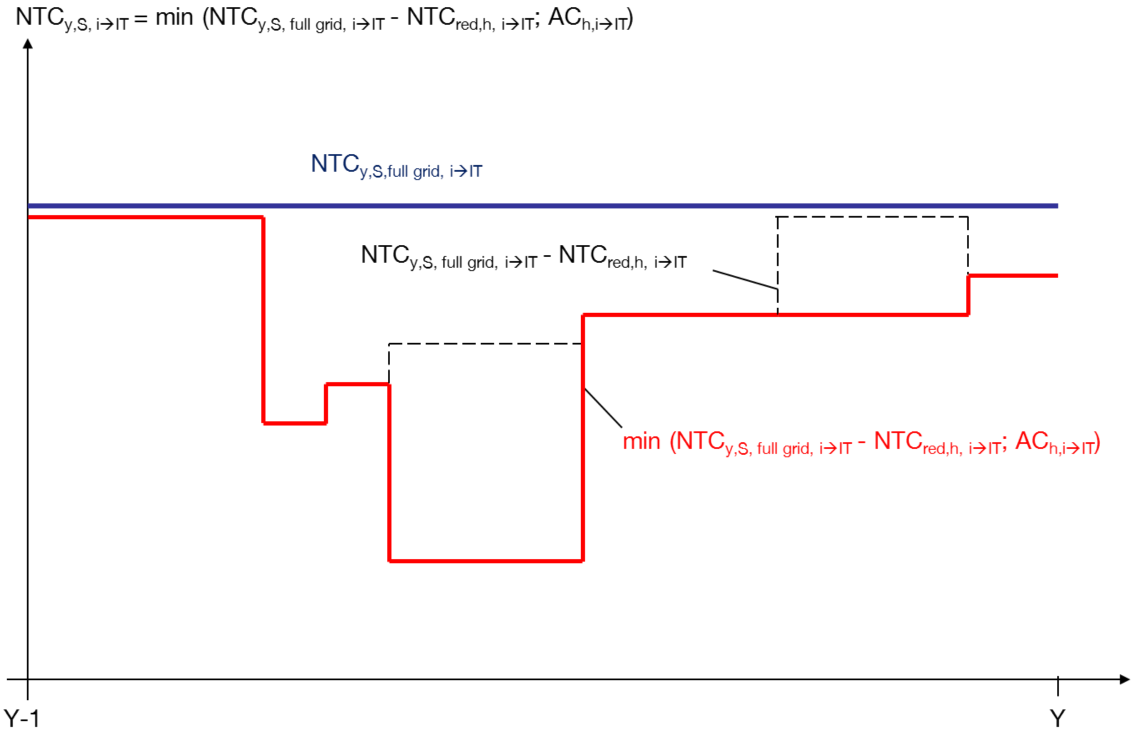

Figure 10 : Example of bilateral NTC seasonal yearly product calculated by considering the bilateral "full grid" seasonal NTC (flat value for the entire season/period), the bilateral hourly NTC reductions and bilateral hourly Allocation Constraint profiles.

The hourly NTC profile modification to consider the effect of new grid investments

Once the effect of a new grid investment is calculated for each season and border/direction, its respective investment value is added on top of hourly NTC import/export profiles that already consider maintenances and Allocation Constraints, as shown in Figure 5.

For each new investment a maintenance plan will be also considered in order to properly compute the new NTC profile for each border/direction also considering when such new elements will be out of service during the delivery period.

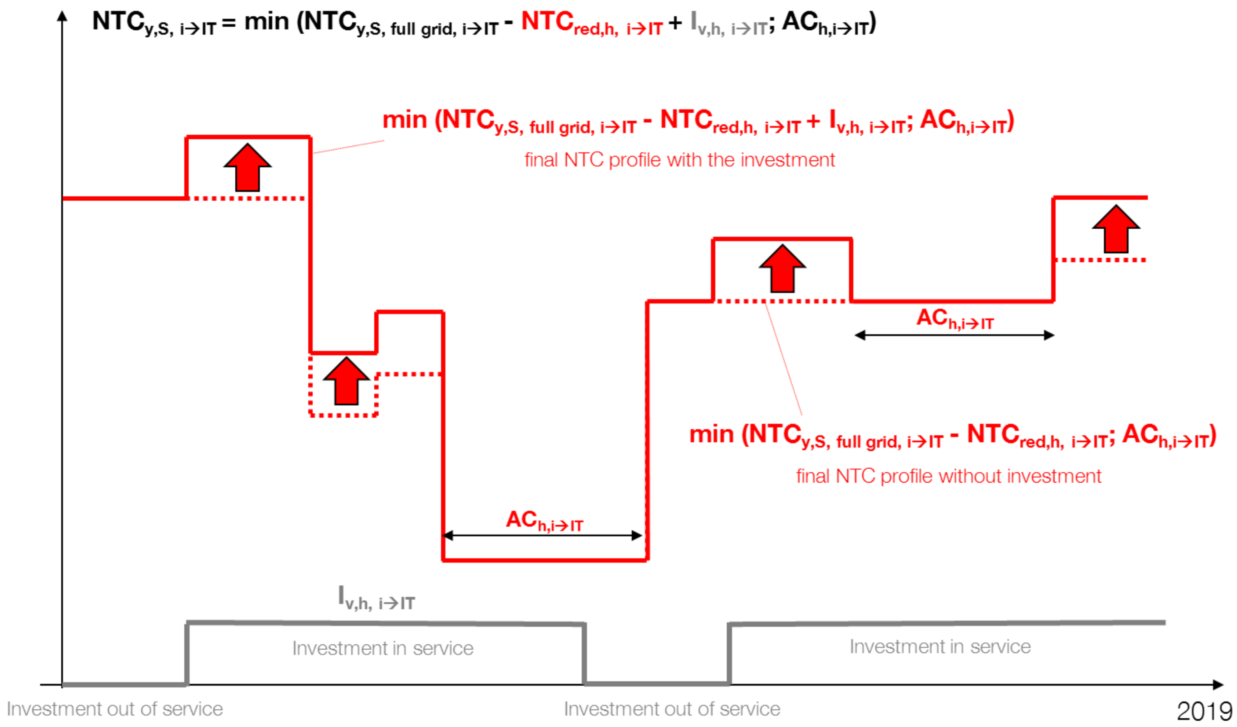

Figure 11 : Final NTC hourly profile computation considering the general inclusion of a new grid investment and its hourly Investment value profile (according its availability plan).

The monthly capacity calculation

The hourly NTC profile computation for the monthly timeframe

The monthly timeframe statistical methodology aims at updating the yearly NTC profile already described in the previous paragraphs. In other words, the monthly NTC profile will be calculated by considering:

The yearly seasonal "full-grid" NTC values: the monthly "full grid" NTC will be the value of the corresponding Seasonal Period already calculated in the yearly statistical methodology by fixing a proper risk level.

$$NTC_{m,full-grid,S,i\rightarrow IT} = NTC_{y,full-grid,S,i\rightarrow IT} \quad (9)$$

1. Where S= season Winter Peak/Off-Peak and Summer Peak/Off-Peak, $NTC_{y,full-grid,S}$ = seasonal full-grid NTC for a fixed risk level.

   An updated version of planned maintenance calendar and related NTC bilateral reductions: in this way it is possible to update the previous yearly NTC profile by considering possible variations in the yearly planned and "extraordinary" out of service combinations.

$$NTC_{m,h,i\rightarrow IT} = NTC_{m,full-grid,S,i\rightarrow IT} - NTC_{red,h,i\rightarrow IT} \quad (10)$$

2. Where $NTC_{m,h,i\rightarrow IT}$ = hourly NTC profile obtained by deducting the hourly NTC reduction profile from the monthly "full-grid" NTC and $NTC_{red,h,i\rightarrow IT}$ = hourly NTC reduction profile.

   Recalculated Allocation Constraints values based on most updated input data.

3. $NTC_{m,h,i\rightarrow IT} = \min(NTC_{m,full-grid,S,i\rightarrow IT} - NTC_{red,h,i\rightarrow IT}\ ;\ AC_{h,i\rightarrow IT})$
   Where $NTC_{m,full-grid,S,i\rightarrow IT}$ = monthly "full grid" NTC of the generic border and the generic season S, $NTC_{red,h,i\rightarrow IT}$ = hourly NTC reduction profile of the generic border (eventually updated in the monthly process) and $AC_{h,i\rightarrow IT}$ = hourly Allocation Constraint profile of the generic border.

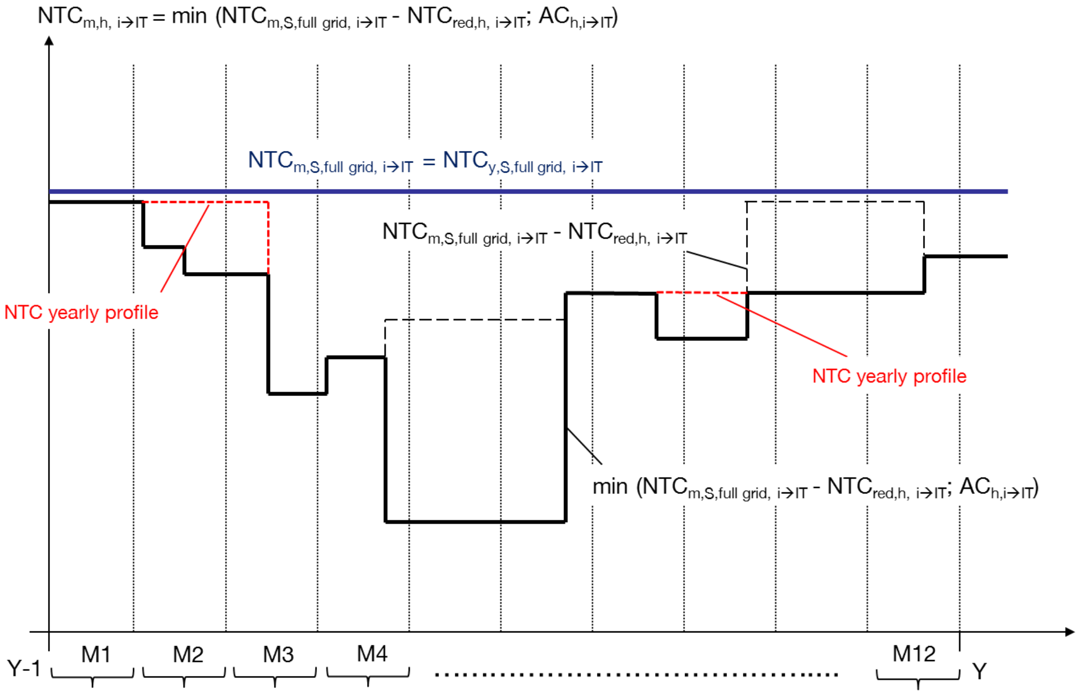

Figure 12: Example of bilateral NTC season/period monthly product calculated by considering the bilateral "full grid" season/period NTC (flat value for the entire winter peak period), the bilateral season/period NTC reductions (based on the updated monthly planned maintenance calendar) and the updated bilateral Low Consumption profile

Annex 2

Improved efficiency of statistical approach

According to FCA Regulation Art 10.4(b), the following requirements are set for using a statistical approach by the TSOs of the Italy North Region and Technical Counterparties:

I. Increase the efficiency of the capacity calculation methodology
II. Better take into account the uncertainties in long-term cross-zonal capacity calculation than the security analysis in accordance with paragraph 4(a)
III. Increase economic efficiency with the same level of system security

Qualitative Argumentations

The following paragraphs list the main arguments in a qualitative manner to show a statistical approach is more beneficial than a scenario-based approach.

Initiating a process for creating satisfactory scenarios for Italy North would require significant resources and incur delays in the planning. The TSOs of the Italy North Region and Technical Counterparties would have to find an agreement with all ENTSO-E TSOs in order to create additional time stamps, which would be useful for the Italy North region. This would lead also to a higher effort of the ENTSO-E TSOs side.

As part of a preliminary experimentation exercise and using the common all TSOs' winter scenario for 2019, the models were found to be pre-congested. This resulted in problems with convergence of the load-flow analysis and to very low or even non-existing long-term capacities for the borders in Italy-North Region. As a consequence, a special process step for a base case quality improvement would be required in the LTCCM.

Likewise, the firmness of the capacities is important for the long-term capacities, ensuring a high level of firmness for a scenario-based approach would result in a high TRM/FRM value, which would result in lower capacities. Moreover, the scenario based approach would need to define a robust and statistically valid methodology for the TRM/FRM calculation since the reference scenarios, being specific and artificially created cases, do not cover all possible situations which may happen over long timeframes (e.g. all possible hours of a year/month and impossibility to have meaningful long term forecasts of variable such as renewable sources and load). Therefore, the TSOs of the Italy North Region and Technical Counterparties will need to define a statistical methodology for the TRM/FRM calculation regardless of the approach chosen. This has to be carried out in parallel with the scenario-based process developments, thus increasing TSOs and RSCs' workload and leaving the scenario-based calculations without significant added value.

Finally, the scenarios are not fully representative for the Italy North region and they would not always capture all Italy North Region particularities (like different flow distribution on Italy North borders linked to the influence of the external CCRs).

Moreover, a statistical long-term CC approach would directly benefit from the better forecasts in the short-term process, each time an improvement on short-term CCM is implemented (based on the Day Ahead and Intra Day results).

The following paragraphs list the main arguments in a quantitative manner to show that statistical approach is more beneficial than a scenario-based approach.

In particular, TSOs of the Italy North Region and Technical Counterparties performed an experimental scenario-based computation, using the ENTSO-E Winter Peak reference model of 2019, in order to:

- Compare scenario based and statistical capacity values
- Assess the quality level of the ENTSO-E reference models to be used for the scenario-based computation
- Assess the reliability and firmness of the calculated scenario-based capacity

The ENTSO-E Winter Peak reference model of 2019 has been used to perform such analysis and the following issues have been noticed:

- The used model had a very low quality in terms of reactive power and voltage regulation settings of some generators. Such issues caused divergence of the load flow calculation algorithm. Hence, the TSOs had to manually improve such model before starting the scenario-based capacity calculation. In a hypothetical automatic scenario-based process, such poor input data quality would have resulted in a LTCC process fail;
- After the application of the above-described improvements, the N-1 security analysis has been performed monitoring the Italy North CNEC list, resulting in a pre-congested model, mainly due to the random PSTs and bus-bar couplers settings which affected the yearly reference scenario. In such model, the tie-line Lienz-Soverzene between Austria and Italy was pre-congested in N and N-1 state due to uncoordinated settings of the PSTs in Lienz (Austria), Divaca (Slovenia) and Padriciano (Italy) sub-stations;
- Such pre-congestions resulted in a very low calculated TTC value of 5735 MW, which has been calculated without optimizing Remedial Actions, being their availabilities and real-time application very difficult to ensure so far ahead.
- The full-grid scenario based NTC of 5235 MW, obtained by deducting the current D-2 TRM value of 500 MW to the calculated TTC, has been compared with the statistical full-grid winter peak value obtained by fixing the risk level of 3%, as described in the Art. 6(2) of this methodology (see Figure 13). Such comparison has shown a scenario-based capacity 1424 MW lower than the statistical NTC with the selected risk level of 3%.
- Moreover, such comparison has been performed without considering a robust and statistically valid methodology for the long-term TRM calculation (for sake of simplicity the same TRM as in D-2 has been considered). Therefore, being the year and month ahead uncertainties higher than the D-2 or ID ones and since the reference scenarios do not cover all possible situations which may happen over long timeframe, to ensure a high level of firmness for the computed scenario-based capacity a higher TRM values would have been set, with a consequent lower capacities.

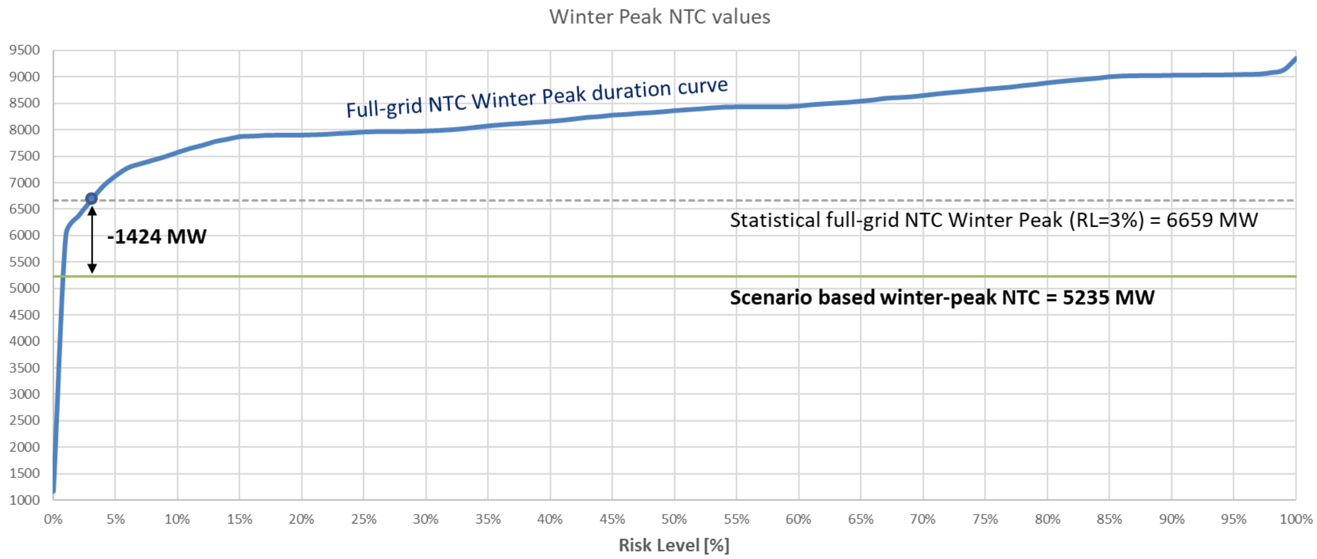

Figure 13: comparison between the scenario based and statistical NTC values.

Net position forecast dependency

In addition, the influence of other countries on the Italy North capacity calculation process has been investigated using again the ENTSO-E Winter-Peak reference model of 2019. This analysis was performed by changing the Net Position (NP) forecast of Germany.

In this case, only the Winter Peak period is considered With the Remedial Actions (WRA). A positive variation of the NP of France to Germany illustrates an increase of the exchange from Germany to France. A negative one, depicts an increase of the exchange from Germany to France.

The ENTSO-E reference scenario has a French NP of +10575 MW and a German NP of + 6655 MW. The total NTC value for Italy North region is 9985 MW. The Table 1, page 31, shows the global picture of this test case. When the Δ shift between France and Germany decreases from -1000 MW to -3000 MW, the total NTC value decreases too but the limiting element does not change.

On the contrary, the increasing of Δ shift from 0 to +1000 MW will increase the total NTC of Italy North region while, the continuous increasing of the Δ from +1000 MW to + 4000 MW will lowered the final NTC value and make the tie line couple Riddes-Valpelline #Albertville-Rondissone 1&2 the new limiting element (see Figure 14).

To conclude, with this small example, we have a better idea of non-Italy North Country on the CCR. The only acceptable value of Δ variation is between 0 + 3000 MW of NP position increasing since it does not affect considerably the final NTC of Italy North region. The detail impact on the limiting element Soazza-Bulciago is illustrating in the second graph next page.

Table 1 : NTC value comparison with variation Delta shift (NP-FR>NP-DE)

FR NET POSITION	**+ 7704**	**+ 9632**	**+ 10575**	**+ 11535**	**+ 13567**	**+ 14529**
DE NET POSITION	+ 9412	+ 7576	+ 6655	+ 5714	+ 3776	+2802
Δ shift (NPFR>NPDE)	-3000	-1000	REFERENCE STUDY	1000	3000	4000
Full Grid Situation	**Winter Peak WRA**	**Winter Peak WRA**	**Winter Peak WRA**	**Winter Peak WRA**	**Winter Peak WRA**	**Winter Peak WRA**
Limiting Element	**Soazza-Bulciago #Robbia-Bulciago/ SanFiorano**	**Soazza-Bulciago #Robbia-Bulciago/ SanFiorano**	**Soazza-Bulciago #Robbia-Bulciago/ SanFiorano**	**Soazza-Bulciago #Robbia-Bulciago/ SanFiorano**	**Riddes-Valpelline #Albertville-Rondissone 1&2**	**Riddes-Valpelline #Albertville-Rondissone 1&2**

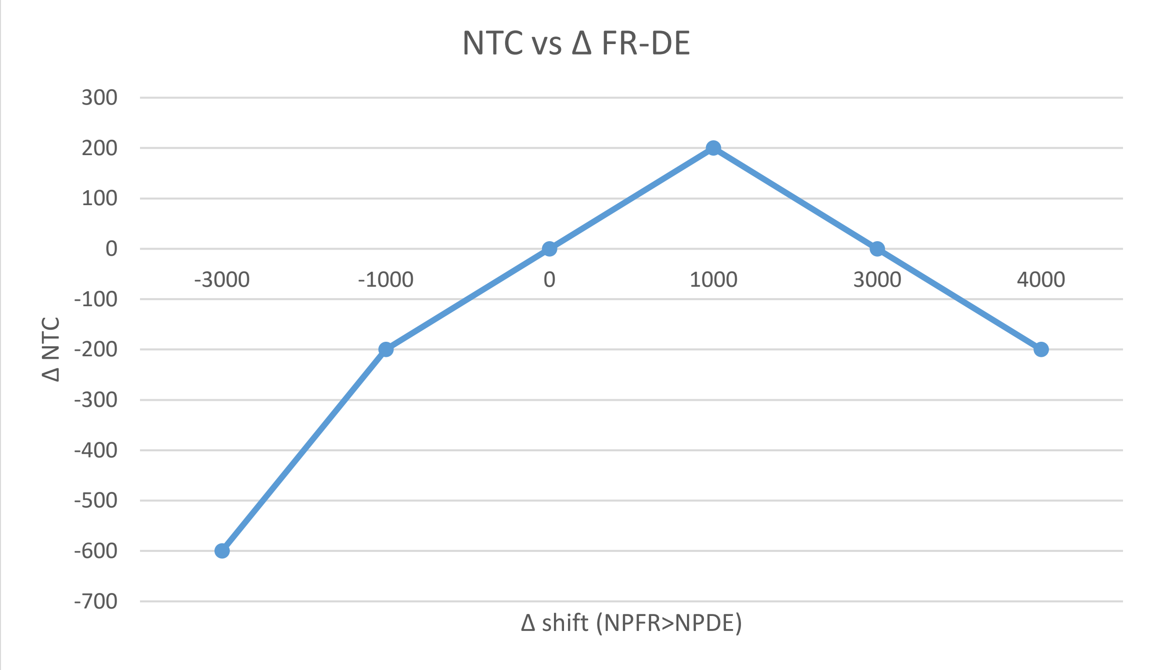

Figure 14: NTC value with Delta shift variation

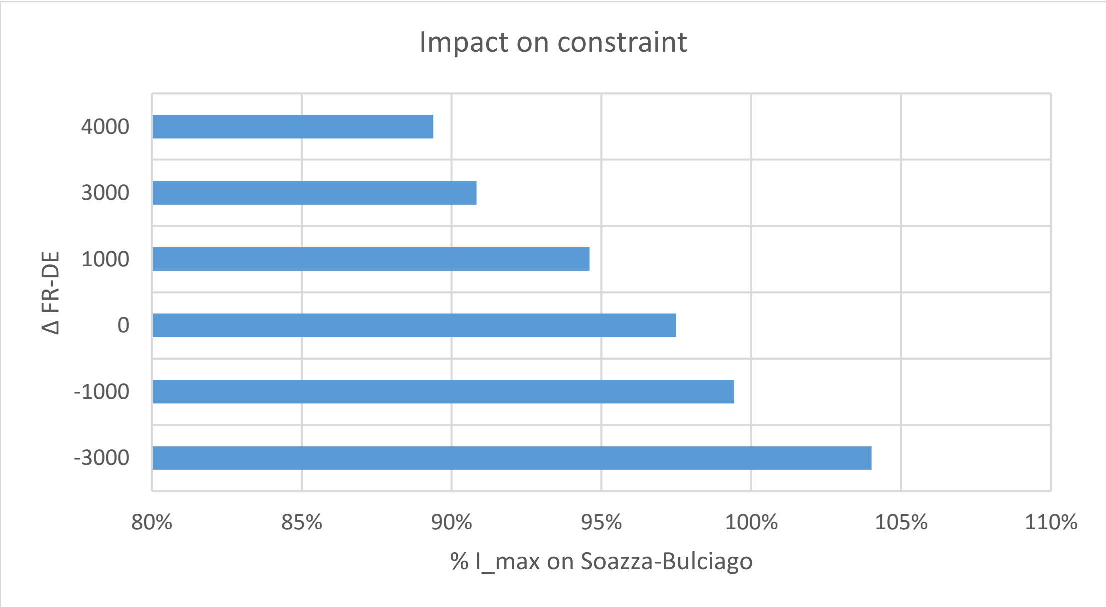

Figure 15: The impact of FR→DE exchange variation on the initial critical network element ***Soazza-Bulciago***

Incremental Cost estimation

The cost estimation is based on the additional amount of workload for IN TSOs and also for ENTSO-E TSOs in case a scenario based approached would be chosen for the IN region (see Table 2 below). The analysis has been developed estimating the effort, given in equivalent Man Day (MD), necessary for the development of the capacity calculation process with a scenario based and a statistical approach. The cost comparison between the two approaches is given in Table 2.

Table 2 : Cost estimation for different approaches in details (MD = Man Day)

Tasks	**Scenario-based approach**		**Statistical approach**	
	MD RSCs	**MD TSOs**	**MD RSCs**	**MD TSOs**
1. 4 additional scenarios for IN region				
a. ENTSO-E scenario CGM gathering	3	600[1]	0	0
b. Specific Italy North scenario building			0	0
c. Validation of specific scenarios by other CCR			0	0
2. Base case improvement	20	25	0	0
3. Integration of full year D-2&IDCC data	5	5	5	5
4. Definition of risk level	0,5	5	0,5	5
5. Integration of planned outages	0,5	10	0,5	5
6. TRM computation	20	25	0	0
7. TSO LT Capacity validation	0	25	0	5
Total FTE (MD)	**49**	**695**	**6**	**20**

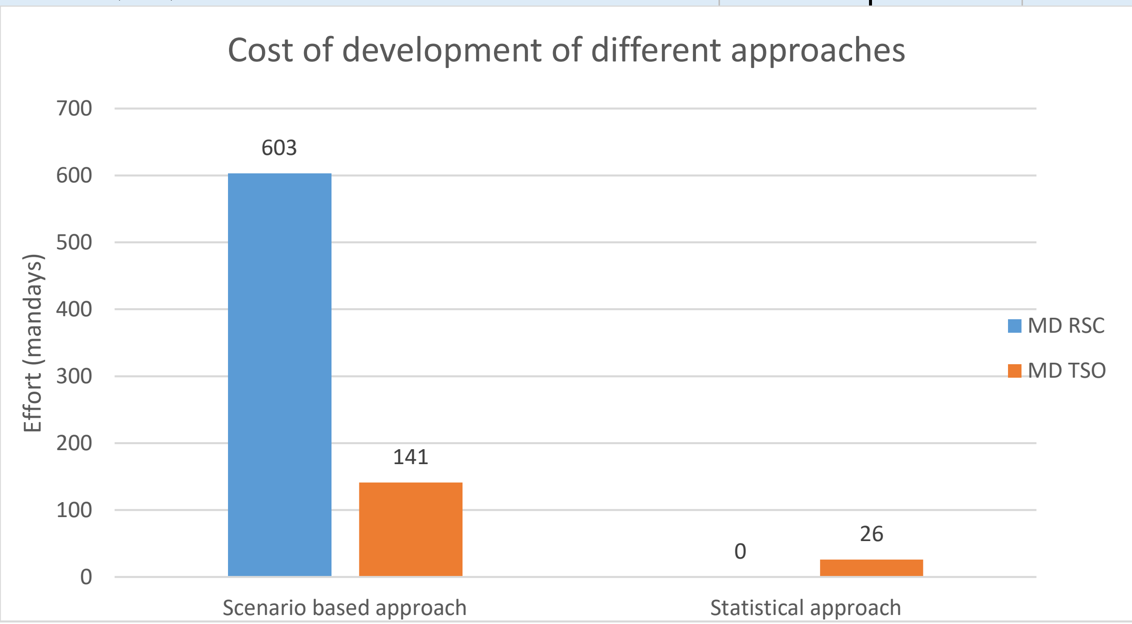

Figure 16 : Cost estimation in efforts of the implementation of the scenario-based and the statistical approach

[1] Estimated 5 MDs per TSO per scenario and assuming 30 TSOs.

The main effort provided by choosing the scenario-based approach is related to the definition of the additional scenarios for IN region by all ENTSO-E TSOs. In particular, the development process for scenario-based approach is covering by the sum of ENTSO-E scenario CGM gathering process for RSCs and TSOs which is in global 603 mandays. This step would not be necessary going with a statistical approach.

Then, the effort for completing the global implementation process can be estimated considering the tasks from 2 to 7. The cost of the implementation process for the scenario based approach results 141 Man Days, while the statistical approach requests 26 Man Days. The main difference is the additional effort that scenario based approach takes for the improvement of the base cases. This step would not be necessary for the statistical approach because the scenarios are already optimized.

Figure 16 shows a direct comparison between the estimated costs of development of the two different approaches.