Explanatory Document to the second amendment of the Intraday Capacity Calculation Methodology of the Core Capacity Calculation Region

in accordance with article 20ff. of the Commission Regulation (EU) 2015/1222 of 24th July 2015 establishing a guideline on capacity allocation and congestion management

09-08-2022

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NRA approval:	☐ outstanding	☐ approved

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1. Introduction

The Commission Regulation (EU) 2015/1222 establishing a guideline on Capacity Calculation and Congestion Management ('CACM') requires the development and implementation of a common Day-Ahead Capacity Calculation Methodology ('DA CCM') and Intraday Capacity Calculation Methodology ('ID CCM') per Capacity Calculation Region ('CCR').
CCR Core ('Core') submitted the proposal for the Core ID CCM on 15th September 2017 and received a Request for Amendment ('RfA') by Core National Regulatory Authorities ('NRAs') on 15th March 2018. On 4th June 2018 Core Transmission System Operators ('TSOs') re-submitted the Core ID CCM. The Core NRAs could not reach a common approval and the Core ID CCM got send to the Agency ('ACER'). In 21st February 2019 ACER published its decision on the Core ID CCM.

In this explanatory document Core TSOs will explain the changes included in the proposal for a second amendment of the Core ID CCM. A track-change version of the Core ID CCM reflecting the proposed changes is shared for informative purpose.

2. Alignment with Core ROSC Day-ahead CROSA process

The capacities made available to the Intraday (ID) market should take into account all possible conditions resulting from the security of the system operation, while offering the highest possible capabilities available to the market. This assurance will be possible if TSOs take into account all cross-border relevant remedial actions (XRAs) from the coordinated regional operational security analysis (CROSA) in accordance with Article 78 of the SO Regulation. Not providing the full set of data for the IDCC process with all necessary XRA from the current ROSC improved coordinated solution (ICS) or future CROSA process could result in the TSOs applying more frequently security measures during the individual validation process in IDCC. The security measures implemented in the individual validation could result in limitations in the offered transmission capacities for the ID market.

Ideally, the coordination between the common grid model (CGM) creation, ROSC ICS/CROSA and IDCC processes will be improved and allow a fully sequential order of the different processes.

During the public consultation stage, Core TSOs will carry out work on the possibilities of process synchronization.

The current Core ID CCM and business process leads to a two-fold and interlinked issue:

1. It would be difficult to integrate output from Core ROSC DA CROSA process in IDCC due to the parallel operational timings of both processes and the conflicting objective functions of the remedial action (RA) optimizers. Using an initial Day-Ahead Congestion Forecast (DACF) CGM (i.e. without coordinated RAs or grid model corrections) available around 18:15 and performing the non-costly Remedial Action Optimization (NRAO), the resulting list of applied remedial actions from NRAO would conflict with the both costly & non-costly remedial actions from the ROSC ICS process. This increases risks for unreliable results and compromised grid security.
2. It would be challenging to reach the required performance with tight IDCC process timings, leading to doubt on the feasibility to fit IDCC target process timings according to CCM requirements. A key factor in this problem is the known performance of NRAO in the Core DACC process, which due to a high level of constraints, currently consumes a major amount of time, well exceeding the shorter time window available for IDCC.

The amendment proposes to change several business process steps to ensure a better alignment with the ROSC CROSA process, by:

- Establishing a consistent use of remedial actions between the CROSA and IDCC process, which will ensure remedial actions applied in CROSA (at that point in time) remain effective after providing intraday capacity.
- Considering both costly & non-costly remedial actions to solve congestions in the CGM, in order to afterwards calculate capacity on a CGM which is as much as possible congestion-free.
- Solving performance issues and timing constraints caused by the parallel operational timings of CROSA and IDCC processes by skipping the NRAO step and the intermediate FB computation within the IDCC process.

In general, CROSA aims to solve all congestions present in the CGM. Ensuring better alignment between Core IDCC and CROSA process is therefore considered as an improvement in ensuring sufficient available ID capacity compared to the current methodology. During the intermediate period until ROSC v1 Go-Live the performed coordination in the ROSC ICS process is limited in comparison to the target v1 solution, which could lead to limited capacities.

2.1. Target solution

Ideally, the outputs of the second regional run of the ROSC DA CROSA process should

be included but this solution is not feasible in terms of timing (all outputs available around 22:00, after deadline for providing capacities to IDA1 at 21:45). The best feasible option is therefore to consider coordinated RAs at the end of the ROSC DA CROSA 1st regional run, which are expected to be available around 20:00. The IDCC target solution is to include outputs from the 1st regional run of the parallel ROSC DA CROSA process. See figure 1 for the (future) target timings of the ROSC DA CROSA process

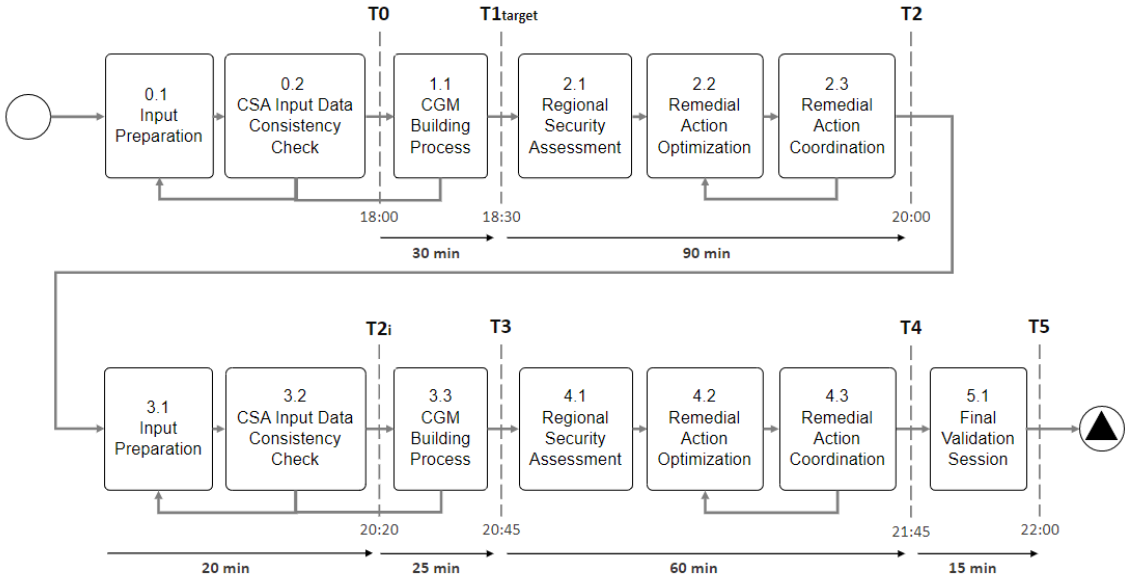


Figure 1:Target timings for Core DA CROSA process

Consequently, the IDCC business process has been updated to be able to include the available CROSA outputs between 20:00-20:30. The selected solution excludes the NRAO step and the intermediate FB computation, which should enable a process time saving of at least 45 minutes.

The ROSC v1 version (Go-Live planned in 2024) will not yet respect these target timings, the currently foreseen implementation plans to deliver 2 different versions of outputs (coordinated RAs) in two output formats (updated common grid models and a list of XRAs) depending on the timing :

- "Proposed RAs" at 19:40. This set of RAs is the output of ROSC Remedial Action Coordination (see 2.2 in figure 1) including the XRAs proposed by TSOs before the coordination step.
- "Agreed RAs" at 20:30. This set of RAs is the output of the ROSC Remedial Action Coordination phase (see 2.3 in figure 1).

The target of Core IDCC process is to include at the beginning of IDCC process the full set of "Agreed RAs" if available, or the "Proposed RA" if the coordinated RAs are not available. The high-level business process of the target Core IDCC process, with current timing assumptions[1], is depicted below.

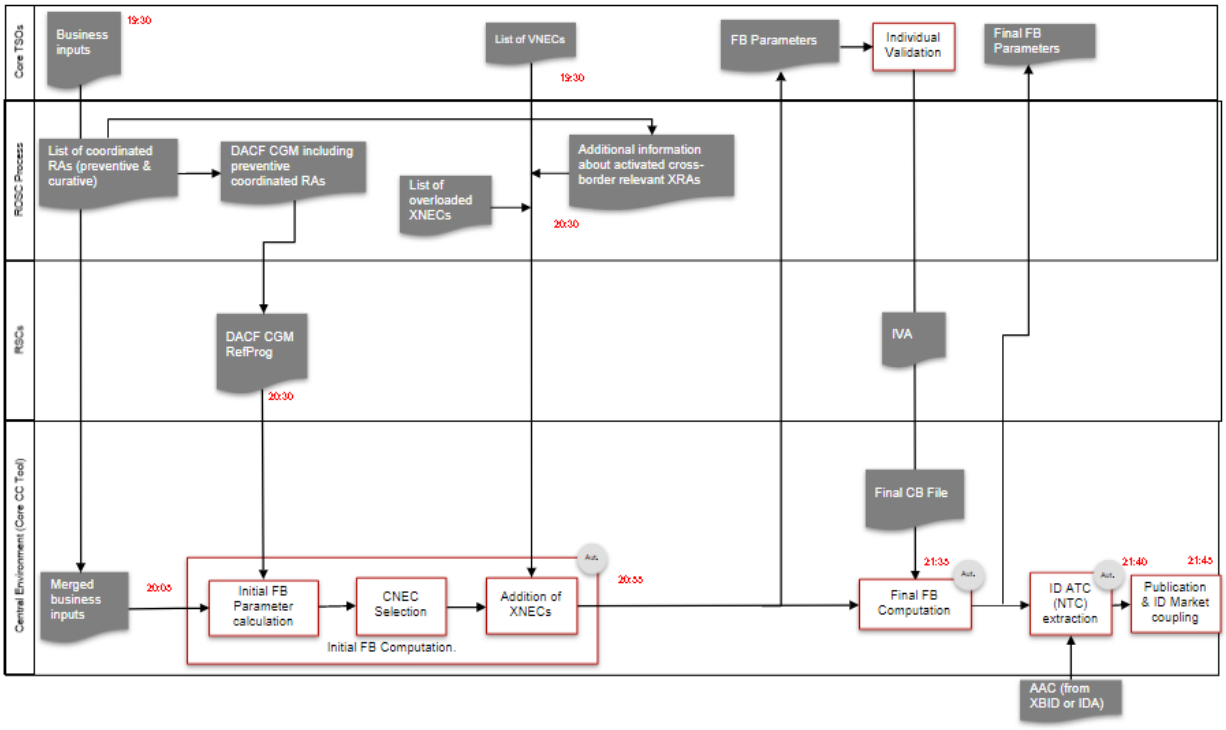


Figure 2: High-level Flowchart Core FB IDCC – Target solution

Article 31 of the Core ROSC CCM allows TSOs to prevent that XRAs coordinated during the ROSC process which include a cross-border schedule free up additional ID capacity. An additional step is therefore proposed with the intention of strictly applying Art. 31 of ROSC methodology by including a minimum subset of overloaded XNECs from ROSC as additional CNECs in the IDCC process if cross-border redispatch or countertrading has been applied. Their inclusion shall prevent the market from counteracting applied XRAs. It is important to highlight that the respective overloaded XNECs are detected as overloaded by the CROSA prior to the application of Remedial Actions. These overloads are to be addressed by the CROSA and since a CGM including preventive costly and non-costly Remedial Actions is considered at the start of the IDCC process, the XNECs should not be overloaded anymore.

In general, CROSA aims to solve all congestions of all XNECs in Core CCR regardless of the fact, if they are CNECs in IDCC or not: this sub-process focuses on possible

[1] Timing assumptions are subjected to be slightly updated with experience of the parallel-run.

inclusion of additional XNECs in IDCC for overloaded XNECs which overload is solved by applying cross-border redispatch or countertrading in CROSA, but not initially considered as CNEC in IDCC.

In details, the principle of the process is based on a 2-step filtering approach of overloaded XNECs from ROSC DA CROSA process that is depicted in the figure below:

1. Overloaded XNECs must be part of a static VNEC[2] list defined in IDCC process
    - If an overloaded XNEC is not part of pre-defined VNEC list, this XNEC is ignored by IDCC process.

2. Overloaded XNECs must have a minimum sensitivity compared to any cross-border redispatch / countertrading activated in CROSA RAO
    - Depending whether this sensitivity is over a certain threshold (to be agreed upon amongst Core NRA and Core TSOs[3]), the overloaded XNEC is turned into an additional CNEC in IDCC after the "normal" CNEC selection process. The RAM of such additional CNEC is capped up to zero to prevent any negative capacity that would go beyond the objective of Art. 31 of ROSC methodology.
    - Such approach aims to comply with Art. 31(3a) of ROSC methodology. The "effect of activated XRAs on operational security" is assessed by computing the sensitivity of such activated XRAs from CROSA RAO on the overloaded XNEC. For the situation with a high sensitivity, the addition of overloaded XNEC as a CNEC in IDCC enables to "prevent the netting of cross-border schedules which results from activated XRAs" and "prevent that these schedules increase cross-zonal capacities in the direction in which additional trade could worsen operational security".

[2] VNEC: Validation Network Element and Contingency. Such element can be added by Core TSOs during the individual validation step according to Art. 19(3) if all available costly and non-costly RAs are not sufficient to ensure operational security.

[3] A solution should be reached during the interim solution until ROSC v1 go-live, based on an analysis on operational data.

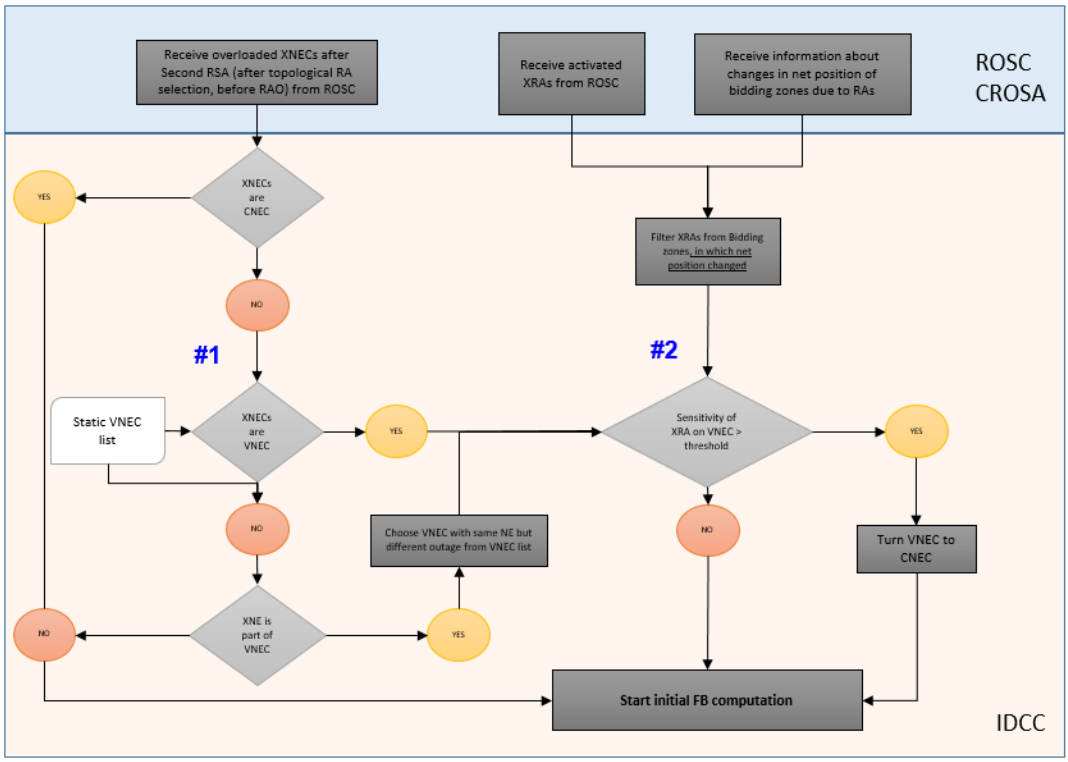


Figure 3: Sub-process of inclusion of XNEC from DA CROSA process in IDCC

With the possible inclusion of additional XNEC from ROSC, it must be noted that the FRM methodology differs between ROSC CROSA (no FRM) and IDCC (by default 10% Fmax). This is justified by the different goal of both processes. FRMs during the IDCC are needed to cover uncertainties of the FB calculation process. These uncertainties are increased due to fact that an intermediate step of ROSC DA CROSA will be used in ID CC. Indeed, the ROSC and IDCC processes will be run in parallel and data from the ROSC process to the IDCC will be provided before the ROSC process is completed. Therefore, there is a risk that in the IDCC process there will be deviations from the final ROSC results. This is related to the quality of the best forecast available when the IDCC process starts and the general methodology of the capacity calculation itself. However, the ROSC process does not need to cover all these uncertainties and limitations since not all agreed RAs need to be ordered at the moment of identification. A reassessment of the situation is possible when better/later input is available as long as the activation times of RAs can be fulfilled. It has to be acknowledged that in IDCC, available capacity is directly given to the market and allocated capacities are firm such that TSO cannot influence them anymore. In general, it can be assumed though that using later created input data will allow the usage of decreasing FRMs.

Technically, the major changes compared to the business process before amendment are:

- Skipping NRAO steps within the IDCC process and discarding the use of MNECs since this concept is not used anymore in the process due to the exclusion of a NRAO.
- Merging the Initial and Intermediate FB computation, since no new FB computation is required, using the outcomes of the NRAO step.
- Inclusion of preventive (in case not included in CGM) and curative RAs from the list of RAs provided by ROSC CROSA process ("Proposed" or Agreed" RAs) in the Merged CBCORA file of the IDCC process as an input of the initial FB computation.
- Inclusion of a DACF CGM version including Proposed or Agreed preventive (incl. redispatch) RAs from ROSC (CGMES format) as an input of the initial FB computation.
- Incorporate a subset of XNECs which are overloaded after the second regional security assessment (19:20 D-1) during the ROSC process in the IDCC as CNECs if cross-border redispatch or countertrading has been applied (application of Art. 31 of Core ROSC CCM).

2.2. Interim solution

According to Article 37 of Core ROSC CCM, ROSC v1 go-live is not planned before 2024. Since Core IDCC go-live is expected to take place earlier (current assumption is June2023), an interim IDCC solution must be used until alignment with ROSC v1 is possible in 2024. The interim solution aims at being as close as possible to the target solution in order to facilitate smooth transition and enable good practices.

The interim solution consists in substituting the inputs that will be provided by ROSC v1 process (list of proposed / agreed RAs) by the similar outputs available from the ROSC ICS process in Core. The ROSC ICS substituted the former coordinated security assessment in Core since 2021. Therefore, when considering the option of using existing DACF CGMs, this process should be followed. Consequently, it is proposed to keep a very similar process as planned for the target solution as depicted below:

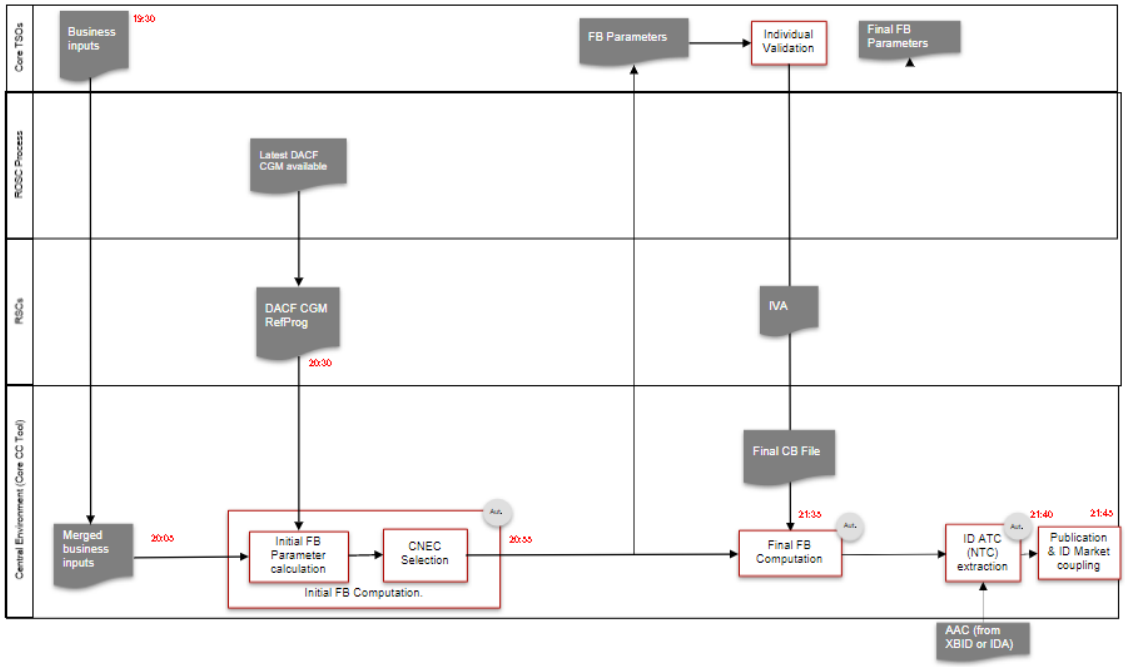


Figure 4: High-level Flowchart Core FB IDCC – Interim solution

The DACF CGM that is provided by ROSC ICS process is the latest available DACF CGM available in the coordination process before 20:30 This "combined DACF CGM" consists of a combination of the most recent updated DACF models, including model improvements of the coordination process (RAs), from both Core RSCs Coreso and TSCnet.

The current version of ROSC ICS process also provides preventive RAs, selected during model improvement phase included in the updated Combined DACF CGM, but doesn't include any provision of an external list of RAs that are selected as model improvements. However, it is understood that any curative RAs that would be used in the ROSC ICS process can't be communicated to IDCC process.

Compared to the target solution, the main limitations of the interim process based on alignment with ROSC ICS process are:

- Usage of an intermediate version of combined DACF CGM available before 20:30, with partial coordination only. The full coordination at the Core level (last version of combined DACF CGM) is only available after the additional runs are performed, done after the inter-TSO Daily Operational Planning. Teleconference(Results available ~22:00). It is expected to have a more advanced level of coordination around 20:30 with the arrival of ROSC v1 process (end of coordination of the 1st regional run at the Core CCR level around 20:30). Nevertheless, since no operation experience with CROSA exists, this is only an estimation.

- No inclusion of curative RAs since no external list of RAs can be provided by ROSC ICS process.
- The common process to handle the XRA effect from ROSC CROSA (application of Art. 31 of ROSC CCM) is not included in the approach for the interim solution. Such a process is not technically feasible since ROSC ICS is not able to provide any of the additional required standardized inputs. The benefits of such process seem also limited since most of cross-border redispatch and countertrading actions are currently performed after 20:00 in the current CSA process.

3. New ID ATC Extraction Methodology for negative ATCs

ID CCM Art. 21 (1) states that ATCs shall be used during allocation, in case the SIDC is unable to accommodate FB parameters, the CCC shall convert them into ATCs for each Core oriented bidding zone border. Based on the SIDC roadmap, at least until 2024 the allocation will be based on ATCs.

The Final FB IDCC Domain can contain CNECs with a negative RAM as no LTA or minRAM are applied in IDCC. Negative RAMs must be translated to negative ATCs for the allocation in XBID to ensure grid security by preventing netting. In case a trade is made in a relieving market direction, the market would not be allowed making trades that would go back in the critical direction until the negative ATC becomes positive again. For example if there is a negative ATC for the border direction A→B of 100 MW then 101 MW have to be allocated in the opposite direction B→A before an allocation in the burdening direction A→B is possible again. A negative ATC is not seen as a hard constraint and not imposing any cross-zonal trade. It is just preventing the netting effect in case there are trades in the direction towards the 'safe' capacity domain. For ID Auctions, a zero ATC will be provided instead of a negative ATC. Hence, there is no loss of socio-economic welfare, the IDCC process is only providing negative ATCs to XBID (continuous trading) to prevent that freed-up capacities in ID Auctions are taken back during continuous trading.

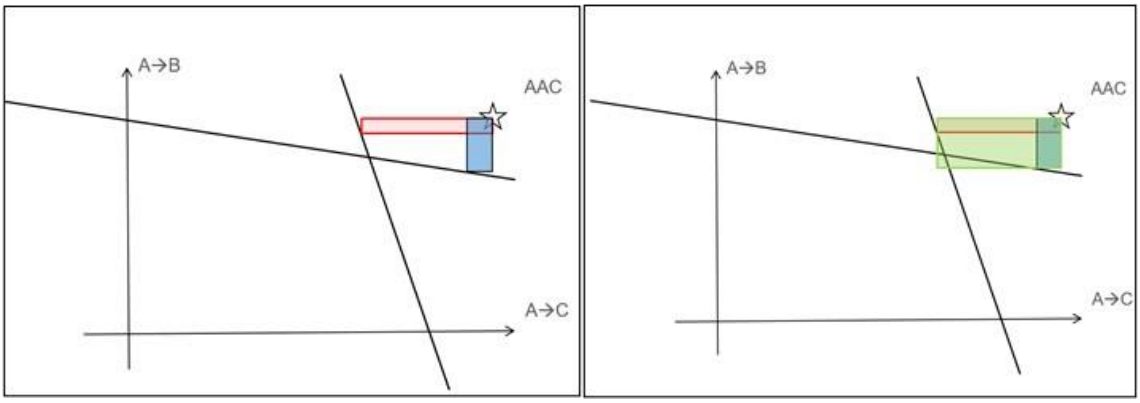
ID CCM Art. 21 foresees to share the negative RAM equally to all Core borders for ATC extraction as done for positive RAMs. The issue with the current ID ATC extraction method is that on distant Core borders a relative small negative RAM could lead to disproportionate negative ATCs. For example a CNEC in Western Europe with a negative RAM of -10 MW could lead to a negative ATC of -1000 MW on a border in Eastern Europe when its sensitivity is at 1% for this border. Those high negative ATCs would basically block this border direction for the ID market although the benefit from grid security perspective is very limited. Core TSOs propose to take PTDFs into account when distributing negative RAM to borders. A border with a PTDF of 10% would receive double the share of negative RAM of that CNEC compared to a border that has a PTDF

of 5%. This in turn would limit the impact on distant borders. This approach minimizes the sum of all negative ATCs while increasing the negative RAMs on sensitive borders leading to increased grid security

The new ID ATC extraction process works in several steps: In the first step positive ATCs are extracted by curtailing all negative RAMs to zero.

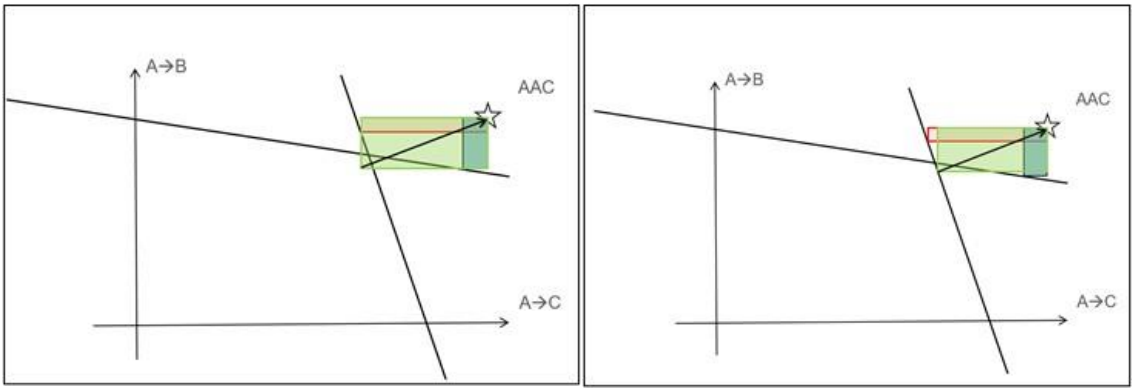
This first step is the iterative process according to the current ID CCM and not changed.

The second step aims at calculating the negative ATCs that result from the negative RAMs before curtailing them to zero. Only for this second step the sharing of RAMs shall be adapted to take PTDFs into account (instead of equal share over all borders). It will calculate negative ATCs for all borders for which a CNEC with negative RAM and positive PTDF exists. The idea of this approach is to keep the ratio of negative ATCs the same but only have as much negative ATCs as is needed to ensure that all negative RAMs can become zero or positive. A visual description of this approach follows:



Red and blue are negative ATCs of CNEC 1 and CNEC 2. The green area represents the resulting negative ATCs before scaling. As it is determined by the most negative ATCs it reaches inside the FB Domain.

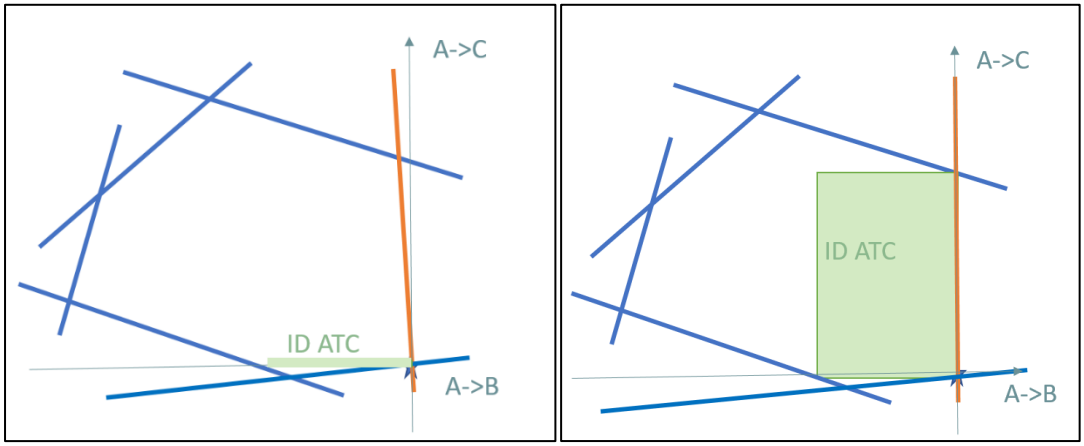
During scaling, as visualized below, the green ATCs are reduced to just touch but not reach inside the safe FB Domain.



4. Possibility to set low PTDFs to zero before ATC extraction

In addition to the optimization of the extraction of negative ATCs as described in chapter 3, TSOs are performing studies on the modification of PTDFs before ATC extraction in order to

increase the ID capacities that can be provided to the market. The aim of the studies is to investigate if low positive zone-to-zone PTDFs of certain CNECs can be set to zero before the ATC extraction. This shall tackle the fact that very distant CNECs with low PTDFs and low or even negative RAMs block the exchanges on certain borders. In the following example, in the left picture, the orange CNEC leads to an ID ATC of zero for the border direction A→C. However, already a slight adaption of the FB Domain allows the ATC extraction algorithm to extract significant ATCs in this direction. The modification done in this example is to put the zone-to-zone PTDF of the orange CNEC for the border A→C to zero. After the modification, the orange CNEC neither blocks exchanges in the direction A→C nor in the direction C → A.



However, modifying the PTDFs means that some flows caused by cross-border trade are neglected and could therefore pose a security risk. TSOs are therefore analysing the benefits and risks of different thresholds that could be applied. One investigated parameter is the threshold below which PTDFs should be set to zero. The second point of interest is how capacities and grid security change when this modification of PTDFs is applied on different subsets of CNECs. The parameter to choose a subset of CNECs is the RAM. The reasoning behind it is that CNECs with high RAM anyway are not likely to block borders. Therefore, the PTDFs of such CNECs could stay as they are. To find the right RAM threshold below which the PTDFs should be modified is also part of the conducted studies.

The first results from the aforementioned studies, based on a limited set of business days, showed some preliminary promising results. An interesting benefit-risk balance could be reached, in term of capacity provided and neglected flow, with the following set of parameters:

PTDF threshold of 2% or 3% and RAM threshold of 10 or 50 MW (e.g.: setting PTDF lower than 2 or 3% to zero, if the CNEC is below 10MW or 50MW of RAM).

TSOs are willing to commit to thresholds in this range of configuration in case it confirms it enables to reach significant positive results in terms of capacity provided to the market and grid security. More experience during parallel run of IDCC process should help to confirm this approach.

5. Consistency updates with DA CCM amendment and minor updates

In order to ensure consistency with the latest DA CCM amendment smaller adaptations have been made. These updates concern the quarterly report for Core NRAs by

including flows resulting from net positions resulting from the SIDC on each CNEC and external constraint of the final flow-based parameters.

In addition, more details regarding the modelling of HVDC interconnectors in capacity calculation has been added. Therefore, equation 7 of article 12 has been extended with additional terms to reflect the impact of an HVDC link to CNECs.

Former formula:

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

New formula:

$$\begin{aligned} PTDF_{z2zmax,l} = max\Big(&\max_{A\in BZ}\left(PTDF_{A,l}\right) \\ &- \min_{A\in BZ}\left(PTDF_{A,l}\right), \max_{H\in HVDC}\Big(\left|\left(PTDF_{A,l} - PTDF_{VH\_1\ \ ,l}\right)\right. \\ &\left.\left. - \left(PTDF_{B,l} - PTDF_{VH\_2\_,l}\right)\right|, \left|PTDF_{VH\_1\ \ ,l} - PTDF_{VH\_2\ \ ,l}\right|\Big)\Big) \end{aligned}$$

The new formula is based on the concept of Evolved Flow Based, meaning that the market is given the freedom to freely select the virtual hub net positions for system optimality (not only for BE-DE exchanges) and that the sensitivity with regard to this optimization variable should also be part of the CNEC selection.

To complete the description of the HVDC interconnector integration of Core bidding zones, additional constraints that model the maximum possible exchange of the HVDC interconnector itself have been added. These constraints ensure that HVDC links are operated within its technical limits, this is in addition to modelling their impact on CNECs in capacity calculation and allocation.

To prepare for the implementation of article 41 of the Commission Regulation (EU) 2017/2195, establishing a guideline on electricity balancing, planned in August 2023, the methodology on how to calculate the final remaining available margin for ID capacity allocation has been updated. In case capacity for market-based balancing processes has already been reserved, the remaining available margins for the ID capacity allocation need to be reduced accordingly. The design of the full common technical concept in alignment with other processes (DACC, ROSC, BTCC) is still under discussion, and will be described in more details in the CCM version for the final submission.

6. Possibility for CORE TSOs to update ID capacities between the ID CCM runs to react to changing system conditions

The coordinated Core IDCC in TSOs opinion should also take under consideration the possibility of reducing intraday capacity during the day (after 22:00 D-1 and after 10:00

D) in case of significant changes in the interconnected system. For this reason, appropriate provisions were introduced in Article 4 of the ID CCM.