
Italy North TSOs proposal for common provisions for regional operational security coordination in accordance with Article 76 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation

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TSOs of the Italy North Region, taking into account the following:

Whereas

- (1) Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereafter referred to as the “SO Regulation”) entered into force on 14 September 2017.
- (2) This document, including its annexes, is a common proposal developed by all Transmission System Operators (hereafter referred to as “TSOs”) of the Italy North Capacity Calculation Region (hereafter referred to as “Italy North Region”), as defined in accordance with Article 15(1) of Regulation (EU) 2015/1222 on Capacity Allocation and Congestion Management (hereafter referred to as the “CACM Regulation”), for the methodology for regional operational security coordination (hereafter referred to as “ROSC methodology”) inside the Italy North Region, required by Article 76(1) of the SO Regulation.
- (3) This ROSC methodology takes into account the principles and goals set out in the SO Regulation, as well as those of the CACM Regulation, established according to Article 6 of Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity (hereafter referred to as “Regulation (EC) No 714/2009”). Moreover, this ROSC methodology in accordance with Article 76(1) of the SO Regulation follows the principles set out in the methodology for coordinating operational security analysis (hereafter referred to as “CSAm”) established by the Agency for the cooperation of energy regulators (hereafter referred to as “the Agency”) in its decision No 07/2019.

This proposal takes also into account the effective structure of the grid by establishing TSO-TSO based contractual framework 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.

- (4) Ensuring operational security, which is among the objectives of the SO Regulation as laid down in Article 4, requires the inclusion of Third Countries’ Remedial Actions in the coordinated security analysis processes of Italy North Region. SO Regulation’s objectives cannot be achieved in any other way but by including Third Countries’ Remedial Actions. This inclusion is in line with Article 13 of the SO 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 Regulations, this ROSC methodology Proposal will include Third Countries as Technical Counterparties.

To ensure operational security by including Third Countries’ Remedial Actions, TSOs of Italy North Region will conclude an agreement with relevant Technical Counterparties. In order to be taken into consideration in the regional operational security coordination, and enter into a TSO-TSO based contractual framework, Technical Counterparties must fulfil the conditions laid down by Article 1(3) of the CSAm, applicable to TSOs from jurisdictions outside the area referred to in Article 2(2) of the SO Regulation. This agreement will include ROSC 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 regional operational security coordination.
- (5) In accordance with Article 76(1) of the SO Regulation, the ROSC methodology “shall determine:
- (a) *conditions and frequency of intraday coordination of operational security analysis and updates to the common grid model by the regional security coordinator;*
 - (b) *the methodology for the preparation of remedial actions managed in a coordinated way, considering their cross-border relevance as determined in accordance with Article 35 of Regulation (EU) 2015/1222, taking into account the requirements in Articles 20 to 23 and determining at least:*
 - (i) *the procedure for exchanging the information of the available remedial actions, between relevant TSOs and the regional security coordinator;*
 - (ii) *the classification of constraints and the remedial actions in accordance with Article 22;*
 - (iii) *the identification of the most effective and economically efficient remedial actions in case of operational security violations referred to in Article 22;*
 - (iv) *the preparation and activation of remedial actions in accordance with Article 23(2);*
 - (v) *the sharing of the costs of remedial actions referred to in Article 22, complementing where necessary the common methodology developed in accordance with Article 74 of Regulation (EU) 2015/1222. As a general principle, costs of non-cross-border relevant congestions shall be borne by the TSO responsible for the given control area and costs of relieving cross-border-relevant congestions shall be covered by TSOs responsible for the control areas in proportion to the aggravating impact of energy exchange between given control areas on the congested grid element.”*
- (6) In accordance with Article 77(1) of the SO Regulation, the ROSC methodology “shall also include common provisions concerning the organisation of regional operational security coordination, including at least:
- (a) *the appointment of the regional security coordinator(s) that will perform the tasks in paragraph 3 for that capacity calculation region;*
 - (b) *rules concerning the governance and operation of regional security coordinator(s), ensuring equitable treatment of all member TSOs;*
 - (c) *where the TSOs propose to appoint more than one regional security coordinator in accordance with subparagraph (a):*
 - (i) *a proposal for a coherent allocation of the tasks between the regional security coordinators who will be active in that capacity calculation region. The proposal shall take full account of the need to coordinate the different tasks allocated to the regional security coordinators;*



- (ii) *an assessment demonstrating that the proposed setup of regional security coordinators and allocation of tasks is efficient, effective and consistent with the regional coordinated capacity calculation established pursuant to Articles 20 and 21 of Regulation (EU) 2015/1222;*
 - (iii) *an effective coordination and decision making process to resolve conflicting positions between regional security coordinators within the capacity calculation region.”*
- (7) *In accordance with Article 77(3) of the SO Regulation, the TSOs of each capacity calculation region shall propose the delegation of the following tasks in accordance with paragraph 1:*
 - (a) *regional operational security coordination in accordance with Article 78 of SO Regulation in order to support TSOs fulfil their obligations for the year-ahead, day-ahead and intraday time-frames in Article 34(3) and Articles 72 and 74 of SO Regulation;*
 - (b) *building of common grid model in accordance with Article 79 of SO Regulation;*
 - (c) *regional outage coordination in accordance with Article 80 of SO Regulation, in order to support TSOs fulfil their obligations in Articles 98 and 100 of SO Regulation;*
 - (d) *regional adequacy assessment in accordance with Article 81 of SO Regulation in order to support TSOs fulfil their obligations under Article 107.*
- (8) This ROSC methodology in accordance with Article 76(1) of the SO Regulation considers and, where necessary, complements the common Italy North methodology for coordinated redispatching and countertrading (hereafter referred to as “RDCT methodology”) proposed by the TSOs of Italy North Region in accordance with Article 35 of the CACM Regulation and approved by the relevant national regulatory authorities according to Article 9 of CACM Regulation.
- (9) Articles 11 of the SO Regulation require that the ROSC methodology Proposal shall be subject to consultation for a duration of not less than one month. The Italy North ROSC methodology Proposal is consulted from 18th October to 18th November 2019, without any response by stakeholders received.
- (10) Article 6(6) of the SO Regulation requires that the proposed timescale for the implementation and the expected impact of the Italy North ROSC methodology Proposal on the objectives of the SO Regulation shall be described. The timescale for implementation is detailed in Article 28 of this ROSC methodology Proposal. The impact is presented below (point (11) of this Whereas Section).
- (11) The ROSC methodology Proposal contributes and does not in any way hinder the achievement of the objectives of Article 4 of SO Regulation:
 - a) Article 4(1)(a) of SO Regulation aims at determining common operational security requirements and principles. The Italy North ROSC methodology Proposal serves this objective by introducing common set of principles to be followed by TSOs and Technical Counterparties in the Region for a coordinated operational security coordination.
 - b) Article 4(1)(d) of SO Regulation aims at ensuring the conditions for maintaining operational security throughout the Union. The Italy North ROSC methodology Proposal serves this objective by setting out the rules for coordination within the Region



considering the future amendments to be developed with cross-regional focus (e.g. the ones under Article 27 of the CSAm).

- c) Article 4(1)(e) of SO Regulation aims at ensuring the conditions for maintaining a frequency quality level of all synchronous areas throughout the Union. The Italy North ROSC methodology Proposal serves this objective since maintaining the operational security is essential (together with the balancing mechanisms) for safeguarding the frequency quality in the interconnected system.
 - d) Article 4(1)(f) of SO Regulation aims at promoting the coordination of system operation and operational planning. The Italy North ROSC methodology Proposal serves this objective by setting out rules for the preparation of Remedial Actions to be coordinated, thus extending the scope of coordination also to the operational planning timeframe.
 - e) Article 4(1)(g) of SO Regulation aims at ensuring and enhancing the transparency and reliability of information on transmission system operation. The Italy North ROSC methodology Proposal serves this objective by introducing specific provisions for the exchange of necessary information among the TSOs or the Technical Counterparties and the Regional Security Coordinator, and among the Regional Security Coordinators in the Region for achieving the necessary coordination.
 - f) Article 4(1)(h) of SO Regulation aims at contributing to the efficient operation and development of the electricity transmission system and electricity sector in the Union. The Italy North ROSC methodology Proposal serves this objective since this specific Region is an integral part of the European interconnected system. Therefore, by safeguarding secure operation in the Region, the overall security is guaranteed, and the markets can function in a way that provides the right incentives for the development of the system and the electricity sector in the Union.
- (12) In conclusion, this ROSC methodology contributes to the general objectives of the SO Regulation.

SUBMIT THE FOLLOWING ROSC METHODOLOGY PROPOSAL TO THE NATIONAL REGULATORY AUTHORITIES OF THE ITALY NORTH REGION:

TITLE 1

General Provisions

Article 1

Subject matter and scope

1. The ROSC methodology as determined in this Proposal is the common proposal of all TSOs of the Italy North Region in accordance with Article 76 of the SO Regulation. In line with the RDCT methodology defined for the same Capacity Calculation Region according to Article 35 of CACM Regulation, Technical Counterparties can be involved in the processes described in this methodology. Technical Counterparties will set up separate contracts, provided that they fulfil the requirements set up in paragraphs 3 and 4 of this Article.
2. This Proposal shall cover the day-ahead and intraday regional operational security coordination within Italy North Region. This Proposal shall apply to all TSOs, Technical Counterparties and RSC(s) within Italy North Region.



3. As provided by Article 1(3) of the CSAm, TSOs from jurisdictions outside the area referred to in Article 2(2) of the SO Regulation may participate in the regional operational security coordination on a voluntary basis, provided that
 - a) for them to do so is technically feasible and compatible with the requirements of the SO Regulation;
 - b) they agree that they shall have the same rights and responsibilities with respect to the coordinated security analysis as the TSOs referred to in paragraph 2;
 - c) they accept any other conditions related to the voluntary nature of their participation in the coordinated security analysis that the TSOs referred to in paragraph 2 may set;
 - d) the TSOs referred to in paragraph 2 have concluded an agreement governing the terms of the voluntary participation with the TSOs referred to in this paragraph;
 - e) once TSOs participating in the regional operational security coordination on a voluntary basis have demonstrated objective compliance with the requirements set out in (a), (b), (c), and (d), the TSOs referred to in paragraph 2, after checking that the criteria in (a), (b), (c), and (d) are met, have approved an application from the TSO wishing to participate on a voluntary basis in accordance with the procedure set out in Article 5(3) of the SO Regulation.
4. The TSOs referred to in paragraph 2 shall monitor that TSOs participating in the regional operational security coordination on a voluntary basis pursuant to paragraph 3 respect their obligations. If a TSO participating in the regional operational security coordination pursuant to paragraph 3 does not respect its essential obligations in a way that significantly endangers the implementation and operation of the SO Regulation, the TSOs referred to in paragraph 2 shall terminate that TSO's voluntary participation in the regional operational security coordination process in accordance with the procedure set out in Article 5(3) of the SO Regulation.

Article 2

Definitions and interpretation

1. For the purposes of this proposal, the terms used shall have the meaning of the definitions included in Article 3 of the SO Regulation, Article 2 of CACM Regulation, Article 2 of the CSAm and the other items of legislation referenced therein. In addition, the following definitions shall apply:
 - a) 'Ordered Remedial Action' means an agreed Remedial Action which cannot be reassessed in the following operational security assessment considering the lead time required for its activation;
 - b) 'Area of Common Interest' or 'ACI' means the list of critical network elements pursuant to the RDCT methodology;
 - c) 'Remedial Action' or 'RA' means any measure or combination of measures applied by a TSO or several TSOs, manually or automatically, in order to maintain operational security
 - d) 'Requester of RA' means the TSO owning the element for which a RA needs to be activated;
 - e) 'RAO' means Remedial Action Optimisation;



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- f) 'Technical Counterparty' means any non-EU TSO to be included in procedures of this methodology through respective agreements;
 - g) 'ID RSA' means Intraday Regional Security Analysis;
 - h) 'CNE' means Critical Network Element;
 - i) 'APG' is the Austrian Transmission System Operator;
 - j) 'ELES' is the Slovenian Transmission System Operator;
 - k) 'RTE' is the French Transmission System Operator;
 - l) 'Terna' is the Italian Transmission System Operator.
2. Potential categories of RAs shall be classified in accordance with Article 22 of the SO Regulation.
 3. Where this Methodology refers to grid elements, it includes HVDC systems.
 4. 'IGM', 'CGM' and 'regional CSA' respectively stand for 'individual grid model', 'common grid model' and 'Coordinated Regional Operational Security Assessment' defined in Article 2 of the CSAm.
 5. For the avoidance of doubt, a Cross-Border Impacting RA as described in RDCT methodology is equivalent to a Cross-Border Relevant RA (or XRA) as defined in CSAm.
 6. In this Proposal, unless the context requires otherwise:
 - a) the singular indicates the plural and vice versa;
 - b) the headings are inserted for convenience only and do not affect the interpretation of this ROSC methodology;
 - c) References to an "Article" are, unless otherwise stated, references to an Article of this ROSC methodology;
 - d) References to a "paragraph" are, unless otherwise stated, references to a paragraph included in the same Article of this ROSC methodology where it is mentioned; and
 - e) 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.

TITLE 2

Provisions for regional operational security coordination

Chapter 1

General provisions for regional operational security coordination

Article 3

Detection of the constraints in regional CSA

1. When performing day-ahead and intraday regional CSA, TSOs of Italy North Region and Technical Counterparties shall detect if power flows exceed thermal limits on the XNEs of the Region.



2. To detect other constraints (such as voltage violations, violations of short-circuit thresholds or violations of stability limits) each TSO of Italy North Region and Technical Counterparty will perform Local Preliminary Assessment and long-term operational security analyses according to Article 31, 38 and 73 of the SO Regulation.
3. After the process according to the all TSOs' proposal for a common grid model methodology in accordance with Articles 67(1) and 70(1) of SO Regulation is fully implemented, the TSOs will assess the possibility to detect other constraints in the day-ahead and intraday regional CSA as described in paragraph 1.

Article 4

Definition of the secured area

1. The secured area consists of all the XNEs of Italy North Region.
2. The XNEs shall include at least all the CNEs of Italy North Region.
3. In addition to the network elements referred to in the previous paragraph, each TSO of Italy North Region and Technical Counterparty have the right to add in the regional list of the XNEs any additional network element, provided that it is higher than or equal to 220 kV and included in its IGM.

Article 5

Procedure for exchanging the information between relevant TSOs and the RSC(s)

1. TSOs of Italy North Region and Technical Counterparties shall make available to the RSC(s) the contingency list established according to the criteria defined in the CSAm.
2. On a yearly basis or when there is a significant change on the grid, the TSOs and Technical Counterparties of Italy North CCR shall reassess and update this contingency list and share it with RSCs and other TSOs of Italy North Region and Technical Counterparties.
3. Each TSO of Italy North Region and Technical Counterparties shall manage exceptional contingencies inclusion information according to Article 11 of CSAm.
4. In day-ahead timeframe, at latest at hour T0 defined in accordance with Article 45 of CSAm or in intraday timeframe, before the starting time of each Coordinated Regional Operational Security Assessment defined in Article 7, each TSO shall provide to the relevant RSCs the last updated information on the transmission systems, including the following information:
 - a) the updated list of available RAs, among the categories listed in Article 22 of the SO Regulation, and their anticipated costs provided in accordance with RDCT Methodology and Article 18(3) of CSAm if a RA includes redispatching or countertrading, aimed at contributing to relieve any constraint identified in the Region;
 - b) the operational security limits to fulfil Article 3 of this ROSC methodology.
5. In intraday timeframe, if a TSO is not able to provide to the relevant RSCs the updated information described in the previous paragraph, the RSC shall consider the latest available information previously submitted by this TSO.



Article 6

Creation of Individual Grid Models

1. For the day-ahead timeframe, each TSO of Italy North Region and Technical Counterparty shall build and deliver its IGM for at least each hour of the day of delivery, in accordance with the provisions of Article 21 of CSAm and with the reference times referred to in Article 33 of CSAm.
2. For intraday timeframe, prior to each reference time referred to in Article 7, each TSO of Italy North Region and Technical Counterparty shall build and deliver an intraday IGM for at least each hour of the day of delivery between the reference time and the end of the business day, in accordance with the provisions of Article 21 of CSAm.

Article 7

Timing of day-ahead and intraday Coordinated Regional Operational Security Assessment

1. TSOs of Italy North Region and Technical Counterparties shall ensure or delegate to the RSC(s) their participation to the day-ahead Coordinated Regional Operational Security Assessment process starting at the reference time.
2. TSOs of Italy North Region and Technical Counterparties shall ensure or delegate to the RSC(s) their participation to the intraday Coordinated Regional Operational Security Assessment process starting 45 minutes before the reference time.
3. The reference times for day-ahead timeframe are defined in the CSAm.
4. The reference times for intraday timeframe are defined in Annex 1.
5. The number of operational security assessments and the reference times referred to in paragraph 4 may be revised on a yearly basis, taking into account potential updates of the CGM methodology and subject to the agreement of the involved TSOs and communicated to NRAs of Italy North Region.

Chapter 2

Remedial Actions cross-border relevance assessment

Article 8

General principles

1. TSOs of Italy North Region and Technical Counterparties shall aim at agreeing on a qualitative approach in accordance with Article 9 to determine the potential RAs that are deemed cross-border relevant and the corresponding TSOs affected by those RAs.
2. If the TSOs of Italy North Region and Technical Counterparties cannot agree on a qualitative approach, a quantitative approach shall be used, in accordance with Article 10.
3. Prior to day-ahead or intraday operational planning, TSOs of Italy North Region and Technical Counterparties may identify new RA compared to those identified on an annual basis, according to the frequency established in Article 11. If a new RA is designed, each TSO of Italy North Region and Technical Counterparty shall assess its relevance using quantitative approach.



4. TSOs of Italy North Region and Technical Counterparties shall delegate the task described in paragraph 3 to the relevant RSC.
5. If a new RA is activated during real time operation, the XRA connecting TSO or Technical Counterparty of Italy North Region shall use quantitative assessment in order to identify if this RA is cross-border-relevant, unless the system is in emergency state and operational conditions do not allow it.
6. RA influence factor computation for RAs described in paragraphs 2, 3 and 5 shall be performed on the last available CGM, according to Article 15(4) and 15(5) of CSAm.

Article 9

Process for cross-border relevance assessment (qualitative approach)

1. TSOs of Italy North Region and Technical Counterparties shall jointly establish a list of potential RAs, both preventive and curative, which are generally able to address operational security violations in the Region. This list should contain at least the RAs made available for the Capacity Calculation process.
2. For each RA:
 - a) Each TSO shall individually assess the cross-border relevance of the RA on its grid;
 - b) The TSO owner of the RA shall also assess the cross-border relevance of the RA on each other TSOs grid;
 - c) For RAs that are quantifiable (e.g. PSTs, HVDC links or activation of redispatch and countertrading), the quantity above which this RA is deemed cross-border relevant has to be specified.
3. Each TSO shall propose RAs deemed necessary for coordination.
4. If an agreement is reached among all the TSOs affected by a given RA, then the RA is defined as cross-border relevant. If a RA is not proposed as cross-border relevant by any TSO, it is considered as non-cross-border relevant.
5. If an agreement on a RA cannot be reached, then the quantitative approach is used to assess the cross-border relevance of this RA.

Article 10

Process for cross-border relevance assessment (quantitative approach)

1. Quantitative approach shall be used to assess cross-border relevance of RAs only if no agreement can be reached on the cross-border relevance assessment of these RAs using qualitative approach.
2. To assess the cross-border relevance of one RA quantitatively, the following process is defined:
 - a) Year-ahead CGMs developed in accordance with Article 67 of the SO Regulation shall be used for assessment;
 - b) TSOs shall provide a list of elements on which the influence of the RA shall be assessed;
 - c) RSC(s) calculate the influence of each RA on each element according to the RA influence factor defined in Article 15 of CSAm;



- d) For RAs that are quantifiable (e.g. PSTs, HVDC links or activation of redispatch and countertrading), the quantity above which this RA is deemed cross-border relevant has to be specified.
3. TSOs shall consider commonly agreed as cross-border relevant all the RAs for which the RA influence factor is higher than 5%.

Article 11

Frequency of update

1. TSOs of Italy North Region and Technical Counterparties will share with the RSC(s) the agreed list of RAs that are deemed cross-border relevant.
2. When there is a significant change on the grid or a new RA is designed prior to day-ahead operational planning or at least every 12 months, TSOs of Italy North Region and Technical Counterparties shall update the list of XRAs in accordance with Article 8.

Chapter 3

Conditions of coordination of operational security assessment

Article 12

Day-ahead regional CSA and preparation of RAs

1. In accordance with Article 78 of the SO Regulation and in line with the reference times and processes defined in Article 33(1) of the CSAm, each day the appointed RSC(s) shall run the day-ahead Coordinated Regional Operational Security Assessment to check the security of the grid in accordance with Article 3.
2. The appointed RSC(s) shall perform the day-ahead Coordinated Regional Operational Security Assessment using the data listed in Article 5 and the CGM built in accordance with the all TSOs' proposal for a common grid model methodology in accordance with Articles 67(1) and 70(1) of SO Regulation.
3. The day-ahead Coordinated Regional Operational Security Assessment is performed by the appointed RSC(s) with the aim of:
 - a) Ensuring that, in accordance with Article 3, the operational security limits of all the network elements belonging to the secured area are respected according to the available CGM;
 - b) Selecting in a coordinated way with the concerned TSOs the RAs which allow the achievement of point a) with the minimum cost.
4. Each day-ahead Coordinated Regional Operational Security Assessment shall cover all the 24 hours of the day of delivery.
5. While the appointed RSC(s) perform the assessment run referred to in Article 33(1)(b) of the CSAm, all available RAs are optimised attempting to solve all the detected constraints on the network elements belonging to the secured area. The TSOs of Italy North Region and Technical Counterparties shall evaluate and agree on the recommended RAs in accordance with the principles of Article 20 of SO Regulation and Article 14 of this Proposal.



6. TSOs, Technical Counterparties and RSC(s) of Italy North Region will participate to the coordinated cross-regional operational security assessment in accordance with Article 30 and Article 33(1)(e) of the CSAm.
7. Taking into account the provisions of Article 33(1)(c) and (g) of the CSAm, each TSO of Italy North Region and Technical Counterparty shall implement all the agreed preventive RAs in its subsequent IGMs in accordance with the requirements of the methodology developed according to Article 70(1) of SO Regulation. The list of all agreed RAs, both preventive and curative, shall be logged and made accessible to all TSOs and RSCs, in line with the objectives of Article 41 of the CSAm.

Article 13

Intraday regional CSA and preparation of RAs

1. In accordance with Article 78 of the SO Regulation, each day the appointed RSC(s) shall run the intraday Coordinated Regional Operational Security Assessment to check the security of the grid in accordance with Article 3.
2. The appointed RSC(s) shall perform the intraday Coordinated Regional Operational Security Assessment using the data listed in Article 5 and the CGM built in accordance with the CGM methodology developed in accordance with Article 67(1) and 70(1) of the SO Regulation.
3. The intraday Coordinated Regional Operational Security Assessment is performed by the appointed RSC(s) with the aim of:
 - a) Ensuring that, in accordance with Article 3, the operational security limits of all the network elements belonging to the secured area are respected according to the available CGM;
 - b) Selecting in a coordinated way with the concerned TSOs the RAs which allow the achievement of point a) with the minimum cost.
4. Each intraday Coordinated Regional Operational Security Assessment shall start 45 minutes before each reference time defined in Article 7(4) and cover every hour between the reference time and the end of the day.
5. As a first step, all the agreed but not ordered regional costly RAs resulting from the previous coordinated operational security analysis performed in Italy North Region are removed from the CGM but are kept in the list of available RAs unless made technical unavailable, in order to assess if more economically efficient RAs can be found according to the latest available grid information.
6. After the application of paragraph 5 and in accordance with Article 3, a security analysis shall be performed on the CGM by the appointed RSC(s) in order to check the respect of the operational security limits of all the network elements belonging to the secured area;
 - a) If constraints are detected on one of these network elements, the curative non-costly agreed RAs coming from the previous intraday Coordinated Regional Operational Security Assessment is implemented for each contingency to check whether it is sufficient to secure the grid;
 - b) If there is no previous intraday Coordinated Regional Operational Security Assessment, the curative non-costly agreed RAs coming from the day-ahead Coordinated Regional Operational Security Assessment shall be used.



7. In case after the application of paragraph 6 there are still some violations of the operational security limits in accordance with Article 3, all available RAs are optimised to solve all the detected constraints on the network elements belonging to the secured area. The TSOs of Italy North Region and Technical Counterparties shall evaluate and agree on the recommended RAs in accordance with the principles of Article 20 of SO Regulation and Article 14 of this Proposal.
8. Each TSO of Italy North Region and Technical Counterparty shall implement all the agreed preventive RAs in its intraday IGM in accordance with the requirements of the methodology developed according to Article 70(1) of SO Regulation. The list of all agreed RAs, both preventive and curative, shall be logged and made accessible to all TSOs and RSCs, in line with the objectives of Article 41 of the CSAm.
9. When performing the capacity calculation process pursuant to the common Italy North capacity calculation methodology developed in accordance with Article 21 of CACM Regulation, the TSOs of Italy North Region and Technical Counterparties shall take into account the activation of ordered RAs. The resulting capacities shall not aggravate the operational security.

Article 14

Validation and coordination of the remedial actions recommended by the RSC(s) to the relevant TSOs

1. In accordance with Article 78(4) of SO Regulation, each TSO of Italy North Region and Technical Counterparty shall evaluate and decide on whether to implement or not the RAs recommended by the RSC(s) during the day-ahead and intraday Coordinated Regional Operational Security Assessment performed according to Article 12 and Article 13.
2. RAs which are specified as cross-border relevant (XRAs) in accordance with Chapter 2 of TITLE 2 shall be applied in a coordinated way, in order to prevent negative impact on affected TSOs.
3. Each TSO of Italy North Region and Technical Counterparty shall coordinate and agree on any XRA taking into account the provisions of Article 17(5), Article 27 and Article 30 of the CSAm.
4. TSOs, Technical Counterparties and RSC(s) of Italy North Region shall relieve operational security limits violations on overlapping XNEs and shall coordinate XRAs impacting these overlapping XNEs in accordance with the proposal for amendment to be developed pursuant to Article 27 of CSAm.

Article 15

Monitoring of inclusion of agreed Remedial Actions in the individual grid models

1. In line with Article 28 of CSAm, each RSC shall monitor in the relevant timeframes the correct inclusion of the agreed RAs in the IGMs by the TSOs, as required by Article 70(4) of the SO Regulation.
2. When an RSC identifies that a previously agreed RA has not been included in the IGM by a TSO or that uncoordinated additional XRAs have been added, that RSC shall inform the other relevant RSCs about it. The RSC in charge of CGM building for this TSO according to Article 77(3)(b) of the SO Regulation shall, in accordance with Article 79(3) of the SO Regulation,



ask the relevant TSO to correct its IGM without undue delay in accordance with Article 12 and Article 13 of this ROSC Proposal.

Article 16

Activation of Remedial Actions

1. For each hour, all the RAs recommended by the RSC(s) and validated by the relevant TSOs of Italy North Region and Technical Counterparties in accordance with Article 14 are considered the reference for the real time operations.
2. Each TSO of Italy North Region and Technical Counterparty shall activate each of the RAs referred to in paragraph 1, unless:
 - a) a RA is not anymore available for proven technical reasons (e.g. outage), or
 - b) new RAs are agreed by the affected TSOs for a given time period according to the real time conditions of the network, or
 - c) the difference between the RAs referred to in paragraph 1 and the new RAs are not considered cross-border relevant, or
 - d) a preventive RA is agreed for a subsequent hour and, in accordance with Article 19(2) of the CSAm, is activated earlier than when it is necessary with consideration of the operational conditions and provided that it does not introduce any operational security limit violation.
3. In case one TSO detects and communicates that the new RAs referred to in paragraph 2(b), 2(c) or 2(d) is not ensuring anymore the grid security, the RAs referred to in paragraph 1 shall be activated, unless the fast activation process pursuant to Article 17 is activated and new RAs are agreed.
4. RAs activated pursuant to paragraph 1, paragraph 2 and paragraph 3 of this Article shall be considered as coordinated actions.
5. Where a TSO refuses to activate any of the RAs according to paragraph 2 and paragraph 3, the non-activation of the RA(s) is considered as a non-coordinated action.

Article 17

Fast activation process

1. The fast activation process is a process that can be triggered in real-time or close to real-time, to relieve physical congestion due to sudden critical situations (such as, but not limited to, an unplanned outage in real time or a relevant forecast error), that lead to overloads on Italy North XNEs and requires fast actions, which cannot be effectively and promptly treated with the regular process described in Article 12 and Article 13 (e.g. critical situations detected between two regular assessment runs or after the last intraday run).
2. The fast activation process shall also be considered as a fallback where coordination through the RSC(s) is no longer possible due to insufficient time and the regular processes described in Article 12 and Article 13 could not be properly applied (e.g. missing data, tools failure).
3. In the fast activation process, the activation of preventive as well as curative XRAs may be designed.



4. In the fast activation process, each TSO of Italy North Region or Technical Counterparty may activate XRAs in direct coordination with XRA affected TSO(s) considering also the provisions of Article 14.
5. In the fast activation process, TSOs of Italy North Region and Technical Counterparties shall aim at activating all the available non-costly RAs for relieving or reducing congestions on the XNEs before using costly measures. However, considering the application of this process should be very infrequent, being linked to extraordinary and unusual events, and that it must be characterized by fast activation, it may be possible that not all RAs available are considered because there is not enough time to evaluate their impact.
6. In case the RAs used in the fast activation process have an impact on TSO(s) outside the Italy North Region pursuant to the amendments to be developed in accordance with Article 27 of the CSAm, the TSOs of Italy North Region and Technical Counterparties shall inform the concerned TSO(s).
7. The TSO triggering the fast activation process shall ex-post provide the RSC(s) with all the relevant information on which the decision was based. The RSC(s) shall monitor occurrences of fast activation processes and the information provided by the relevant TSOs on those occurrences together with the regular reporting obligations from Article 17 of SO Regulation.
8. RAs agreed among affected TSOs during the fast activation process shall be considered as coordinated RAs.

Article 18

Intraday regular regional security analysis

1. In addition to the intraday regional CSA described in Article 13, Italy North RSCs shall perform regular ID RSA.
2. The goal of the regular ID RSA is to provide TSOs of Italy North and Technical Counterparties each hour of the day with the latest information about the loading of the transmission system and previously undetected violations of operational security limits, which may serve as a trigger for a fast activation process.
3. This regular ID RSA shall be performed on hourly basis and cover every hour between the starting time and the end of the day.
4. ID RSA shall be performed on the latest available IGMs containing the latest available forecast of generation and load, planned and forced outages, Agreed RAs and Ordered RAs.
5. RSCs shall use the latest available CGMs to perform a load flow and contingency analysis calculation and deliver the results to all TSOs of Italy North Region and Technical Counterparties.



Chapter 4

Sharing of the costs

Article 19

Sharing of costs for Remedial Actions

1. The costs incurred to relieve any congested element shall be subject to the principles established in accordance with the methodology developed under Article 74 of the CACM Regulation.
2. The methodology developed under Article 74 of the CACM Regulation shall include the following provisions for coordinated actions:
 - a) rules and/or criteria to establish the XNEs for which the costs attributed to them shall be shared among the involved TSOs and the XNEs for which the costs attributed to them shall be covered solely by the XNE connecting TSO(s);
 - b) a process to allocate the costs of remedial actions to the XNEs;
 - c) rules to share the costs among the involved TSOs.
3. The methodology developed under Article 74 of the CACM Regulation shall also include rules for the allocation of costs for non-coordinated actions.

Chapter 5

Remedial Actions optimisation

Article 20

General principles

The objective of the RAs optimisation is the identification of the most cost-efficient combination of RAs, which will solve all the constraints detected on the XNEs during each run of the Coordinated Regional Operational Security Assessment.

Article 21

Objective function

1. The objective function shall aim at minimizing the overall costs for Italy North Region resulting from the activation of the costly RAs needed to solve the constraints detected during each run of the Coordinated Regional Operational Security Assessment.
2. The definition of the objective function is detailed in Annex 2.
3. The RAs obtained pursuant to the objective function defined in paragraph 2 shall also be the most efficient ones in terms of number of actions to be activated.



Article 22

Constraints

1. During the optimisation process, at least the following technical constraints shall be considered:
 - a) balance of the activated redispatching and countertrading resources;
 - b) lead time for activation of a RA;
 - c) operational security limit on all the elements belonging to the secured area;
 - d) only RAs that have an influence on the respective constraints higher than a certain threshold can be used during RAO;
 - e) maximum number of preventive and curative RAs per TSO, Region and timestamp;
 - f) PSTs' tap positions, PST flow, HVDC set point and HVDC power flow inside the available range.

More details about the aforementioned constraints are given in Annex 3.

2. The TSOs of Italy North Region and Technical Counterparties will assess during the implementation of this ROSC Proposal the need to consider intertemporal constraints in RAO in order to ensure consistency of results.

Article 23

Optimisation variables

1. During Remedial Actions optimisation the following optimisation variables shall be considered:
 - a) Switching states of topological measures;
 - b) Adjustment of PSTs tap position;
 - c) Operating mode of HVDC (Set-Point/AC Emulation);
 - d) AC emulation Parameters when HVDC is operating in AC emulation mode;
 - e) HVDC set point when HVDC is operating in set-point mode;
 - f) Amount and localization of countertrading and redispatching.
2. Topological measures are defined as follows:
 - a) Opening or closing one or more line(s), cable(s), transformer(s), busbar coupler(s) or
 - b) Switching one or more network element(s) from one busbar to another, in case of non-explicit modelling of busbar couplers.

Article 24

Other functionalities of Remedial Actions Optimisation

The RAs optimisation shall support the following operating modes for the PSTs:

- a) Tap mode (the result of the optimisation is the tap number)
- b) Target flow mode (the result of the optimisation is the flow on the PST).



TITLE 3

Appointment, governance and task allocation of the RSC(s)

Article 25

Appointment of RSCs and task allocation

1. The TSOs of Italy North Region and Technical Counterparties appoint CORESO and TSCNET as regional security coordinators that will perform the tasks listed in Article 77 (3) of SO Regulation in Italy North Region.
2. CORESO and TSCNET shall perform the tasks listed in Article 77(3) of SO Regulation for all TSOs of Italy North Region and for Technical Counterparties in a transparent and non-discriminatory manner.
3. In accordance with Article 77(3) of SO Regulation all TSOs of Italy North Region and Technical Counterparties delegate the following tasks to CORESO and TSCNET:
 - a) Regional operational security coordination in accordance with SO Regulation Article 78 in order to support Italy North TSOs to fulfil their obligations for the year-ahead, day-ahead and intraday timeframes in accordance with Articles 34(3), 72 and 74 of SO Regulation;
 - b) Building of common grid model in accordance with Article 79 of SO Regulation;
 - c) Regional outage coordination in accordance with Article 80 of SO Regulation, in order to support Italy North TSOs to fulfil their obligations in Articles 98 and 100 of SO Regulation;
 - d) Regional adequacy assessment in accordance with Article 81 of SO Regulation in order to support Italy North TSOs to fulfil their obligations under Article 107 of SO Regulation.

Article 26

Allocation of tasks between RSCs

1. CORESO and TSCNET carry out the task for regional operational security coordination in accordance with Article 78 of SO Regulation on a rotational basis over a pre-determined period as defined in paragraph 2.
2. The rotational basis assumes that CORESO and TSCNET will rotate the roles of Leading and Backup RSC over pre-determined periods which shall be agreed in the rules for operation of RSCs referred to in Article 29(4). The Leading RSC is responsible and accountable for the effective and efficient execution of the regional operational security coordination in accordance with the Article 78 of SO Regulation over a pre-determined period. The Backup RSC is responsible for supporting the Leading RSC to ensure the effectiveness of the regional operational security coordination process for all the TSOs of Italy North Region and Technical Counterparties. This support can be either requested by the Leading RSC or suggested by the Backup RSC.
3. CORESO and TSCNET carry out the task of common grid model building on a rotational basis over a pre-determined period in accordance with Article 20 of CGM methodology and with Article 79 of SO Regulation. Within ENTSO-E, TSOs will set-up a consistent and harmonized approach at pan-European level to ensure that the solutions implemented to build common



grid models and operated by the RSCs will be compliant with the respective requirements set up in the relevant legislation in force, including SO Regulation (notably Article 79(5)), the CGM methodology and the CSAm, while ensuring reliability of the CGM delivery process and the aligned use of the resulting unique CGM.

4. TSCNET carries out the task of regional outage coordination in accordance with Article 80 of SO Regulation.
5. CORESO carries out the task of regional adequacy assessment in accordance with the Article 81 of SO Regulation.
6. The organization of the regional outage coordination task and of the regional adequacy assessment task in (4) and (5) may be amended in accordance with Article 27 and Article 28.

Article 27

Efficiency and effectiveness of the allocation of tasks between RSCs

1. CORESO and TSCNET shall monitor the effectiveness and efficiency of the allocation of the tasks for which they are responsible and, where applicable, the rotation arrangements of those tasks and their operational performance on a yearly basis in the scope of preparation of the annual reports on regional coordination assessment according to Article 17 of SO Regulation.
2. CORESO and TSCNET shall agree on clear and specific performance indicators with the TSOs of Italy North Region and Technical Counterparties to perform the tasks referred to in paragraphs 1 and 4 of this article and to assess the performance of the tasks referred to in Article 26.
3. CORESO and TSCNET will ensure, based on the instructions of the TSOs of Italy North Region and Technical Counterparties, transparency and interoperability of all processes and their associated data within the operational tasks mentioned in this methodology.
4. CORESO and TSCNET shall assess interoperability issues to allow the TSOs of Italy North Region and Technical Counterparties to propose changes aiming at improving effectiveness and efficiency in the system operation coordination.

Article 28

Coordination and decision-making process

1. The Leading RSC with the support of the Backup RSC will ensure the coordination with all the TSOs of Italy North Region and Technical Counterparties.
2. RSCs shall cooperate in good faith and shall seek to adopt a fair and loyal treatment of the Parties concerned.
3. RSCs will implement the provision of the tasks in close consultation and cooperation with the TSOs of Italy North Region and Technical Counterparties.
4. RSCs, TSOs of Italy North Region and Technical Counterparties will establish a contractual framework for the implementation of this methodology.



Article 29

Rules concerning governance and operation of RSCs

1. The security of supply shall be the responsibility of each of the TSOs of Italy North Region and the Technical Counterparties according to national laws and regulations. The responsibility for secure system operation and any decision taken based on services from CORESO and TSCNET shall remain with the TSOs of Italy North Region and Technical Counterparties. Governance rules shall be further defined and agreed by the TSOs of Italy North Region, the Technical Counterparties and the RSCs in accordance with Article 33(2)(a) and within the timescales defined in Article 33(3)(a).
2. For the avoidance of doubt, these rules do not replace any provision of national or European law that may apply to any of the TSOs of Italy North Region and Technical Counterparties. The provisions of these rules shall be complementary and interpreted in accordance with the applicable regulations. In case of contradictions between these rules and the applicable laws and regulations, the provisions of these rules shall be amended accordingly.
3. Any dispute between the RSCs and between RSCs and the TSOs of Italy North Region and the Technical Counterparties arising out of or in connection with this methodology shall be settled amicably between the Parties. In case the dispute cannot be settled amicably between the Parties within 60 calendar days after having been notified hereof, the dispute shall be finally settled by an arbitration process.
4. CORESO and TSCNET shall agree on a contractual framework defining the rules for operation of RSCs and the liability between RSCs.

TITLE 4

Publication, implementation of the proposal and monitoring

Article 30

Timescale for publication of the proposal

In accordance with Article 8(1) of the SO Regulation the TSOs of Italy North Region shall publish on their website this ROSC methodology Proposal without undue delay after a decision has been taken by the NRAs of Italy North Region.

Article 31

Timescale for implementation of the proposal

1. The implementation of this ROSC methodology is subject to:
 - a) Regulatory approval of this ROSC methodology in accordance with Article 6 of SO Regulation;
 - b) Regulatory approval of the common Italy North methodology for coordinated redispatching and countertrading cost sharing developed in line with the provision of Article 19(2) and 19(3) and in accordance with Article 74 of the CACM Regulation by the relevant national regulatory authorities according to Article 9 of CACM Regulation;



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- c) Regulatory approval of common Italy North methodology for coordinated redispatching and countertrading (hereafter referred to as “RDCT methodology”) in accordance with Article 35 of the CACM Regulation by the relevant national regulatory authorities according to Article 9 of CACM Regulation;
 - d) Regulatory approval and implementation of the proposal for amendment referred to in Article 14(4);
 - e) Development, testing and readiness of the IT tools, systems and procedures required to implement the Italy North ROSC methodology, CGMES format included and amendments of the CSAm.
2. In the implementation of this ROSC methodology, the TSOs of Italy North Region and Technical Counterparties shall consider the following steps for the condition referred to in paragraph 1(e):
- a) High level business solution consisting among others of identification of the contractual needs between the TSOs of Italy North Region, Technical Counterparties and RSCs, drafting of the business process, performing the gap analysis with the current situation, screening the market for potential solution to fill the gaps and drafting related business, IT and service level requirements for tools and hardware and determining the acceptance criteria for validating the accuracy and robustness of the solution;
 - b) Tendering consisting in preparing and performing the selection and contracting of the vendors for the different tools and hardware solution identified in the step (a), in case this is required;
 - c) Development of the solution including the negotiation of performance requirements, Functional Acceptance Test, Site Acceptance Test and User Acceptance Test;
 - d) Experimentation of the solution by TSOs of Italy North Region, Technical Counterparties and RSCs experts and key users aiming at tuning the different parameters to ensure accuracy and robustness of the solution towards the acceptance criteria defined in the step (a);
 - e) Parallel operational run where TSOs of Italy North Region, Technical Counterparties and RSCs will train their operators and perform operational runs in parallel with the existing operational processes to assess the accuracy and robustness of the solution towards the acceptance criteria defined in step (a);
 - f) Operational Go-Live where the solution will replace the existing operational processes.
3. TSOs of Italy North Region, Technical Counterparties and RSCs shall respect the following maximum timing for the different implementation steps defined in the paragraph 2:
- a) Step 2(a) shall be completed at the latest by 12 months after the approval of this ROSC methodology;
 - b) Step 2(b) shall be completed at the latest by 12 months after the completion of step 2(a);
 - c) Step 2(c) shall be completed at the latest by 18 months after the completion of step 2(b);



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- d) Step 2(d) shall be completed at the latest by 6 months after the completion of step 2(c);
 - e) Step 2(e) shall be completed at the latest by 6 months after the completion of step 2(d);
 - f) Step 2(f) shall be completed at the latest by 1 months after the completion of step 2(e).
4. TSOs of Italy North Region and Technical Counterparties, with the support of the Italy North RSCs, shall aim at regularly identifying the common functions and tools referred to in paragraph 1(e). All relevant TSOs of Italy North Region and Technical Counterparties, with the support of the Italy North RSCs, shall:
 - a) Decide on their development;
 - b) Provide for the needed budgets for their tendering, development and maintenance;
 - c) Agree on the rules applicable for the management of the development and maintenance, including evolutions.

Article 32 **Monitoring**

1. TSOs of the Italy North Region shall deliver to the NRAs of Italy North Region on a three-month basis information on the monitoring of the regional CSA process, starting after the implementation of this ROSC methodology, and at the latest 10 days into the following three-month period.
2. TSOs of the Italy North Region can delegate the task of preparing the information referred to in paragraph 1 to the RSCs.
3. By 12 months after the approval of this ROSC methodology, the TSOs of Italy North Region shall define a list of information to be provided to the NRAs of the Region. In this process, the TSOs of Italy North Region shall consult and seek guidance from the relevant NRAs.
4. The list referred to in paragraph 3 shall at least include the number of fast activation processes triggered by any TSO of the Italy North Region or Technical Counterparty and the relevant justification.

TITLE 5 **Final provisions**

Article 33 **Language**

The reference language for this ROSC methodology shall be English. 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 Article 8(1) of the SO Regulation and any version in another language, the relevant TSOs shall, in accordance with national legislation, provide the relevant national regulatory authorities with an updated translation of the proposal.



Annex 1

1. The reference times for intraday timeframe shall be 00:00h, 08:00h and 16:00h.
2. The reference times are chosen in line with the CGM methodology and in such a way to ensure the availability of the latest updated IGMs on pan-European level.



Annex 2

The objective function referred to in Article 21 shall be defined as follows:

$$\min \left(\sum \Delta P_i \cdot p_i \right)$$
$$0 \leq \Delta P_i \leq P_{i,\max} \text{ for upward resources}$$
$$P_{i,\min} \leq \Delta P_i \leq 0 \text{ for downward resources}$$

Subject to the constraints listed in Article 22 (further detailed in Annex 3), where:

- a) i is a generic redispatching or countertrading resource;
- b) ΔP_i is the activated amount of the resource i ;
- c) p_i is the price of the resource i ;
- d) $P_{i,\max}$ is the available volume of the upward resource i ;
- e) $P_{i,\min}$ is the available volume of the downward resource i (considered as negative).



Annex 3

More details about, the constraints defined in Article 22 are given below:

- a) balance of the activated redispatching and countertrading resources:

$$\sum \Delta P_i = 0$$

Where:

- ΔP_i is the activated amount of the resource i ;
- b) lead time for activation of a RA:

$$t_i < T_{activation} - T_0$$

Where:

- t_i is the lead time of RA i ;
 - T_0 is the run of the regional CSA;
 - $T_{activation}$ is the T time for which the RA is activated;
- c) operational security limit on the elements belonging to the secured area;

$$P_e + \Delta P_{e,preventive} + \Delta P_{e,curative} \leq PATL_e, \forall e \in \text{observed element}$$

$$P_e + \Delta P_{e,preventive} \leq TATL_e, \forall e \in \text{observed element}$$

Where:

- P_e is the power flow on the element e (it may be in N or N-1 situation depending on the congestion detected);
 - ΔP_e is the effect of the RAs used during the RAO, either preventive or curative;
 - $TATL_e$ is the temporarily admissible transmission loading on the element e ;
 - $PATL_e$ is the permanently admissible transmission loading on the element e ;
- d) only RAs that have an influence on the respective active constraints higher than a certain threshold can be used during the RAO:

$$IF_{RA \text{ Constraint}} \geq MinIF$$

Where:

- $IF_{RA \text{ Constraint}}$ is the influence factor of a RA on a given constraint;
 - $MinIF$ is the minimum influence which the RA can have on the given constraint;
- e) maximum number of preventive and curative RAs per TSO, Region and timestamp:

$$Number PRA_{TSO} \leq Max PRA Limit_{TSO}$$

$$Number PRA_{REGION} \leq Max PRA Limit_{REGION}$$

$$Number CRA_{TSO} \leq Max CRA Limit_{TSO}$$

$$Number CRA_{REGION} \leq Max CRA Limit_{REGION}$$



Where:

- Number PRA_{TSO} is the number of Preventive RA which are in a set after optimisation per TSO;
 - Number PRA_{REGION} is the number of Preventive RA which are in a set after optimisation for the whole Italy North Region;
 - Max PRA Limit $_{TSO}$ is the maximum number of Preventive RA that can be used for one TSO during the RAO;
 - Max PRA Limit $_{REGION}$ is the maximum number of Preventive RA that can be used for the whole Italy North Region during the RAO;
 - Number CRA_{TSO} is the number of Curative RA which are in a set after optimisation per TSO;
 - Number CRA_{REGION} is the number of Curative RA which are in a set after optimisation for the whole Italy North Region;
 - Max CRA Limit $_{TSO}$ is the maximum number of Curative RA that can be used for one TSO during the RAO;
 - Max CRA Limit $_{REGION}$ is the maximum number of Curative RA that can be used for the whole Italy North Region during the RAO;
- f) PSTs' tap positions, PST flow, HVDC set point and HVDC power flow inside the available range:

$$\begin{aligned}
 TAP_{p,\min} &\leq TAP_p \leq TAP_{p,\max} \forall p \in \text{available PSTs} \\
 PSTflow_{p,\min} &\leq PSTflow_p \leq PSTflow_{p,\max} \forall p \in \text{available PSTs} \\
 HVDC_{h,\min} &\leq HVDC_h \leq HVDC_{h,\max} \forall h \in HVDCs \\
 HVDC_{g,\min} &\leq HVDC_g \leq HVDC_{g,\max} \forall h \in HVDCs
 \end{aligned}$$

Where:

- TAP_p is the PST's tap position;
- $TAP_{p,\max}$ is the maximum PST's tap position available for that PST;
- $TAP_{p,\min}$ is the minimum PST's tap position available for that PST;
- $PSTflow_p$ is the PST's target flow;
- $PSTflow_{p,\max}$ is the maximum PST's target flow available for that PST;
- $PSTflow_{p,\min}$ is the minimum PST's target flow available for that PST;
- $HVDC_h$ is the HVDC's set point, when HVDC is operating in set point mode;
- $HVDC_{h,\max}$ is the maximum HVDC's set point available for that HVDC, when operating in set point mode;
- $HVDC_{h,\min}$ is the minimum HVDC's set point available for that HVDC, when operating in set point mode;
- $HVDC_g$ is the HVDC's power flow, when HVDC is operating in AC emulating mode;



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- $HVDC_{g,max}$ is the maximum HVDC's power flow, when operating in AC emulating mode;
 - $HVDC_{g,min}$ is the minimum HVDC's power flow, when operating in AC emulating mode.

The same constraints can be also expressed in relative terms.