Methodological paper:

Assessment of capacity calculation coordination

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Content

1. Introduction

(1) This document is one of a set of documents describing various methodologies applied in the electricity wholesale markets volume of the annual ACER/CEER Market Monitoring Report (MMR), which is intended to present the results of the monitoring of the performance of the internal electricity market in the European Union (EU).

(2) Coordination among TSOs is essential for the well-functioning of the Internal Electricity Market, as their actions and electricity exchanges within and between bidding zones can significantly influence physical flows and operational security in other areas. In this respect, the CACM Regulation requires better coordination in the capacity calculation (CC) process among TSOs, both within and between Capacity Calculation Regions (CCRs). This paper aims to assess the level of TSO coordination applied when conducting cross-zonal capacity calculation.

2. General approach

(3) Coordination among TSOs is expected to yield multiple benefits, including increased cross-zonal capacity and reduced unscheduled allocated flows (UAFs)[1] resulting from non-coordinated capacity allocation on other borders.

(4) Three main dimensions assess coordination levels for the year-ahead (YA), month-ahead (MA), day-ahead (DA) and intra-day (ID) time frames

- The predefined coordination methodology
- Whether a common grid model (CGM) is used
- Which of the relevant input parameters[2] are (re)assessed in each capacity calculation process

(5) The assessment is based on data provided by NRAs for each border through a dedicated questionnaire[3]. The response for each border and timeframe was matched by the Agency with the response from the other side of the same border. Congruent answers were evaluated and scored as provided. When the information reported by two NRAs for the same border was different, only the lower level of coordination reported and consistently reported parameters were further considered in the assessment and respective scoring[4]. This approach was chosen because it is assumed that coordination on a given border is only as strong as its weakest part.

3. Calculation process

(6) The following process is used to assess the coordination level of a given border for a given time frame. A basic score is first given based on the general level of coordination, and this is then refined to take the availability of CGMs and parameters into account.

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[1] More information on the different types of unscheduled flows (UFs), i.e. UAFs and LFs, on the underlying definitions and on their magnitude can be found in the methodological paper on UFs available at: https://www.acer.europa.eu/en/Electricity/Market%20monitoring/Documents_Public/ACER%20Methodological%20paper%20-%20Unscheduled%20flows.pdf

[2] The relevant parameters are described in paragraph (9)

[3] The questionnaire is available in section 5

[4] For 2017, fully consistent answers were provided for the GB-NL and HR-SI borders only. Inconsistencies appeared for all other borders. For the following five borders (AT-CH, CH-DE, CH-FR, FI-NO and GB-IE), no data were provided for one side of a border. In these cases, the only information provided was used for the assessment.

(7) Five main “levels of coordination” are defined, and are graded from zero to four

- None: no capacity calculation performed
- Pure bilateral NTC calculation (BIL): CC on a given border is completely independent of CC on any other border. Each TSO on a border calculates the NTC value for this border based only on its own CC inputs, and subsequently the lower of the two values is offered for capacity allocation.
- Partially coordinated NTC calculation (PC): CC on this border is coordinated with at least one but not all the borders that are significantly affected by exchanges on this border. All TSOs on these borders perform CC in a coordinated way using their CC inputs. When capacity on two borders is coordinated individually by one TSO, but other TSOs are not involved, this configuration should be considered as pure bilateral coordination.
- Fully coordinated NTC calculation (FC): the calculation of NTC values is performed together on all borders significantly affected by exchanges on this border by the relevant TSOs by including the conditions of all significantly affected networks in the calculation process.
- Flow-based capacity calculation (FB): capacity calculation is fully coordinated at regional level, and relies on the flow-based methodology.

(8) The basic score is fully attained when a CGM is used for the CC process. Otherwise, basic scores are downgraded by 0.5, leading to the following adapted scoring

Table 1 : Adapted scoring taking CGM into account

Method of applied CC	**Basic score**	**Adjusted basic score depending on the use of a common grid model**
None	0	No CC process
Pure bilateral NTC	0.5	No ‘bilateral’ CGM is used
	1	‘Bilateral’ CGM is used
Partially coordinated NTC	1.5	No CGM is used among those ≥3
	2	CGM is used among those ≥3
Fully coordinated NTC	2.5	No CGM is used
	3	A CGM is used
FB[5]	4	A CGM is used

(9) A multiplier factor is then applied in order to reflect whether the following relevant CC parameters are (re)assessed; this is described in **Table *1***Table 2

a) Reliability margins (RMs),

b) Operational security limits (mostly CNEs) and contingencies (i.e. outages) relevant to capacity calculation,

c) Allocation constraints (e.g. import/export limits, losses, etc.),

d) Generation shift keys (GSKs),

e) Remedial actions (RAs)

[5] The FB CC process is assumed to be possible only with a CGM

Table 2: Multiplier for parameters (re)assessed/used

Timeframe	Multi-plier	Conditions
YA, MA, DA, ID	0.5	No parameter is assessed/used
YA, MA	1	At least parameters (a), (b), (d) are assessed/used
YA, MA	0.9	At least two of (a), (b), (d) are assessed/used
YA, MA	0.8	At least one of (a), (b), (d) are assessed/used
DA, ID	1	All parameters (a) – (e) are assessed/used
DA, ID	0.9	4 out of 5 parameters are assessed/used
DA, ID	0.8	3 out of 5 parameters are assessed/used
DA, ID	0.7	2 out of 5 parameters are assessed/used
DA, ID	0.6	1 out of 5 parameters are assessed/used

(10) Moreover, when the capacity (re)calculation at DA or ID level is not made with an hourly resolution (i.e. the same NTC value[6] is valid for 24 hours), the DA and ID scores (after multiplier) are reduced by 0.5 (each).

(11) As a result, the assessment relies on the following formula[7] for a given time frame

$$score_{overall} = \left(score_{methodology} - modifier_{CGM}\right) * modifier_{parameters} - modifier_{hourly\ calculation}$$

(12) Finally, all (adjusted) scores are aggregated among time frames, and the ratio of the total score over the maximum possible score (12 for NTC or 14 for the FB method[8]) is then computed per border or CCR.

(13) The following examples are intended to make the grading methodology easier to understand

- No CC → 0 points
- YA bilateral CC with no CGM and no parameter → 0.25 pts (maximum possible score: 3 pts)
- DA bilateral CC with no CGM, no parameter and only one value per day → 0 pts (max. 3, or 4 for meshed AC border)
- YA bilateral CC with CGM and parameters b) and d) assessed → 0.9 pts (max. 3)
- DA bilateral CC with CGM and parameters b) and d) assessed (and hourly NTC values) → 0.7 pts (max. 3, or 4 for meshed AC border)
- DA fully coordinated CC with CGM and parameters b) and d) assessed (and hourly NTC values) → 2.1 pts (max. 3, or 4 for meshed AC border)

[6] The (non-)application of an hourly resolution is assessed per border direction by analysing the average daily variation of hourly DA NTC values. An hourly resolution is assumed when the number of changes of hourly NTC values exceeded 2.5 on average per day. As the – possibly slightly updated – ID NTC values are not available to the Agency, the result for the DA NTC analysis is also taken for the ID evaluation of the (non-)existence of an hourly resolution.

[7] If the score is negative (due to the absence of hourly calculations in DA or ID), it is corrected to 0.

[8] The maximum (benchmark) score per border derives from Table 1, as follows. For fully coordinated NTC: 4 timeframes x 3 = 12 points, and for FB CC: 2 timeframes (YA & MA → NTC) x 3 + 2 timeframes (DA & ID → FB) x 4 = 14 points. The implementation of FB is not required for the year-ahead and month-ahead timeframes, so the maximum score is 14 points. FB CC is envisaged for meshed AC networks.

- DA fully coordinated CC with CGM and all parameters assessed (and hourly NTC values) → 3 pts (max. 3, or 4 for meshed AC border)

- DA FB with CGM and all parameters assessed → 4 pts (max. 4)

4. Caveats

(14) When applying the foregoing methodology, the following caveats and considerations apply:

- Some related obligations stemming from the CACM Regulation and the FCA Guideline do not yet apply[9]. However, the CCMs related to these elements are currently in development in order to reach the level required by the CACM Regulation. Therefore, the assessment should be understood as an indication of the room for improvement at this early stage of implementation.

- The methodology does not reflect whether CC is performed for both directions of a given border. For example, CC is usually only performed for Italian imports on the northern Italian borders.

- The methodology assesses only data availability, not quality

- Many aspects, including coordination, affect CC. Internal and loop flows, remedial actions… also have an impact on available cross-zonal capacity, but are beyond the scope of this analysis.

[9] Although similar obligations, with a less detailed legal and governance framework, were already imposed by Regulation (EC) No 714/2009.

5. Data

Table 3: Required data

Description	Unit	Time granularity	Geographic granularity	Source
Historical hourly NTCs	MW	Market time unit	Bidding zone border	ENTSO-E TP
Coordination level: methodology, CGM, parameters…			Bidding zone border	NRAs (form below)

(15) The figure below depicts the questionnaire sent to NRAs to assess coordination on European borders. Each NRA was expected to answer individually for all borders for which it is responsible.

Figure 1 : Form used to gather information from NRAs about coordination on each border

Question / Border (please specify) -->	X-Y ***devised*** example DE-FR	X-Y_1	X-Y_2	…	X-Y_n
1- Capacity calculation timeframes: Please specify the capacity calculation timeframes by answering "yes" (y) or "no" (n) for all the options listed below Note: The publication of only updated ATC values (i.e. NTC resulting from the precedent capacity calculation less already allocated capacity) without reassessing some or all the elements described under questions 2 & 3 should not be considered as capacity calculation.					
year-ahead (y/n)	y				
month-ahead (y/n)	y				
day-ahead (y/n)	y				
intra-day (y/n)	y				
other (Please specify!)					
2- Common grid model: Is a common grid model used for capacity calculation? If so, please specify the TSOs with whom you jointly use the common grid model for the different time frames.					
year-ahead (y/n)	n				
month-ahead (y/n)	n				
day-ahead (y/n)	y, DE TSOs + Tennet NL, RTE, Elia				
intra-day (y/n)	n				
other (Please specify!)					
3- Which of the following parameters are explicitly (re)assessed and used as an input for capacity calculation for the specific timeframe? **a) reliability margin, b) operational security limits (mostly critical network elements) and contingencies (i.e. outages) relevant to capacity calculation, c) allocation constraints (e.g. import/export limits, losses, etc.), d) generation shift keys; (e) remedial actions**					
year-ahead	a)				
month-ahead	a)				
day-ahead	a), b), c), d), e)				
intra-day	No intra-day reassessment				
other (Please specify!)					
4- Level of coordination: Please specify the level of coordination in the different timeframes by choosing one of the following definitions (a) to (e) (further explained at the bottom of this table)! **a) pure bilateral NTC, b) partially coordinated NTC, c) fully coordinated NTC, d) Flow-based, e) Other (Please specify!)** Note: Definitions have been refined compared to the previous year (see bottom of this questionnaire for details).					
year-ahead	a)				
month-ahead	a)				
day-ahead	d)				
intra-day (if the answer is other than a), please describe the CC process briefly)	a)				
other (Please specify!)					
5- Level of coordination: Please specify which other <u>borders and TSOs</u>, if any, are involved within the same coordinated capacity calculation process applied for this border. Note: Definitions at the bottom of this questionnaire					
year-ahead	no further coordination beyond this border				
month-ahead	no further coordination beyond this border				
day-ahead	DE-NL, FR-BE and NL-BE involving DE TSOs + Tennet				
intra-day	no further coordination beyond this border				
other (Please specify!)					
6- Thermal capacity of interconnectors (MVA):					
Note1: This should only refer to the interconnector itself excluding the surrounding network (e.g. no additional limitations). Note 2: In case of several interconnector lines on the same border, please report data for each of them individually (Please do not report aggregated values!).	Amprion: 5000 MVA Transnet BW: 2800 MVA				