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Efficient preparation of TSOs for the integration of Capacity Calculation Regions (CCRs) in terms of security and welfare

Jadranko Kučica
Croatian Transmission System Operator
Kupska 4, 10000 Zagreb/Croatia
Tel.: +385-1-4545-706
jadranko.kucica@hops.hr

Abstract

For each Capacity Calculation Region (CCR)[1], a coordinated capacity calculator needs to be established to define cross-zonal capacities for day-ahead, intraday timeframes and long-term timeframes. The CCRs have to be adopted to comply with the legal requirements of the CACM Regulation in order to reflect a better coordination of capacity calculators and the progressive introduction of flow-based approaches. Forced by Article 29(9) of the CACM Regulation, the goal of coordinated congestion management methods between the neighboring regions requires cooperation between coordinated capacity calculators for exchanges and confirming information on interdependency. This dynamic approach is in line with Regulation (EC) No 714/2009, which requires Member States to promote cooperation and monitor the effectiveness of the network at the regional level. That cooperation at regional level is compatible with the progress towards a competitive and efficient internal market in electricity. It is anticipated that the CCRs of CWE and CEE (under Core project) will be the first adjacent regions to implement the flow based capacity calculation methodology, and thus as the first CCRs are obliged to submit a proposal for a common flow based capacity calculation methodology. When this common flow based capacity calculation methodology is implemented, it should in practice bring merging of the CCRs for capacity calculation purposes.

This integration needs to ensure smooth and sufficiently fast enough integration of CCRs as well as consequently adequate preparation of TSOs according to future demands. Also, the cooperation of CCRs leads to less reliance on assumptions, higher transparency and efficiency in flow determination, market efficiency and possible higher capacity for exchanges. It is also anticipated that as the current level of interconnection increases. In the near future, the level of interaction between CCRs needs to be re-evaluated in terms of security, and welfare should also be increased. As it is known, these interconnections must be properly modelled and considered to work successfully in the internal European market coupling.

1 **https://www.entsoe.eu/network_codes/ccr-regions/**

Introduction

CACM Regulation defines the capacity calculation region as the geographic area in which coordinated capacity calculation is applied. It means that, as stated in article 20(2) of CACM, within each capacity calculation region, TSOs have to calculate cross border capacity according to a common methodology. A CCRs configuration is a set of regions where each bidding zone border belongs to one and only one region. It is worth noting that the same bidding zone may belong to many different regions. Only once a configuration has been established it does become possible to develop a methodology to calculate the capacity on each border. Thus the CCR configuration is one of the pillars of the whole mechanism designed by CACM.

It should be noted that there are two approaches for capacity calculation taken into account in CACM:

- Flow Based (FB)
- Available Transmission Capacity (ATC)

FB is the main approach and ATC can apply only as an exception (art 20). However, for each of the two approaches, different methodologies can be developed, so it is possible to have, at least in principle, different regions applying different methodologies within the scope of the same approach. In order to avoid inconsistencies, CACM prescribes that if two adjacent regions implement a capacity calculation methodology based on FB, they have to be considered as one region or, in other words, they need to merge (art. 20(5)). TSOs belonging to these regions have to submit a proposal for applying a common capacity calculation methodology, specifying the implementation date.

Since 20 May 2015, in CWE region a FB market coupling has been operating for the Day Ahead time-frame. So far, in CEE the FB project has not yet been delivered. If two different methodologies are going to be developed it will be much more difficult to converge to a common calculation methodology. In order to prevent such envisaged difficulties, NRAs asked for an immediate merge. [1]The main drivers to start merging process of CWE and CEE regions were following:

- Efficiency: In both regions, grids are highly meshed, so in both regions cross border capacity needs to be calculated according to a FB methodology. In CWE this is already the case and in the near future FB will apply also in CEE. It is more efficient to use the same methodology from the very beginning.
- Certainty: If two different methodologies are being developed, the merging process might be delayed because of technical problems.

During the year 2016., sixteen TSOs started to follow a decision of the Agency for the Cooperation of Energy Regulators (ACER) to combine the existing regional initiatives of former Central Eastern Europe and Central Western Europe to the enlarged European Core region (Decision 06/2016 of November 17, 2016).

In accordance, these TSOs will also design and implement common capacity calculation methodologies for intraday and long-term time-frames.

The countries within the Core region are located in the heart of Europe which is reason why the Core CCR Project has a substantial importance for the further European market integration. [2]

1. Requirements for Capacity Calculation Regions

All TSOs in each CCR must develop a capacity calculation methodology based on a flow-based approach (or coordinated NTC approach with justification), as specified in Article 20 CACM. This is only the first step in the process, as Article 21 further requires that CCR's capacity calculation methodology should be harmonised by 31 December 2020.

During 2017, CCRs (Figure 1) put their proposals to public consultation and submitted them to the relevant NRAs[2]. Not all CCRs' proposed capacity calculation methodologies have been approved yet, because some NRAs have requested amendments. Approval of the methodology triggers a four months delay for TSOs of the concerned CCR to jointly set up the coordinated capacity calculators needed for the deployment of the Common Grid Model.

Figure 1 – Capacity Calculation Regions [3]

2 Two of the CCRs submitted their proposals to public consultation after the legal deadline, the South-East Europe CCR in December 2017 and the IT North CCR in Feb-March 2018.

2. Approach towards the integration of CCRs

TSOs within ENTSO-E have decided to implement and enforce a higher level of coordination among the TSOs for operating the European transmission system, as an answer to the challenge of the transformation of the European electricity system.
Regional Security Coordinators (RSCs) are established and operationally cover all countries and TSOs of Europe – not just the EU, as illustrated in Figure 2.
RSCs and TSOs are partners and collaborators on the same task of ensuring the highest security of electricity supply standards in Europe RSCs are key actors for enabling TSO coordination in Europe and should encourage mutual cooperation. [4]
RSCs must perform five tasks for the TSOs, including coordinated capacity calculation (specified in the CACM and FCA regulations), operational planning security analysis, outage planning coordination, short-term and very short-term adequacy forecasts, and a common grid model with hourly updates (all four services specified in the SOGL).

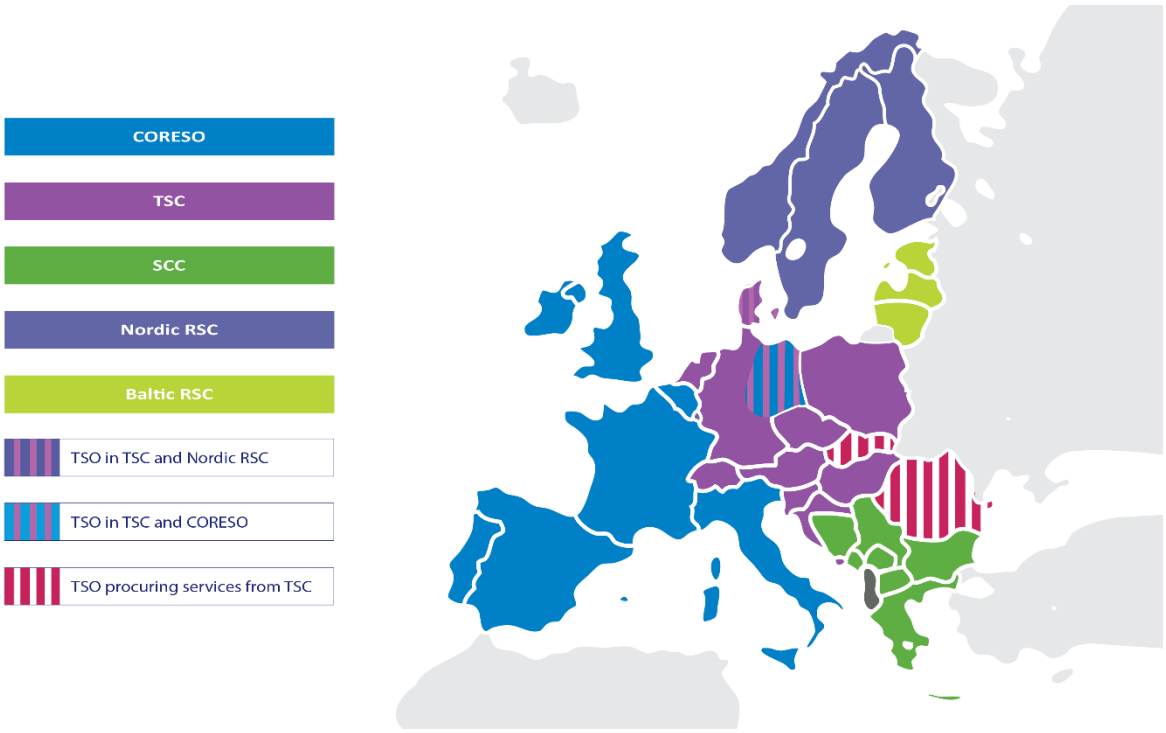

Figure 2 – Overview of the RSCs (simplified illustration) [3]

To achieve those targets set in the CACM Regulation to promote the completion and efficient functioning of the internal market and ensure optimal management, coordinated operation and sustainable technical development of the electricity transmission system in Europe, EC, ACER, regulatory authorities, TSOs and ENTSO-E acknowledge the importance of involving European non- EU TSO members of ENTSO-E, especially those responsible for electricity systems physically connected to EU Member States, in defining the CCRs. TSOs believe this is the best way forward to ensure the efficiency, relevance and accuracy of the capacity calculation processes.

The first step for developing of CCRs is an implementation of the new regional Flow-Based (FB) and Coordinated Net Transmission Capacity (CNTC) calculation

methodologies. The second step should be to harmonize requirements within and between CCRs.

Future goals

Annex 1 of the Proposal [5] describes Regions which in the future will also include non-EU bidding zone borders. This annex will be submitted to all affected non-EU regulatory authorities for their information or eventual approval.
In particular, the 11th Region (SEE) will include borders from: Greece, Bulgaria, Romania, Croatia, Hungary, Serbia, Bosnia-Herzegovina, Montenegro, FYR of Macedonia and Italy (when the submarine connection with Montenegro starts to be operational).
The SEE Region will include borders between EU and non-EU countries, as well as borders between two non-EU countries and will be completed only when CACM Regulation becomes an effective law in the legal framework of each non-EU countries.
Thus, to facilitate the implementation by the non-EU TSOs and the cooperation of the EU and non-EU regulatory authorities at an early stage, within the legal boundaries set by EU or national laws, these involved TSOs (the EU and non-EU) will start working informally together based on the future CCRs composition presented in Annex 1 to achieve the targets set in the CACM Regulation to promote the completion and efficient functioning of internal markets and in order to ensure the optimal management, coordinated operation and sustainable technical development of the electricity transmission system in Europe.
Article 20(4) of the CACM Regulation sets timelines for application of flow based capacity calculation methodology to SEE region as well. [6]
CCR 10 is the official SEE capacity calculation region, consisted of EU's TSOs: ADMIE, TRANSELECTRICA and ESO EAD. In order to include Non-EU's TSOs from SEE region in coordinated capacity calculation process, Shadow CCR 10 region is proposed. Shadow CCR 10 is based on: ACER's decision on CCRs and the Explanatory document sent to all TSOs' proposal for CCR.
Shadow CCR 10 includes the WB6 TSOs (CGES, EMS, KOSTT, MEPSO, NOS BiH and OST) and CCR 10 TSOs, as well as borders to neighboring TSOs – MAVIR, HOPS and TERNA.

Figure 3 – Shadow CCR 10 (recreated)

Shadow CCR 10 (recreated), Figure 3 [7] consists of:

6 EU parties

- RO, BG, GR (3 in CCR 10)
- HR, HU, IT (IT after commissioning of the DC cable IT-ME)

6 WB parties

One of the issues is who will be the capacity calculator for the particular borders between TSOs belonging to different RSCs. Also, while there are borders where TSOs from both sides have already been designated Regional Security Coordinator (RSC) / Coordinated Capacity Calculator (CCC) and there is no issue on the selection of the expected CCC, there are borders between TSOs belonging to different RSCs/CCCs, and the question of calculation and harmonization of NTC values remains pending.
TSOs underscore that Article 29(9) of the CACM Regulation obliges each CCC to cooperate with the neighboring CCCs by exchanging and confirming information on interdependency with the relevant CCCs.
Security Coordination Centre (SCC) Ltd. Belgrade performs a Dry run of day-ahead NTC calculations for all service users borders (18 borders). NTC calculations are performed and they are based on D2CF models delivered by TSOs. Finally, results are being delivered to service users.

Efficiency – facts and solutions

The CACM Regulation (Article 34) organises the regular reporting by ENTSO-E on the efficiency of the existing bidding zone configuration.
In December 2016, ACER issued a request for a review of the bidding zone configuration as specified in CACM Article 32(4). This review covered Austria, Belgium, Czech Republic, Denmark, France, Germany, Hungary, Italy, Luxembourg, the Netherlands, Poland, Slovakia and Slovenia, with a legal deadline of 21 March 2018. During 2017, the

participating TSOs have re-defined the scope of the project so as to be able to deliver it by the legal deadline, run the computations and formally submit the methodologies and assumptions to NRAs. ENTSO-E's role was that of a facilitator, supporting the participating TSOs in the process.
This first attempt at analysing bidding zone configurations in Europe demonstrated the significant technical complexity of the task. The participating TSOs considered that the evaluation presented in the first edition of the Bidding Zone Review did not provide sufficient evidence for a modification of it or for maintaining of the current bidding zone configuration. Therefore they recommended that, given the lack of a clear evidence, the current bidding zone delimitation should be maintained. Further work is ongoing on the TSOs side to assess and learn from the current review, so that more concrete recommendations will be available in future.

For developing and possible merging of CCRs, the idea is to find the optimal future CCR configuration based on clear and transparent criteria following socioeconomic efficiency. With that purpose, it is important to ensure smooth cooperation within described regions. For those regions who are more efficient, benefits will invite them to become even larger region over time, as needed. Development with ambition to deliver maximum benefits to end-consumers in the shortest possible timeframe usually results with faster integration process.

3. Conclusion

Along with increasing interdependencies between different transmission systems and shorter market time intervals, new challenges arise for the TSO community and require much deeper coordination between operators close to the real time.
Enhancing TSO's coordination will benefit consumers through improved security of supply (by minimising the risk of wide area fault events), and lowering costs through increased efficiency in system operation and maximised availability of transmission capacity to market participants.

All TSOs are invited to duly and proactively consider merging future amendment proposals to the determination of the capacity calculation regions, as a way of ensuring an efficient process.
This dynamic period is supported by RSCs/RCCs with the following:

- common data exchange infrastructure and standards (harmonized data exchange format and process)
- alignment of regional methodologies and tools (for capacity, remedial actions, outage planning and adequacy assessment)

Therefore, no matter which final configuration of CCRs is going to happen, regional strength will be established for sure and efficiency will be achieved safely, Figure 4.

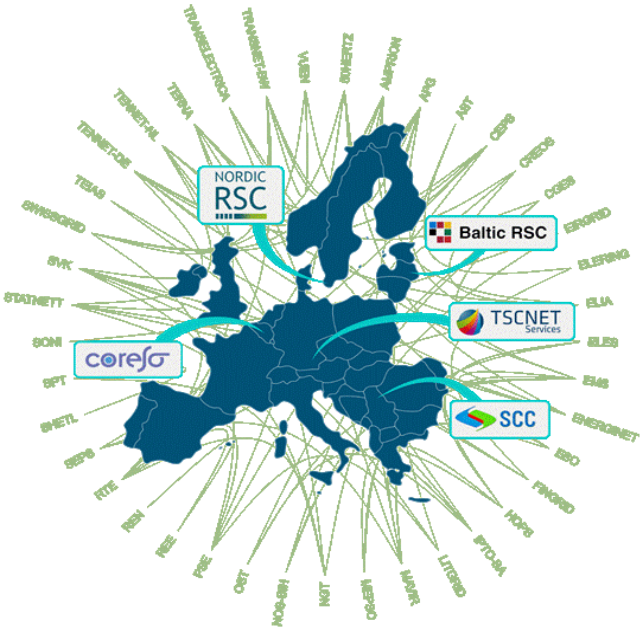

Figure 4 – European Regional Developments
(European coverage by services of the existing RSCs)

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