CCR Core TSOs' Cooperation

Explanatory document to the proposal for the coordinated redispatching and countertrading methodology for Capacity Calculation Region Core in accordance with Article 35 of the Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a Guideline on Capacity Allocation and Congestion Management

05 September 2018

***Disclaimer**: This document is for public consultation and should be considered as "work in progress". Feedback from market parties will be used as input for the finalization of the methodology.*

1. CONTENT

2. DEFINITIONS AND INTERPRETATIONS

For the purposes of this document, the terms used shall have the meaning given to them in Article 2 of Regulation (EC) 714/2009, Article 2 of Regulation (EC) 543/2013, Article 2 of Regulation (EC) 2015/1222 and in Article 3 of Regulation (EC) 2017/1485.

In addition, the following definitions shall apply:

a. “RD and CT Measure” means energy-related measure to solve physical congestion. It is activated by the Requesting and Connecting and Transiting TSO. For each timestamp where RD & CT measures are included in the grid model, the sum has to be energy-balanced. It can be composed of countertrading only, redispatching only, or a mix of both;
b. “Countertrading” means a measure performed by one or several TSOs in at least two bidding zones in order to relieve physical congestions where the location of activated resources are not known within the bidding zone;
c. “Redispatching” means a measure performed by one or several TSOs by altering specific generation and/or load patterns in order to change physical flows in the transmission system and relieve physical congestions. The location of the units considered for Redispatching are known and the parameters of the resource are known;
d. “Cross-border Impacting Remedial Action” means a remedial action considered to be activated by a TSO and whose activation has a significant influence on at least one TSO that is not involved in its activation.

In addition, remedial actions are defined in the following way:

a. A “preventive remedial action” is the result of an operational planning process and needs to be activated prior to the investigated timeframe for compliance with the (N-1) criterion;
b. A “curative remedial action” is the result of an operational planning process and is activated straight subsequent to the occurrence of the respective contingency for compliance with the (N-1) criterion, taking into account transitory admissible overloads and their accepted duration;
c. “Set of remedial actions” means a combination of remedial actions that are to be activated as a whole to maintain operational security.

3. INTRODUCTION

The Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (hereafter referred to as “CACM Regulation”) sets out rules to ensure optimal use of the transmission infrastructure, operational security and optimising the calculation and allocation of cross-zonal capacity.

To implement the CACM Regulation, it is required to develop a common methodology for coordinated Redispatching and Countertrading (hereafter referred to as “Core RD and CT Methodology”). Pursuant to Article 35 of CACM Regulation, all transmission system operators (hereafter referred to as “TSOs”) in the Core Capacity Calculation Region (hereafter referred to as “Core CCR”) have established a proposal for the methodology for coordinated Redispatching and Countertrading (hereafter referred to as “Core RD and CT Methodology”). This document provides additional information and an explanation of the proposal.

The proposal for the Core RD and CT Methodology in CCR Core has to be submitted for approval to all national regulatory authorities (hereafter referred to as “NRAs”) within the Core CCR no later than 16 months after the regulatory approval of capacity calculation regions referred to in Article 15 of CACM Regulation. The proposal shall be subject to consultation in accordance with Article 12 of CACM Regulation, which will start in September 2018.

4. LEGAL REFERENCES AND REQUIREMENTS

A number of relevant parts of the preamble of the CACM Regulation are cited here and should be taken into account in order to properly interpret the articles stated further below.

No. 10 of the preamble of the CACM Regulation states that TSOs should:
“use a common set of remedial actions such as countertrading or redispatching to deal with both internal and cross-zonal congestion. In order to facilitate more efficient capacity allocation and to avoid unnecessary curtailments of cross-border capacities, TSOs should coordinate the use of remedial actions in capacity calculation.”

Followed by no. 12 of the preamble:
“TSOs should implement coordinated redispatching of cross-border relevance or countertrading at regional level or above regional level. Redispatching of cross-border relevance or countertrading should be coordinated with redispatching or countertrading internal to the control area.”

The basis for the Core RD and CT Methodology is Article 35(1) of CACM Regulation:
“Within 16 months after the regulatory approval on capacity calculation regions referred to in Article 15, all the TSOs in each capacity calculation region shall develop a proposal for a common methodology for coordinated redispatching and countertrading.”

Article 35(2) further states that:
“The methodology for coordinated redispatching and countertrading shall include actions of cross-border relevance and shall enable all TSOs in each capacity calculation region to effectively relieve physical congestion irrespective of whether the reasons for the physical congestion fall mainly outside their control area or not.”

And lastly, Article 35(3) states that the Core RD and CT Methodology shall:
“address the fact that its application may significantly influence flows outside the TSO’s control area.”

The Core RD and CT Methodology following Article 35 of CACM Regulation is also interlinked with Article 21 of Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (hereafter referred to as “SO GL Regulation”) specifying that each TSO shall apply principles when activating and coordinating remedial actions in accordance with Article 23 of SO GL Regulation:
“for operational security violations which need to be managed in a coordinated way, a TSO shall design, prepare and activate remedial actions in coordination with other concerned TSOs, following the methodology for the preparation of remedial actions in a coordinated way under Article 76(1)(b) and taking into account the recommendations of a regional security coordinator in accordance with Article 78(4).”

Further Article 23(2) of SO GL Regulation specifies that:
"When preparing and activating a remedial action, including redispatching or countertrading pursuant to Article 23 and 35 of Regulation (EU) 2015/1222, or a procedure of a TSO's system defence plan which affects other TSOs, the relevant TSO shall assess, in coordination with the TSO concerned, the impact of such remedial action or measure within and outside of its control area, in accordance with Article 75(1), Article 76(1)(b) and Article 78(1), (2) and (4) and shall provide the TSOs concerned with the information about this impact."

Also relevant in this respect is the requirement for TSOs to develop common provisions for operational security coordination on a regional level in Article 76(1) of SO GL Regulation:
"…all TSOs of each capacity calculation region shall jointly develop a proposal for common provisions for regional operational security coordination, to be applied by the regional security coordinators and the TSOs of the capacity calculation region."

Article 76(1) further specifies that:
"The proposal shall respect the methodologies for coordinating operational security analysis developed in accordance with Article 75(1) and complement where necessary the methodologies developed in accordance with Articles 35 and 74 of Regulation (EU) 2015/1222."

Lastly, Article 78(1) of SO GL Regulation states:
"Each TSO shall provide the regional security coordinator with all the information and data required to perform the coordinated regional operation security assessment, including at least:
…(b) the updated list of possible remedial actions, among the categories listed in Article 22, and their anticipated costs provided in accordance with Article 35 of Regulation (EU) 2015/1222 if a remedial action includes redispatching or countertrading, aimed at contributing to relieve any constraint identified in the region; and …"

The methodologies of the CACM Regulation and the SO GL Regulation are thus highly interlinked. The following paragraphs provide a description of Core TSOs' interpretation and scope of the Core RD and CT Methodology.

4.1. Definition of redispatching and countertrading

According to the Commission Regulation (EU) 543/2013 of 14 June 2013 on submission and publication of data in electricity markets and amending Annex 1 to Regulation (EC) No 714/2009 of the European Parliament and of the Council (hereafter referred to as "Transparency Regulation") Article 2(13):
"'countertrading' means a cross-zonal exchange initiated by system operators between two bidding zones to relieve physical congestion."

In the case that upregulating and downregulating measures are Countertrading, they are considered as a measure between at least two bidding zones with the objective to relieve physical congestions, where the precise generation or load pattern alteration is not pre-defined.[1] This measure is a market based-solution, where the cheapest bid is selected independently of the geographical location within the bidding zone. By using countertrading resources, the relieving effect on the congestion must be ensured.

[1] ACER: Based on the definitions from the questionnaire for Market Monitoring Report.

Article 2(26) of the Transparency Regulation further clarifies that:
"'Redispatching' means a measure activated by one or several system operators by altering the generation and/or load pattern in order to change physical flows in the transmission system and relieve a physical congestion."

Redispatching is therefore considered as a measure with the objective to relieve physical congestions and, thus, to maintain network security. In case of congestion, it includes the modification of particular generation and/or load patterns. In more detail, one TSO or several TSOs request from specific generators (consumers) to start or increase the production (to decrease the load), while other specific generators (consumers) are requested to stop or reduce the production (to increase the load).[1]

With regard to the above-mentioned definitions, the general idea of Redispatching and Countertrading is to alter the generation and/or load pattern by one or several TSO(s) in order to change physical flows and thereby relieve the physical congestion.

Countertrading and Redispatching are also mentioned in Article 22 of SO GL Regulation as categories of remedial actions[2] that are in line with the definitions specified in the Core RD and CT Methodology and in this document.

4.2. Interpretation and scope of the proposal

Firstly, this proposal is limited to Core CCR purposes only, meaning that the geographical scope of this proposal is confined to the bidding-zones within the Core CCR and cross-border relevant parts. The Core RD and CT Methodology will be applicable to any future bidding-zones which may be added to Core CCR by a NRA decision or an ACER decision.

The legal framework stated above needs to be given an interpretation in order to formulate a legally sound proposal for the Core RD and CT Methodology, to define the scope of this proposal and to make the proposal implementable.

Countertrading and Redispatching are considered remedial actions as defined in SO GL Regulation and can be prepared in different processes and in different timeframes, i.e. day-ahead, intraday and real-time.

When Countertrading and Redispatching are used to mitigate congestions, the TSOs identify the potential need in advance. The effective application on the network is performed at the latest time compatible, and if the TSOs' need is confirmed by the last available information on the expected situation. For example, Countertrading and Redispatching may be considered necessary to secure the grid under certain expected market scenarios, but are not applied if the market results turn out to be different than expected.

Since these measures influence each other, an enduring coordination process is required and the main target of the coordination process is to ensure that RD and CT Measures that have been identified in one process step are also taken into account in the following process steps. To allow the Core TSOs to relieve congestions effectively and economically efficient, an appropriate coordination between TSOs has to be

[2] "Remedial action" is defined in Article 2(13) of CACM Regulation as "any measure applied by a TSO or several TSOs, manually or automatically, in order to maintain operational security."

ensured through this Core RD and CT Methodology. The coordination will be performed largely by the Regional Security Coordinators operating in the Core Region (hereafter referred to as “Core RSCs”).

5. CROSS-BORDER RELEVANCE

5.1. Relation between cross-border relevance cost-sharing and CNEC

Article 35(2) of CACM Regulation describes that the methodology for coordinated Redispatching and Countertrading shall include actions of cross-border relevance. These actions shall enable all TSOs in each capacity calculation region to effectively relieve physical congestions irrespective of whether the reasons for the physical congestion fall mainly outside their control area or not. In the methodology for CACM 35(1), a cross-border relevant element is an element that meets the Critical Network Element with a Contingency (CNEC) selection criteria as developed in regional DA CCM. The Critical Network Elements are a subset of cross-border relevant elements. Critical Network Elements are subject to specific and detailed cost sharing principles of Article 74 CACM Regulation. Elements that are cross-border relevant but no Critical Network Element are treated with the requestor pays principle. When managing congestion, there are no separate processes for CNECs and other elements. These elements will however be treated differently in the cost sharing process.

According to the capacity calculation process defined by the Articles 20 and 21 of CACM Regulation, the CNEC selection criteria include those elements which are significantly impacted by cross-zonal trades. Whereas cross-zonal network elements are by definition considered to be significantly impacted, the other CNECs shall have a zone-to-zone PTDF that exceeds the threshold of 5%. In order to guarantee these cross-zonal trades, any remedial action to safeguard the resulting physical flows and solve congestions in and between bidding zones should be coordinated as referred to in Article 76 of SO GL Regulation and Article 35 of CACM Regulation.

According to Article 74(2) of CACM Regulation, the Redispatching and Countertrading cost sharing methodology shall include cost-sharing solutions for actions of cross-border relevance. Therefore, cross-border relevant elements selected as critical network elements in the capacity calculation process are subject to cost-sharing. Only those remedial actions are of cross-border relevance which are activated to solve congestion on a critical network element as defined in Articles 20 and 21 of CACM Regulation.

According to Article 74(6a) the methodology for cost sharing should provide incentives to manage congestion, including remedial actions and incentives to invest effectively. The connection of cross-border relevance and cost-sharing to CNECs should, thus, ensure that these incentives support the guarantee of firmness of cross-zonal capacity, as set out in Article 74(4) CACM Regulation.

5.2. Cross-border relevance and cross-border impact

There is a difference between cross-border relevance and cross-border impact. First, the meaning of both terms is different. Cross-border relevance is used to determine what remedial actions are relevant for cost sharing. Cross-border impact is used to determine what remedial actions have to be coordinated in case of the activation of such remedial actions. At least remedial actions with a certain cross-border impact will be used to solve congestions on elements of cross-border relevance. Second, both terms originate from different regulations. Cross-border relevance is defined in the methodology required by Article 35(1) of

CACM Regulation. Cross-border impact is defined in the methodology required by Article 75 of SO GL Regulation and will be further described per CCR in the methodology required by Article 76(1) of SO GL Regulation.

6. THE COORDINATION PROCESS

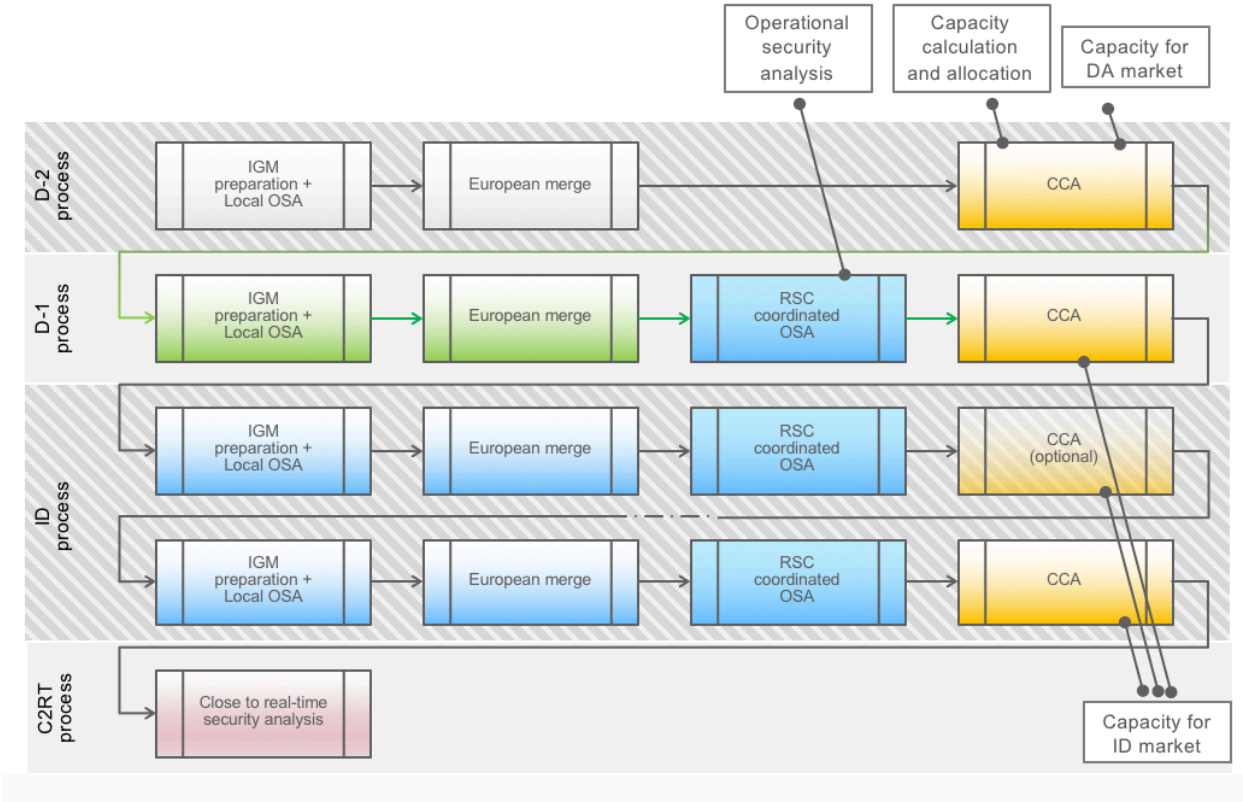
The Core RD and CT Methodology is built upon the cooperation of TSOs in Core CCR via the RSCs. Specific requirements in the SO GL Regulation already require to a large extent the coordination of remedial actions. As Redispatching and Countertrading are remedial actions, these are implicitly included.

6.1. Time-scales for coordination

The redispatching and countertrading application will be coordinated at least on following time-scales:

a. Day-ahead process;
b. Intraday process;
c. Close to real-time process, respectively Fast Activation Process.

This is illustrated in the following picture:



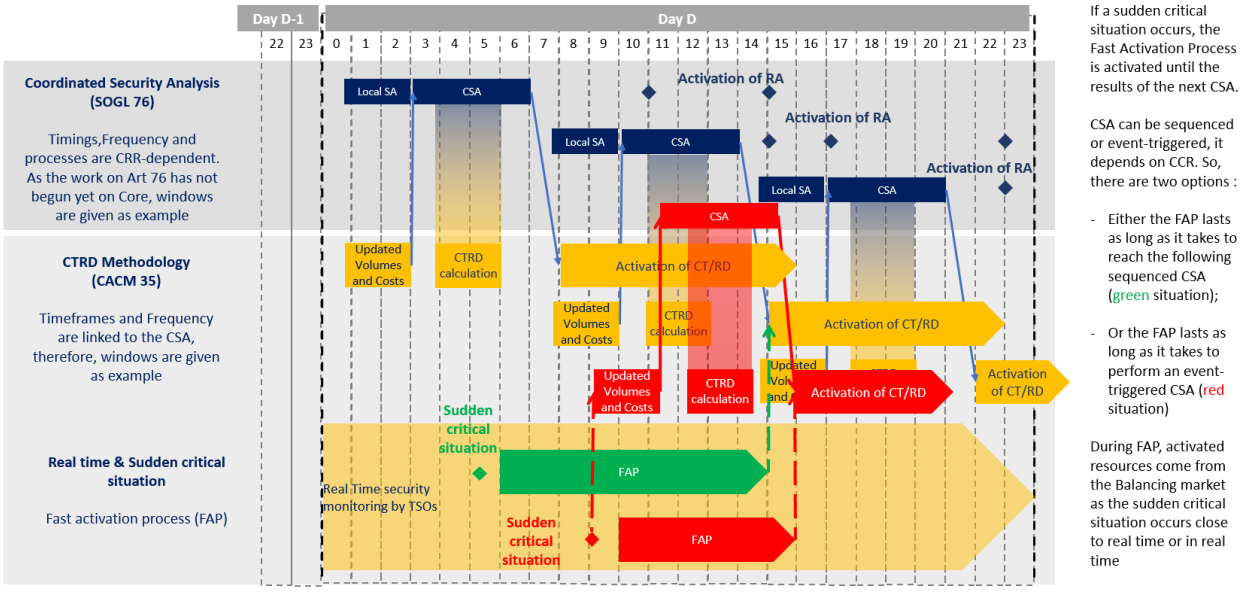
E.g. long lead times of power plants could lead to a need of an earlier CSA (e.g. D-2 or D-3) to decide on costly remedial actions which have to be activated before the DACF process. If it is decided, the Core RD and CT Methodology will be updated simultaneously.

6.1.1. Fast activation process

In case sudden physical congestions arise close to real-time or in real-time, a TSO has the responsibility to alleviate the congestion in its grid as soon as possible. In such a case the fast activation of a remedial action is required and the Fast Activation Process will be applied. In case the remedial action is not cross-border impacting, no coordination with RSCs or neighbouring TSOs is needed. In case it concerns a Cross-border Impacting Remedial Action, the activation of such a remedial action will often be outside the coordination process of the RSCs because of timing constraints related to the RSCs coordination process. However, TSOs impacted by the activation of the remedial action will be informed by the Requesting TSO as soon as possible to the activation and about its impact, which is in line with the methodology of Article 75(1) of SO GL. If the remedial action is activated cross-border (via cross border Redispatching or Countertrading), the counterparty will coordinate with the TSO facing the congestion.

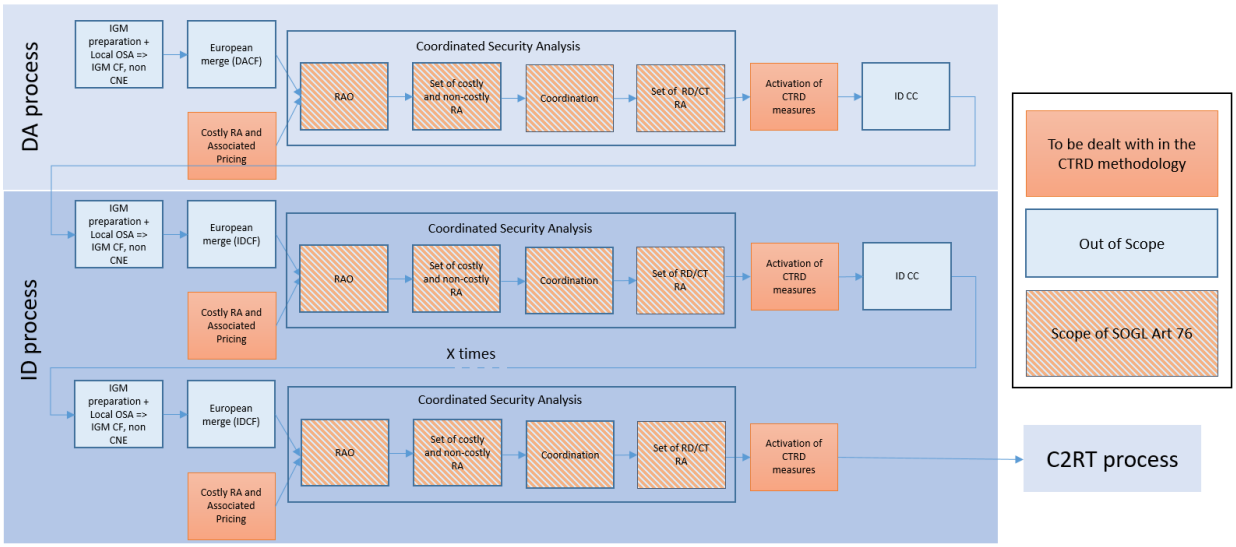
The frequency of the fast activation of a Cross-border Impacting Remedial Action is, however, low and should only happen in rare occasions. These rare occasions could be situations with out-of-range contingencies (in line with used definitions in methodology Article 75(1) of SO GL Regulation) or mistakes in forecasts (e.g. unforeseen weather circumstances with impact on feed-in of renewable energy).

The Fast Activation Process can be activated as long as it takes to have results and measures from the following CSA. A CSA can be started with fixed times or can be event-triggered (see flow chart below).



6.2. RSC coordination process

The general details of the RSC coordination process is shown in the following figure:



List of abbreviations used in this figure:
RAO = Remedial Action Optimisation
DACF = Day Ahead Congestion Forecast
IDCF = Intraday Congestion Forecast
IGM CF = Individual Grid Model Congestion Forecast
RA = Remedial Action
C2RT = Close to real-time
CNE = Critical Network Element
OSA = Operational Security Analysis

Coordination is performed during different timeframes in relation to the different market timings. The preparation of Countertrading and Redispatching starts at least on day-ahead, i.e. the day before the point of delivery. Firstly, TSOs shall individually assess possible Countertrading and/or Redispatching volume and supply a list of these volumes (including their anticipated costs) to the RSCs. The RSCs require such a list amongst other data such as common gird models (hereafter referred to as “CGMs”), the contingency list and the operational security limits, in order to carry out a CSA. The RSCs deliver the results of the CSA to the Core TSOs.

The RSCs shall, where it detects congestion, recommend to the relevant TSOs the most effective and economically efficient Redispatching and/or Countertrading measures. This recommendation is the result of the coordination within the whole Core CCR.

Any recommendation received from the RSCs for a particular Redispatching or Countertrading measure shall be evaluated by the significantly impacted TSOs with regard to the elements involved in that measure and located in its control area. The decision-making on the effective implementation of a Redispatching or Countertrading measure remains the responsibility of the TSOs. The conditions under which each TSO shall accept or refuse the proposed remedial action will be described in the methodology for preparation of remedial actions in a coordinated way developed under Article 76 of SO GL Regulation. The accepted actions should be included by the TSOs in the forthcoming individual grid models (hereafter referred to as “IGMs”).

The described process leads to the coordination of RD and CT Measures, as the assessment for required measures on regional level will be performed by a third party, the RSCs. Thus, these neutral entities will

ensure efficient dispatching of relevant resources on a regional level (Core CCR) in comparison to the current situation where congestion is often relieved bilaterally by TSOs.

There will be fewer possibilities for regional coordination via the RSCs closer to real-time. In order to ensure coordination of unforeseen events causing physical congestions occurring after the last relevant CSA and until real-time, the TSOs shall coordinate at least bilaterally with neighbouring TSO(s) in order to plan and carry out Countertrading and Redispatching. These TSOs will inform directly impacted TSOs in Core CCR as well as the RSCs appointed by the Core CCR. Lastly, TSOs will take into account the bilaterally agreed CT and RD Measures in the next relevant IGMs. New congestions as a result of a Countertrading or Redispatching measure within the Core CCR should be avoided.

In particular, the forecast failure of renewables feed-in and the possible change of the power plant schedules lead to the need of iterative coordinating processes, especially in case of a high demand for Redispatching.

The full set of required measures has to be divided in subsets which will be applied stepwise related to the different coordination processes.

6.3. Lead times

For the coordination of remedial actions, it is crucial to consider the activation lead times of Redispatching resources. The lead times depend on the respective technical specifications. For example, the ramp-up time of power plants requires long lead times. Thus, coordination processes must be carried out in a timely manner and can only be based on the information available at that time. The forecast errors require that remedial actions are activated gradually. For this, in the first coordination process, only the remedial actions that cannot be activated later because of their lead times will be activated according to the optimisation result. These activated actions form the basis for the following optimisation process and will therefore be added to the next IGM. In the next coordination process the activated measures are reviewed and, if possible, adjusted. This procedure is repeated until the final coordination process is reached, in which the actions still available are utilised.

7. SHARING OF RD & CT RESOURCES

Information regarding available resources for Redispatching and Countertrading and relevant additional information (e.g. volume of storage, restrictions of gas supply, etc.) are shared transparently between Core TSOs and the RSCs via the RSCs. Regarding the sharing of resources for Redispatching and Countertrading in the CSA or the future common optimisation, many aspects have to be considered and are described below.

7.1. Dependencies in sharing of resources for redispatching and countertrading

The amount of resources for Redispatching and Countertrading shared by the TSOs depends on:

a. Uncertainties of forecast security calculations in connection with the timeframe of security calculation;
b. The level of coordination.

7.1.1. Uncertainties of coordinated security analysis in different timeframes

The aim of the CSA and remedial actions is to assure the effective and efficient reduction of risks to the reliability and security of the grid for real time operations. As many measures have to be decided prior to real-time (e.g. start-up of a power plant), forecast calculations have to be made, i.e. day-ahead congestion forecast (DACF) and intraday congestion forecast (IDCF). Inter alia, the following changes may occur during the period between the DACF calculation and real-time:

- Intraday-changes due to forecast errors of renewables;
- Changes of generation units which can act fast (e.g. pump storage power plants, gas power plants) and therefore react on changes of renewables;
- Changes of generation units which provide ancillary services;
- Changes of other remedial actions (PST, topology changes);
- Changes of scheduled generation units or exchange flows due to ID-trading;
- Changes of the availability of network elements due to unplanned outages changes of the availability of generation units due to unplanned outages or technical incidents.

All of these changes have an influence on the load flow situation and therefore on the remedial actions which are required to assure the reliability and security of the grid. Therefore, resources for Redispatching and Countertrading have to be used/shared wisely amongst the different timeframes. In particular, it must be considered that, on the one hand, the closer to real-time, the more resources can be shared due to decreasing uncertainties, but, on the other hand, the closer to real-time, the less resources are available due to decreasing activation time left. Any coordinated Redispatching and Countertrading should be activated as close as possible to real-time taking into account the lead time for activation, urgency of the system operation which needs to be solved and any limitations to the availability of resources.

7.1.2. The level of coordination

In the regular process, TSOs coordinate the security analysis via RSCs, in compliance with the optimisation principles described in the methodology.
In the Fast Activation Process, a full coordinated security analysis (hereafter referred to as “CSA”) is not possible due to lack of time. In these cases, normally only bilateral cross-border Redispatching or Countertrading can be used.

7.2. Sharing of resources for redispatching and countertrading

There is a difference in the process for sharing resources for Redispatching and for sharing resources for Countertrading during the different timeframes. Next to this, sharing these resources with different CCRs introduces a different dimension for both Redispatching resources and Countertrading resources

7.2.1. Redispatching

When sharing resources for Redispatching, the aspects for sharing these resources during the different timeframes and aspects for sharing resources with different CCRs need to be taken into account. The following paragraphs describe these different aspects.

7.2.1.1. Aspects for sharing redispatching resources between different timeframes

- Redispatching resources with a long lead time have to be considered in the earliest coordination process. Redispatching resources with a short lead time should be preserved for intraday and close to real-time;
- Pumped storage power plants should be used only for short periods. When used for long periods the water reservoirs are reduced and this implies that these measures are not available in the future or/and additional congestions can arise due to increased pumping;
- Balancing resources should not be endangered;
- Local legislation and technical and regulatory restrictions have to be taken into consideration (e.g. regulations regarding renewable power plants, regulations regarding lead times for the nomination of gas schedules, etc.);
- Batteries, demand response facilities and aggregators can be used as resources for Redispatching if the information of localization and the technical parameters are known and a legal authorization is given. The implementation for these resources regarding timeframes and activation time depends on the respective technical constraints;
- If changes occur on the grid or in the availability of the resources, TSOs update the availability of their resources and notify the RSCs;
- Every TSO is responsible for the security of its own grid. Therefore, the decision on which resources are made available at which time should be made by the TSO.

7.2.1.2. Aspects for sharing redispatching resources between other CCRs

When a TSO is part of more than one CCR, resources of Redispatching have to be shared, depending on the needs of the different CCRs or the need of network elements which are part of more than one region. The sharing of resources between CCRs is a matter of coordination between CCRs. According to the draft of CSA methodology, RSCs should ensure coordination between CCRs. TSOs shall only decide and inform the RSCs whether a resource provided to a CCR is offered simultaneously to different CCRs or is offered only to one CCR. To decide if a resource is offered to one or several CCRs, the following options could be considered by TSOs:

- The basis for sharing of resources between CCRs will be based on the cross-border impact of remedial actions defined in the methodology of Article 76(1) SO GL Regulation;
- The impact of the activation of a resource which has a cross-border impact will be monitored in the CSA process via the observability area defined in the methodology of Article 76(1) SO GL Regulation;
- In case that one CCR does need only little resources, most of the resources can be given to the other region;

- In case the need of one CCR is to increase a resource and the need of the second CCR is to decrease the same resource, this resource can be blocked;
- The decision for sharing resources can be done on the basis of sensitivities: If two CCRs need the same resource and that resource does not worsen any congestion or the grid situation in general, the resource can be activated for the congestion which is most influenced;
- The Redispatching resources shared between different CCRs, specified by the TSO where the resource is located in its control area, has to be reasonable. In case of conflicts, a coordination process between the different CCRs via RSCs should be performed. If the same conflict occurs on a regular basis, then a different approach for sharing resources has to be defined by the respective TSO, either or not with guidance from the RSCs;
- In case resources are shared with more than one RSC or between CCRs, the TSO will flag this to the relevant RSCs.

7.2.2. Countertrading

7.2.2.1. Aspects for sharing of countertrading resources between different timeframes

- When sharing resources for Countertrading, the aspects for sharing these resources during the different timeframes and aspects for sharing resources with different CCRs need to be taken into account. The following paragraphs describe these different aspects. The basis for sharing of resources between CCRs will be based on the cross-border impact of remedial actions defined in the methodology of Article 76(1) SO GL Regulation;
- The impact of the activation of a resource which has a cross-border impact will be monitored in the CSA process via the observability area defined in the methodology of Article 76(1) SO GL Regulation;
- The resources for Countertrading are power plants on the balancing market/ intraday market, demand response facilities, aggregators and balancing platforms. A total amount of available volume for Countertrading should be estimated per TSO for each timeframe;
- Countertrading should be used close to real-time or as a fallback if the CSA or the future common optimiser does not work or during the Fast Activation Process. Any lead time for activation will be taken into account.

7.2.2.2. Aspects for sharing of countertrading resources between different CCRs

- In case a TSO is part of more than one CCR, the total amount of potential Countertrading has to be shared between the CCRs, depending on the need of the different CCRs or the need of network elements which are part of more than one CCR;
- When Countertrading is structurally more efficient on some CCRs (HVDC links, electrical peninsula, the Countertrading does not endanger the security of other parts of the grid, etc.), Countertrading could be given in priority to these CCRs;
- Sharing of a TSO's Countertrading resource with different CCRs has to be reasonable and should be specified by the TSO where the resources are located. In case of conflicts between CCRs, a coordination process between the different CCRs via RSCs should be performed. In case of regular

conflicts, the TSO should propose a different approach for sharing Countertrading volumes, either or not with guidance from the RSCs.

8. SCOPE OF SECURITY ANALYSIS

When performing the CSA, all remedial actions aim at securing the grid. The CSA should preferably be calculated with the full grid model, however, a reduced/equivalente model (e.g. parts of the grid outside of Core CCR observability area, or sub-transmission networks) may be allowed under the condition that it will not affect the flows on the monitored elements. The monitored elements should be at least the grid elements within the Core CCR area, whereas the contingency list should preferably include all grid elements within the observability area of Core CCR. Some exclusion may be proposed by particular TSO, so called blacklist, if this TSO may assure that the potential overload on such elements can be removed by this TSO alone or when congestion is a local issue. The CSA will first identify overloads on monitored elements (in base case and contingency cases) and then relieve those overloads by proposing an optimal set of remedial actions. The exact scope of the used grid model will be defined in the methodology of Article 76(1) SO GL Regulation.

9. REMEDIAL ACTION OPTIMISATION PRINCIPLES

Disclaimer: The optimisation principles described in this chapter are a subject to change and will further evolve, based on the development of the methodology of Article 76(1) of SO GL Regulation.

This document provides a high level overview of the remedial action optimisation principles in a coordinated way (henceforth RA optimisation) and is based mostly on the preliminary concept for “Decision Support and automated Remedial Action assessment” (DSaRAa) provided by TSCNET.

9.1. Inclusion in the regional CSA

The RA optimisation will be included in the regional CSA process, as defined by Article 76 of SO GL Regulation, i.e. within the DACF process and the IDCF processes. The optimisation shall start after all TSOs provided their confirmation on their input data that will be used for the optimisation. After the results of the CSA are available, in which also the remedial actions are considered, two cases may occur after the application of the proposed remedial actions: either the grid is secure, i.e. because there is no congestion or because one or more TSOs accept not to be (N-1) secure if these (N-1) have consequences limited to those TSOs, or the grid is not yet secure and the process has to continue with the next CSA iteration. In the latter case, TSOs have the possibility to update the pool of remedial actions that is to be used in the next process iteration.

9.2. Security assessment principles

The RA optimisation includes two security assessments to fulfil the (N-1) security principle of the transmission system regarding power flows for temporary and permanent admissible transmission loadings: the preventive security assessment and the curative security assessment.
In the preventive assessment, constraints of temporary admissible transmission loading (TATL) or of permanent admissible transmission loading (PATL) are taken into account and the impact of preventive remedial action application is assessed for all contingency cases. The reason for the activation of remedial actions during preventive assessment is to enable the TSO to solve forecasted contingencies in due time.

In the curative assessment, constraints of PATL are included and the impact of curative remedial action application is assessed independently for all linked contingency cases.

9.3. Required input data

The necessary information to perform the RA optimisation comprises of:

a. The merged CGM of best possible quality;
b. The list of contingency cases and admissible loading per element to be considered in the process;
c. The list of Special Protection Schemes (SPS);
d. Additional data.

The remedial actions considered for optimised coordination are defined by the TSOs as input data (update of RAs during the process is possible). Note that already included RAs in the CGM must be considered as activated RAs in the optimisation.

9.3.1. CGM

The RA optimisation will become an integral feature of the CGM process and considers all 24 timestamps/ all remaining hours of each day. The CGM, the contingency list, remedial actions and additional constraints provide the required supportive files for the TSOs on what is the optimal set of remedial actions that is to be applied to achieve a congestion free model. The model must contain all necessary data to perform load flow calculations (e.g. susceptance of branches). Furthermore, the TSOs must provide IGMs which contain the values for reactive and active power loads and feed-ins. The handling of active power losses of the transmission grid requires the modelling of relevant limitations for active power feed-in. These aspects require the modelling of active power limits and reactive power limits for generations units.

9.3.2. Contingency cases and admissible loading

The RA optimisation principle uses contingency cases that are defined by the combination of monitored elements (i.e. a set of network elements that is to be monitored during the contingency analyses) and simulated outages (i.e. a set of network elements that define the outages that are simulated during the contingency analyses). Note that the definition for monitored elements and simulated outages remains unchanged by the introduction of the RA optimisation. Transmission admissible loadings serve as security constraints in each contingency case and consist of PATL and TATL. The PATL describes the physical limits of each monitored element that can be accepted by a network branch for an unlimited duration without any risk for material, whereas the TATL describes the temporary limit that can be accepted by a monitored element for a certain, limited duration. Prior to the definition of admissible loadings, it is important to emphasize that the value of the current limit is defined for each element in TSOs' IGMs.

9.3.3. Special protection scheme

SPS is a RA or a set of RAs respectively, which is implemented automatically if a certain condition is fulfilled. Thus, these RAs must be considered in the security assessment process in any case as they are predefined and will be activated before any other curative RA. In case a SPS is defined for a particular contingency case, this implies that it has to be prioritized over any other curative RA.

9.3.4. Additional data

To perform a security-constrained optimal power flow, an optimisation area has to be defined. Within this area, technical constraints relevant and consistent with CSAM are monitored. Furthermore, all relevant contingencies have to be defined, and all available degrees of freedom must be included. If generation units, transformers or HVDC connections are provided for the optimisation algorithm, their respective limits need to be specified. The required data for a generation unit available for the optimisation includes: its active power limits and power gradients for redispatching, its status (must run, in operation, in revision), its cost information (marginal costs, start-up costs), its minimum downtime and minimum operating time, its objective function penalty term and a supply-dependent attribute. For phase shifting transformers (PST), the objective function penalty term as well as minimum and maximum tap positions (the range of possible adjustments) need to be defined. For HVDC converter stations, at which the power injections can be changed within the optimisation algorithm, the considered information includes the objective function penalty term and its power operating range to describe the available range for the optimisation. Furthermore, possible topological measures have to be considered.

9.4. RA Coordination

In general, RAs can be applied as a preventive or curative measure. Preventive RAs are used to meet a contingency that may occur, while curative RAs are used after the occurrence of a contingency case.

9.4.1. General optimisation approach

The RA optimisation is a global optimisation approach for all remedial actions (costly and non-costly) that minimizes the costs/volume for remedial action application (objective function), while limiting the impact on the market. This means that all existing congestions are considered in conjunction with the available remedial actions. The optimisation is time-coupled, i.e. the optimising algorithm explicitly considers temporal dependencies of remedial actions and does not neglect the interdependencies (e.g. technical, organizational and legal) between consecutive timestamps. For time-coupling optimisation, it is crucial to make use of constant identifiers for all relevant grid elements. For the decision on which remedial actions to utilize, the optimisation approach considers both the costs and the efficiency (i.e. sensitivity) of a remedial action or a set of remedial actions, respectively, on a specific congestion. That is, the optimisation includes the total remedial action costs as well as the total activated remedial action amount. Therefore, both economic and technical aspects of remedial action application are taken into account. In the optimisation algorithm this is implemented by means of objective function penalty terms, e.g. for generation/load units, phase shifting transformer, HVDC converter stations and topological remedial actions. These are taken into account by the optimisation algorithm if the power output of a generation unit is modified. For a generation unit, for example, the objective function penalty term consists of the unit's marginal costs and its specific penalty term. It is applied to avoid too large modifications of the market solution, i.e. the power injection before the optimisation. The interdependencies of remedial actions and congestions are considered implicitly based on the formulation of the optimisation problem. For the coordination of remedial actions, TSOs must define suitable assets as remedial actions and define sharing parameters, which are taken into account during the remedial action assessment. In addition, it is possible for TSOs to introduce manual corrections of the suggested remedial actions. This is implemented by an iterative operational process comparable to the currently applied DACF runs.

9.4.2. Definition of RA types

The considered types of remedial actions are control changes (modification of a phase shifting transformer tap position or transformer, flow control via DC links), topological changes (open or close network elements, node reconfiguration, cancelation of outages) and electric energy injections (Redispatching and Countertrading, curtailment of renewable energy sources). The RA optimisation must consider technical constraints (e.g. continuous application of topological modifications over time operational constraints (e.g. activation lead time of different types of remedial actions) and balancing constraints (e.g. Redispatching and Countertrading must be activated in a balanced way). Note that technical constraints must be differentiated between TATL and PATL in order to calculate the loading of the network elements.

9.4.3. Definition of RA sharing

In the remedial action definition, different types of sharing can be defined. In the DSaRAa project for example, three sharing types of remedial actions are distinguished in the RA optimisation: shared remedial actions, conditionally shared remedial actions and non-shared remedial actions. Shared remedial actions relieve congestions within their technical restrictions, while there are no organizational restrictions that need to be considered. Conditionally shared remedial actions are equivalent to shared remedial actions; however their applicability depends on additional factors. Such factors are, for example, limitations in the 110 kV grids. Non-shared remedial actions are used to relieve specific congestions, but are not available for the global optimisation (e.g. phase shifting transformer on an external border). The described three different types are given as examples. In any case, all different types of sharing of remedial actions have to be in line with the methodology required by Article 76 of SO GL Regulation.

9.4.4. Priorities of RA application

The coordination of different types of remedial actions must consider several economic and regulatory requirements but is not limited to:

a. Non-costly remedial actions should be considered before applying costly remedial actions. If non-costly remedial actions are not efficient enough, then both non-costly and costly remedial actions should be considered. In any case, the algorithm should be able to find a solution with only non-costly remedial actions if it exists;
b. The minimization of remedial action costs must be implemented (particularly for Redispatching);
c. The consideration of national specificities that affects the optimization needs to be clarified and will be defined in the methodology required by Article 76 of SO GL Regulation.

In the RA optimisation, these requirements could be met by defining adequate objective function coefficients, which reflect the priority and cost of each RA. These objective function coefficients could be used to perform the coordination process in an optimisation of all available remedial actions.

9.5. Concepts for RA Activiation

The consideration of activation lead times is crucial for the decision on when to apply which remedial action. Remedial actions with long lead times must be activated earlier, whereas remedial actions with shorter lead times are activated at a later time. Therefore, limits for the activation time and specific criteria to decide on the activation must be included in the optimisation for each remedial action.

9.6. Output of the RA optimisation

The result of a future optimisation should be displayed in a 24 timestamps overview structure for DACF and till the end of the day for IDCF. It should include a list of remedial actions (phase shifting transformer regulation, grid topology, Redispatching, Countertrading), load flows (lines, tie-lines, transformers), a contingency analysis, phase shifting transformer tap positions, a list of outages, net positions and tie line flows including power flows. Furthermore, a graphical and numerical comparison between each stage of the calculation process would be beneficial. Note that the responsibility for final decision of remedial action implementation and activation remains on TSO side.

10. DOCUMENTATION OF REDISPATCHING AND COUNTERTRADING ACTIONS

Today, the TSOs in the Core CCR are obliged to record and report the use and costs of Redispatching and Countertrading following the Transparency Regulation, more specifically Article 13(1) on information relating to congestion management measures:

"For their control areas, TSOs shall provide the following information to the ENTSO-E:

(a) Information relating to Redispatching per market time unit, specifying:

- The action taken (that is to say production increase or decrease, load increase or decrease)
- The identification, location and type of network elements concerned by the action
- The reason for the action
- Capacity affected by the action taken (MW)

(b) Information relating to Countertrading per market time unit, specifying:

- The action taken (that is to say cross-zonal exchange increase or decrease)
- The bidding zone concerned
- The reason for the action
- Change in cross-zonal exchange (MW)

(c) The costs incurred in a given month from actions referred to in point (a) and (b) and from any other remedial action".

The Core RD and CT Methodology proposes that the RSCs appointed by the Core CCR keep a record of the proposed Redispatching and Countertrading actions for five years. The record shall include:

- The Redispatching and Countertrading carried out based on the RSC proposal;
- All additional Redispatching and Countertrading carried out in relation to the Core CCR borders;
- All justifications for why a recommendation from RSCs is not followed.

With the recording of this information, the RSCs have a full picture of the Countertrading and Redispatching action in the Core CCR, including why a recommendation has not been followed by the TSOs. This

information is also to be used for the cost-sharing between the TSOs following the methodology being developed according to Article 74 of CACM Regulation. The details of reporting such as which remedial actions shared in the CSA will be treated in the methodology required by Art. 76 of SO GL Regulation.

11. PLAN FOR IMPLEMENTATION

The implementation of this proposal is dependent on a number of conditions:

a. Regulatory approval of Redispatching and Countertrading cost-Sharing methodology required by Article 74 of CACM Regulation;
b. CSA methodology, according to Article 76 of SO GL Regulation, has been implemented and is in operation for the Core CCR.

The methodology for the CSA will be submitted for approval by all NRAs in September 2018. Past experience shows that NRA approval processes take at least six months, at most 16 months if ACER needs to be involved in the decision-making process. Moreover, at present it is unknown which implementation timeline the CSA methodology will follow. It is therefore not possible, at this time, to give an indicative timing for when the proposal will be implemented.

12. SUMMARY OF STAKEHOLDERS' COMMENTS

To be provided after the public consultation period.