



# Reading Guide: Capacity Calculation & Market Coupling KPIs

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## Related documents


## Attachments


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# 1 Introduction

According to Article 26(4) of the Core Flow-based Intraday Capacity Calculation Methodology (ID CCM) Core TSOs shall continuously monitor the effects and the performance of the application of this methodology during the parallel run. For this purpose, they shall develop, in coordination with the Core regulatory authorities, the Agency and stakeholders, the monitoring and performance criteria and report on the outcome of this monitoring on quarterly basis in a quarterly report. The developed set of Key Performance Indicators (KPIs) will be published on a monthly basis on JAO.

The document at hand aims to introducing the reader solely to the calculated KPIs. It is not intendend to be a general introduction to Core flow-based capacity calculation process.

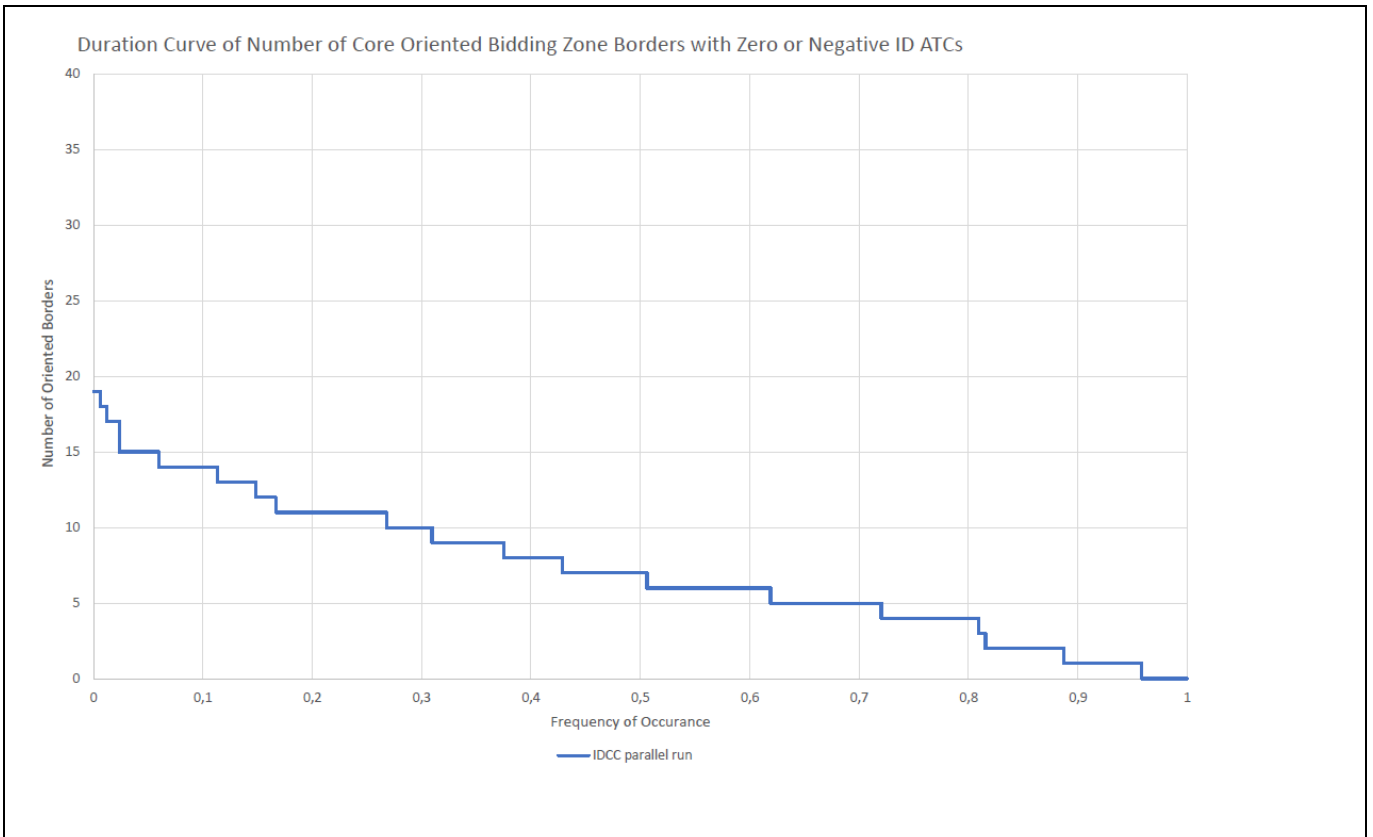
## 2 KPIs

### 2.1. ATC related KPIs

#### 2.1.1. KPI 1 - Duration curve of Core oriented bidding zone borders with simultaneous zero (or negative) ID ATCs

<b>Short Name of KPI</b>	KPI 1 - Duration curve of oriented BZ borders with simultaneous zero (or negative) ID ATCs
<b>Article ID CCM</b>	Article 21. Calculation of ATCs for SIDC fallback procedure
<b>Granularity</b>	Per timestamp, per oriented BZ border
<b>Aggregation</b>	Over all Core BZ borders and over reporting period

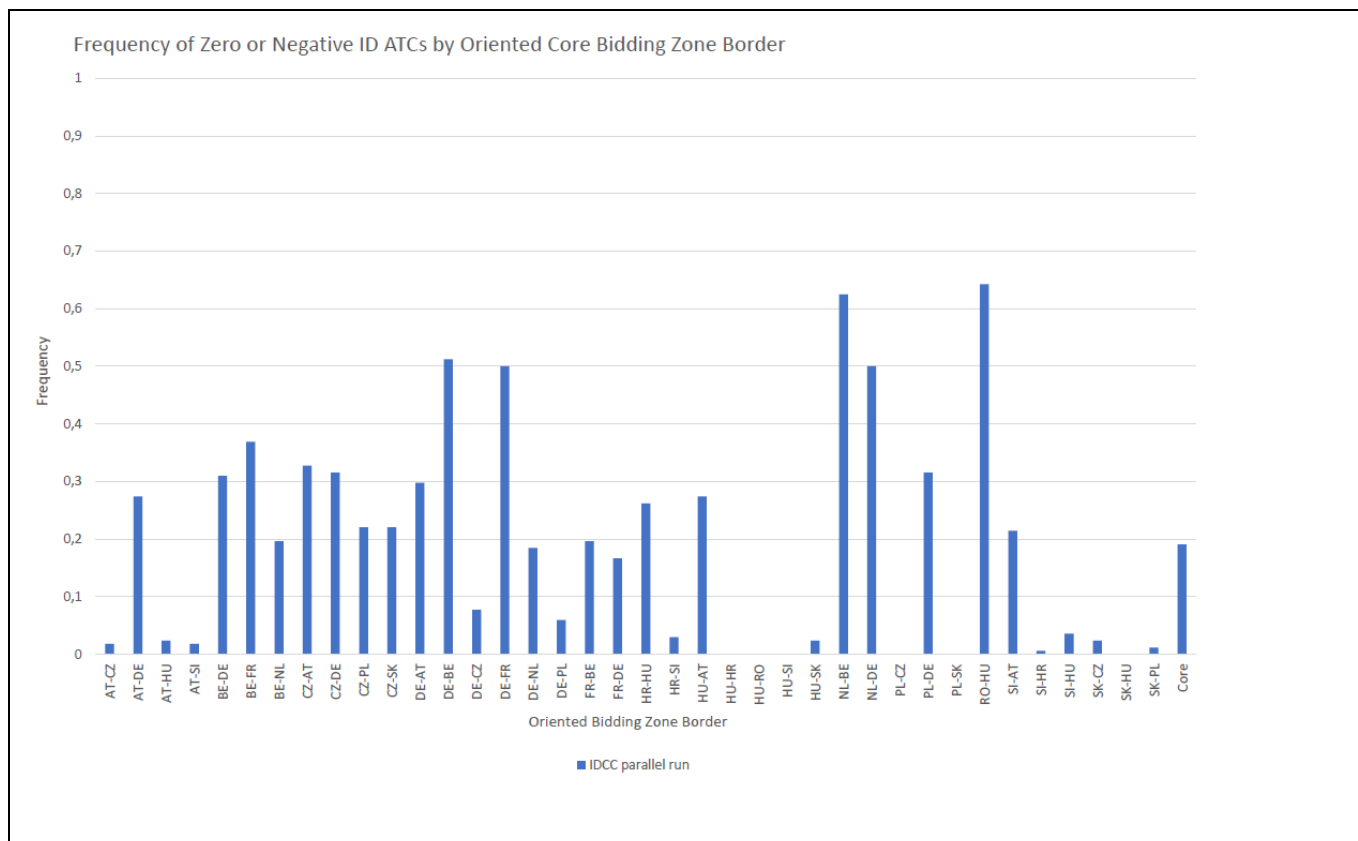
<b>KPI Description</b>
<p>KPI 1 analyses how frequent is occurrence of certain number of oriented bidding zone borders with zero or negative ATCs extracted from the final intraday flow-based domain according to Art.21 of ID CCM.</p> <p>For creation of the duration curve, all timestamps with the same number of oriented BZ borders with zero or negative ATC values are counted and this number is divided by the number of all timestamps of the analysed period. This is done for all 38 oriented bidding zone borders of the Core region as a whole. As a result a duration curve is plotted showing the frequency of occurrence of different number of borders with zero or negative ATCs.</p> <p>In the illustrative example below you can see that there wasn't any timestamp with simultaneous zero or negative ATCs on more than 19 oriented bidding zones of the Core region. Approximately 50% of the time there were 6 or less Core oriented bidding zone borders with zero or negative ATCs. In general, the lower the curve is, the better are the results.</p>
<b>Example Visualisation</b>



**2.1.2. KPI 2 – Frequency of zero (or negative) ID ATCs by oriented Core bidding zone border, and Core average**

<b>Short Name of KPI</b>	KPI 2 – Frequency of zero (or negative) ID ATCs by oriented BZ border
<b>Article ID CCM</b>	Article 21. Calculation of ATCs for SIDC fallback procedure
<b>Granularity</b>	Per timestamp, per oriented BZ border
<b>Aggregation</b>	Over all Core BZ borders and over reporting period

<b>KPI Description</b>
<p>KPI 2 analyses how often are the ATCs extracted from the final intraday flow-based domain according to Art.21 of ID CCM zero or negative and therefore trading on certain oriented BZ border is not possible.</p> <p>For calculation of the frequency of zero or negative ATCs, all timestamps with zero or negative ATC values are counted and this number is divided by the number of all timestamps of the analysed period. This is done for each oriented bidding zone border separately and also for all Core borders in total (last bar on the graph).</p>
<b>Example Visualisation</b>



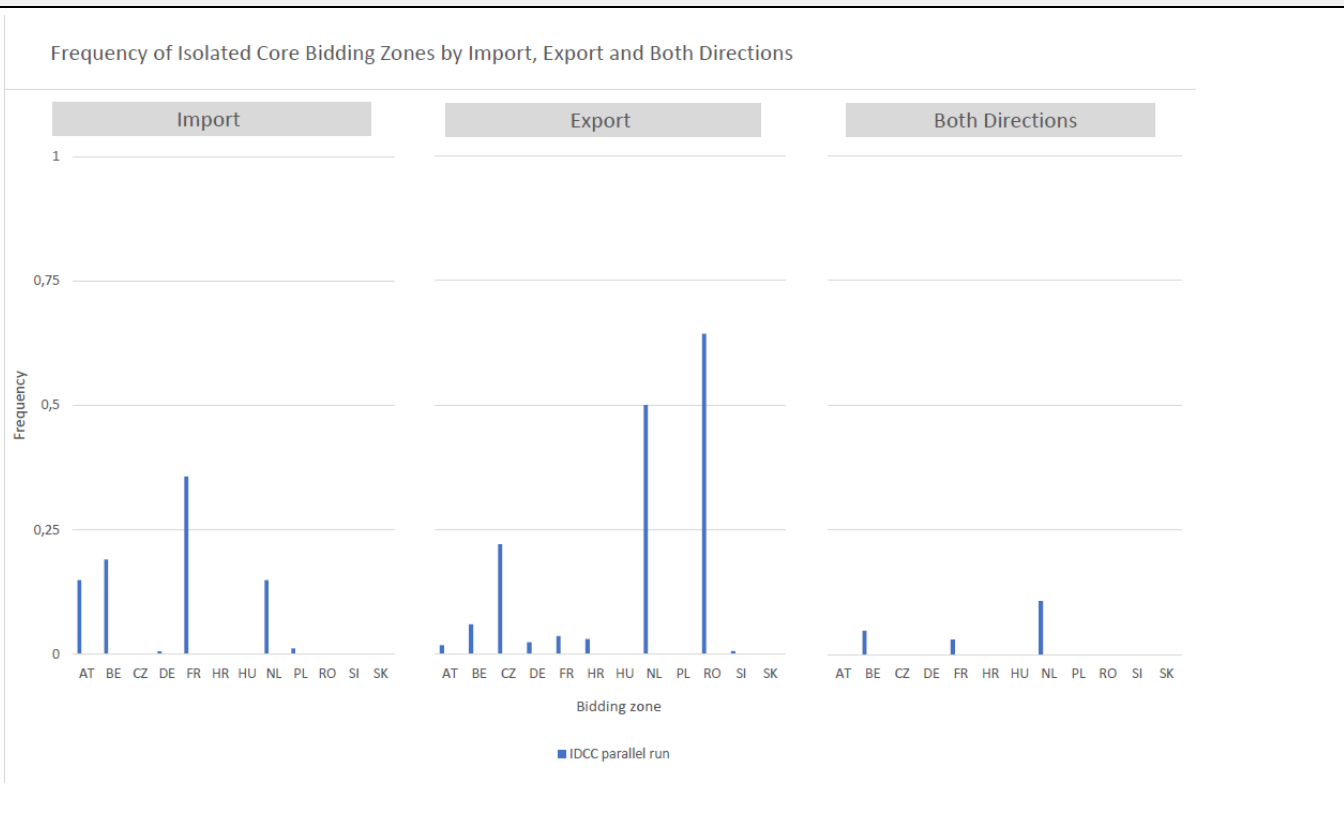
**2.1.3. KPI 3 – Frequency of isolated BZs of zero (or negative) ID ATCs in import, export and both directions**

<b>Short Name of KPI</b>	KPI 3 – Frequency of isolated BZs in import, export and both directions
<b>Article ID CCM</b>	Article 21. Calculation of ATCs for SIDC fallback procedure
<b>Granularity</b>	Per timestamp, per oriented BZ border
<b>Aggregation</b>	Over all Core BZ borders and over reporting period

<b>KPI Description</b>	
<p>KPI 3 analyses how often are the bidding zones isolated in various directions, meaning no trading in import, export or both directions is possible.</p> <p>For calculation of the frequency of isolation in import direction, all timestamps where all oriented BZ borders in import direction of a certain bidding zone XX (e.g. AA→XX, BB→XX and CC→XX) have zero or negative ATC values are counted and this number is divided by the number of all timestamps of the analysed period. This is done for each bidding zone. The results show for each bidding zone how often is trading in import direction not possible because all import borders of the BZ are blocked by zero or negative ATCs.</p> <p>For calculation of the frequency of isolation in export direction, all timestamps where all oriented BZ borders in export direction of a certain bidding zone XX (e.g. XX→AA, XX→BB and XX→CC) have zero or negative ATC values are counted and this number is divided by the number of all timestamps of the analysed period. This is done for each bidding zone. The results show for each bidding zone how often is trading in export direction not possible because all export borders of the BZ are blocked by zero or negative ATCs.</p> <p>For calculation of the frequency of isolation in both directions, all timestamps where all oriented BZ borders in both import and export directions of a certain bidding zone XX (e.g. AA→XX, BB→XX, CC→XX, XX→AA, XX→BB and XX→CC) have zero or negative ATC values are counted and this number is divided by the number of all timestamps of the analysed period. This is done for each bidding zone. The results show for each bidding zone</p>	

how often is trading in any direction not possible because all borders of the BZ are blocked by zero or negative ATCs.

**Example Visualisation**



**2.1.4. KPI 4 – Mean positive ID ATCs by oriented Core bidding zone border, and Core average**

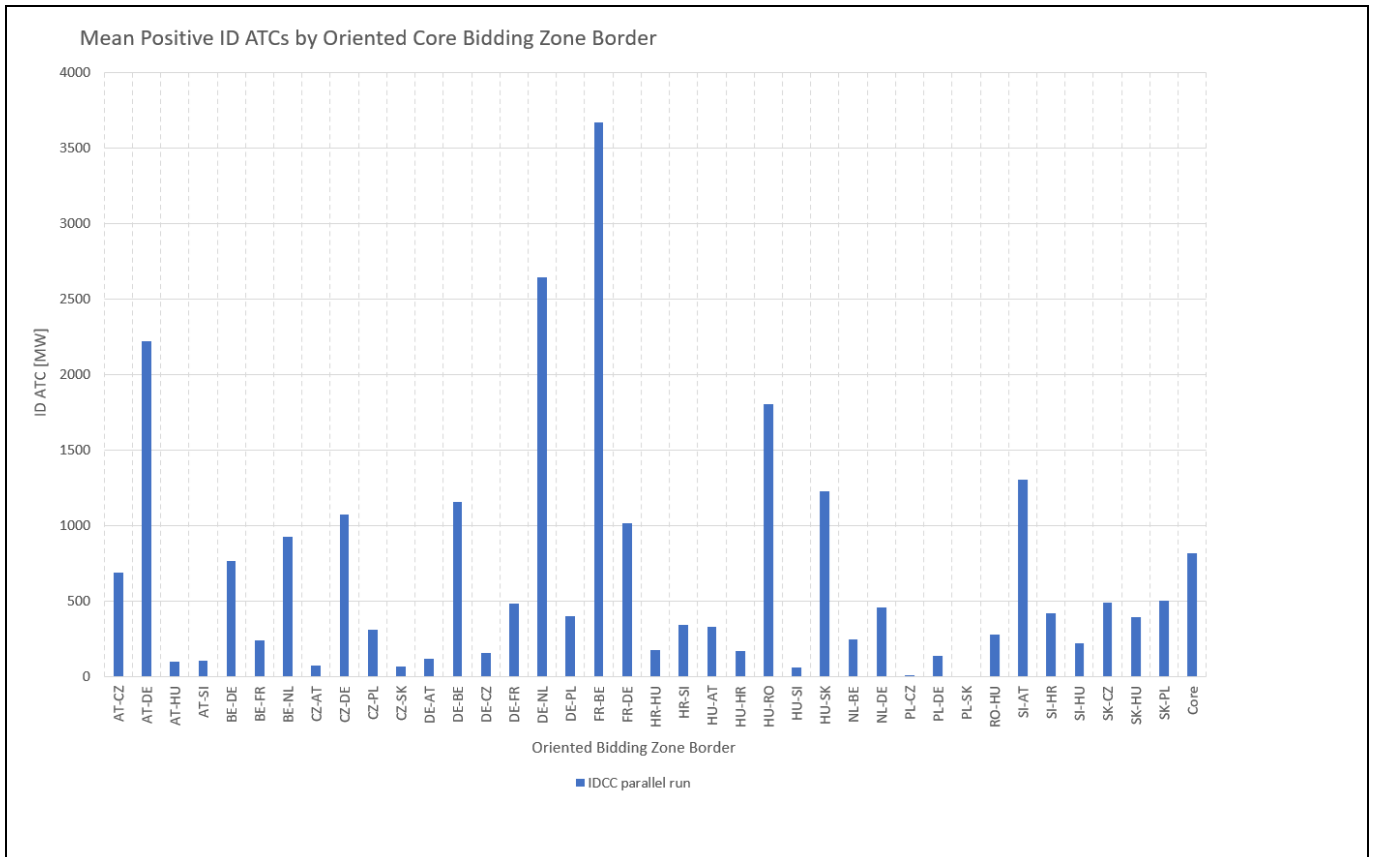
<b>Short Name of KPI</b>	KPI 4 – Mean positive ID ATCs by oriented Core BZ border
<b>Article ID CCM</b>	Article 21. Calculation of ATCs for SIDC fallback procedure
<b>Granularity</b>	Per timestamp, per oriented BZ border
<b>Aggregation</b>	Over all Core BZ borders and over reporting period

**KPI Description**

KPI 4 analyses levels of ATCs extracted from the final intraday flow-based domain according to Art.21 of ID CCM.

For calculation of mean positive ATCs, positive values from all timestamps of the analysed period are summed up and divided by the number of timestamps where ATC are positive. This is done for each oriented bidding zone border separately and also for all Core borders in total (last bar on the graph).

**Example Visualisation**



## 2.2. TSOs' adjustment after validation

### 2.2.1. KPI 5 - Share of MTUs with intervention per TSO

<b>Short Name of KPI</b>	KPI 5 - Share of timestamps with intervention per TSO
<b>Article in ID CCM</b>	Article 19. Validation of flow-based parameters
<b>Granularity</b>	Per timestamp
<b>Aggregation</b>	Per TSO and over reporting period

KPI Description
<p>During the validation process TSOs perform a security analysis upon the initial FB domain. In case the grid cannot be secured despite the use of remedial actions, the capacity (RAM) on a CNEC can be reduced. The amount of reduction of capacity (in MW) is the IVA. This KPI is based on the IVA value in MW as reported in the final flow-based domain.</p> <p>It has three parts:</p> <p>1) Share of MTUs with IVA intervention per TSO</p> <p><math>Share\ of\ MTUs\ with\ IVA = \frac{Sum\ of\ distinct\ MTUs\ with\ IVA\ applied}{Total\ of\ MTUs}</math>, with total of MTUs equal to the number of business days labelled as technically representative within the reporting period * 24.</p> <p>Practical examples with 10 BDs (240 MTUs):</p> <ul style="list-style-type: none"> <li>- TSO A has reduced the capacity for 1 CNE during all 120 MTUs. <ul style="list-style-type: none"> <li>o <math>Share\ of\ MTUs\ with\ IVA = \frac{120}{240} = 50\%</math></li> </ul> </li> </ul>

- TSO B has reduced the capacity for **10** CNEs during **1** MTU.

- $Share\ of\ MTUs\ with\ IVA = \frac{1}{240} = \sim 0,42\%$

- 2) Graphical representation of the aggregated applications of IVAs

IVA min, max, average on the primary y axis and all aggregated IVA applications on the secondary y axis (everything per TSO on x axis)

- 3) Table with top 10 most reduced CNECs per TSO with additional data aggregations

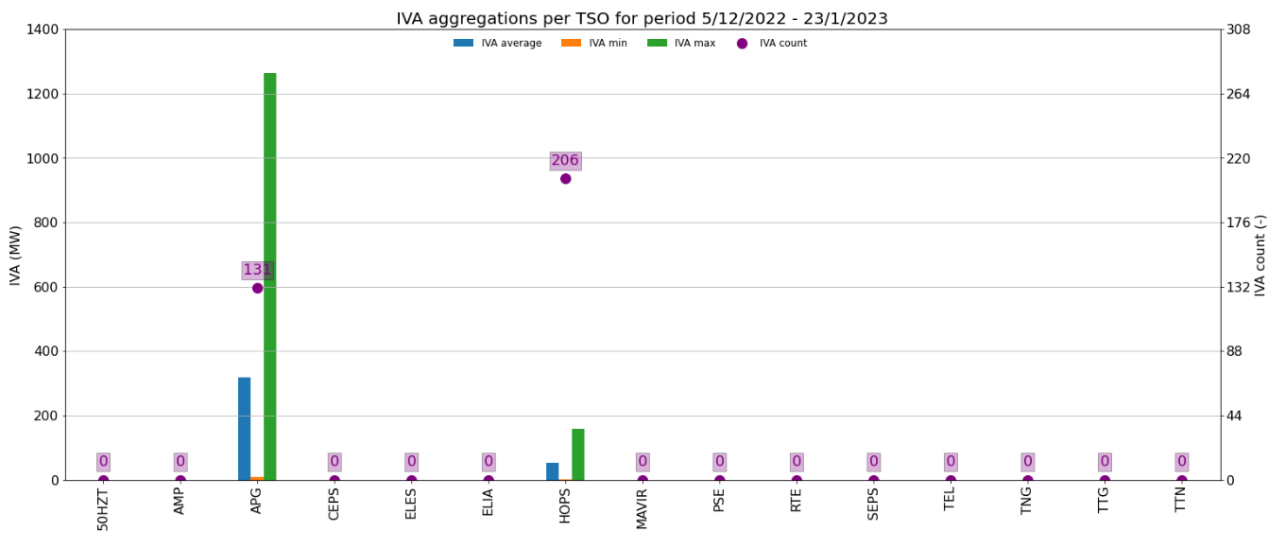
All data are taken from the final flow based domain report file and are aggregated only in case of IVA was applied. For example RAM/Fmax represents average RAM in the final flow based domain file divided by its Fmax when on certain CNEC when IVA applied. The same applies to all other columns.

### Example Visualisation

1)

TSO	Distinct MTUs with IVA	Share of distinct MTUs with IVA (%)
0	50HZT	0.0
1	AMP	0.0
2	APG	19.0
3	CEPS	0.0
4	ELES	0.0
5	ELIA	0.0
6	HOPS	104.0
7	MAVIR	0.0
8	PSE	0.0
9	RTE	0.0
10	SEPS	0.0
11	TEL	0.0
12	TNG	0.0
13	TTG	0.0
14	TTN	0.0

2)





3)

TSO	CNEC	IVA count	average IVA	IVA/Fmax (%)	RAM/Fmax (%)	min IVA	max IVA
	[AT-HU] Neusiedl - Gyoer 246B [OPP] [AT] / N-1 Gyor - Wien	15	74.866667	31.994302	54.871795	10.0	159.0
	[AT-SI] Obersielach - Podlog 247 [OPP] [AT] / N-1 Maribor-Kainachtal 1	15	84.333333	22.549020	40.677362	28.0	169.0
	[AT-SI] Obersielach - Podlog 247 [OPP] [AT] / N-1 Kainachtal - Obersielach 471	14	83.857143	22.421696	37.280367	20.0	167.0
	[AT-SI] Obersielach - Podlog 247 [OPP] [AT] / N-1 Cirkovce-Podlog	12	77.416667	20.699643	38.948307	25.0	143.0
	[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT] / N-1 Slavetice - Durnrohr 2	7	589.142857	27.000131	18.639518	135.0	951.0
APG	[AT-HU] Wien Suedost - Gyoer 245 [DIR] [AT] / N-1 Gyor - Neusiedl	7	179.000000	76.495726	22.039072	51.0	250.0
	[AT-SI] Obersielach - Podlog 247 [OPP] [AT] / N-1 Cirkovce-Krsko	7	97.142857	25.974026	21.008403	28.0	142.0
	[AT-AT] Zaya 2 - Zaya 1 ZYRHU41 [DIR] / N-1 Slavetice - Durnrohr 1	6	275.000000	49.460432	11.390687	110.0	555.0
	[AT-AT] Zurndorf 1 - Szombathely 1 440B [OPP] / BASECASE	5	1081.600000	78.093863	13.675090	984.0	1156.0
	[AT-AT] Obersielach - Obersielach OSRHU41 [OPP] / N-1 Obersielach - Obersielach OSRHU42	4	490.750000	80.981848	-10.189769	381.0	564.0
	[HR-HU] 400kV Ernestinovo - Pecs 1 [OPP] [HR] / N-1 Ernestinovo - Pecs 2	64	73.187500	5.502820	48.425752	2.0	158.0
	[HR-HU] 400kV Ernestinovo - Pecs 2 [OPP] [HR] / N-1 Ernestinovo - Pecs 1	64	73.187500	5.502820	48.425752	2.0	158.0
	[HR-SI] 220kV Pehlin - Divaca [DIR] [HR] / N-1 Melina - Divaca	38	40.973684	10.955531	69.863496	1.0	135.0
HOPS	[HR-SI] 220kV Pehlin - Divaca [OPP] [HR] / N-1 Melina - Divaca	13	4.230769	1.131222	84.594817	1.0	6.0
	[HR-SI] 400kV Tumbri - Krsko 1 [OPP] [HR] / N-1 Tumbri - Krsko 2	12	3.166667	0.238095	70.758145	2.0	6.0
	[HR-SI] 400kV Tumbri - Krsko 2 [OPP] [HR] / N-1 Tumbri - Krsko 1	12	3.166667	0.238095	70.758145	2.0	6.0
	[HR-HR] 400kV Zerjavinec - Tumbri [OPP] / BASECASE	3	23.000000	1.729323	76.065163	23.0	23.0

## 2.3 Limiting elements

### 2.3.1 KPI 6 - Limiting constraints of the ATC domain

<b>Short Name of KPI</b>	KPI 6 – Limiting constraints of the ATC domain
<b>Article in ID CCM</b>	Article 21. Calculation of ATCs for SIDC fallback procedure
<b>Granularity</b>	Per timestamp
<b>Aggregation</b>	Per TSO and per CBCO

#### KPI Description

The constrains having 0 margin after ID ATC computation are those which determine / limit the ATC domain. The remaining margin of the constraint calculated during iterative process will reach 0 (or negative but forced to 0 since negative RAM is currently not allowed) and prevent ATC of corresponding directions increasing further. When RAM = 0 MW for one critical constraint, it will limit ATC=0 for the border directions with positive zone-to-zone PTDFs.

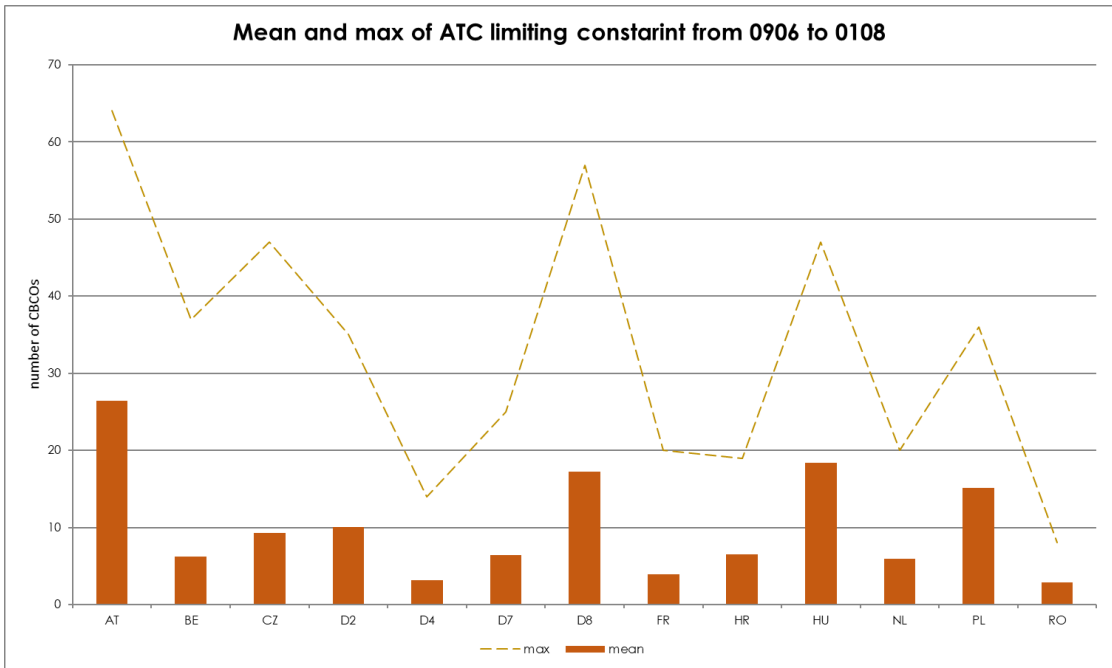
The KPIs will include the

- Th list of top 20 most frequently limiting constraints of the ATC domain
- Per TSO: Generate a diagram with the mean and max number of limiting constraints at TSO level for a certain period of time (example below). Note if the same CNE limited the domain 24 hours a day, then it needs to be counted as 24 in the mean calculation
- Per CBCO: Generate a diagram with the mean and max number of limiting constraints at CBCO level with the mean and max number of limiting constraints at TSO level for a certain period of time (example below).

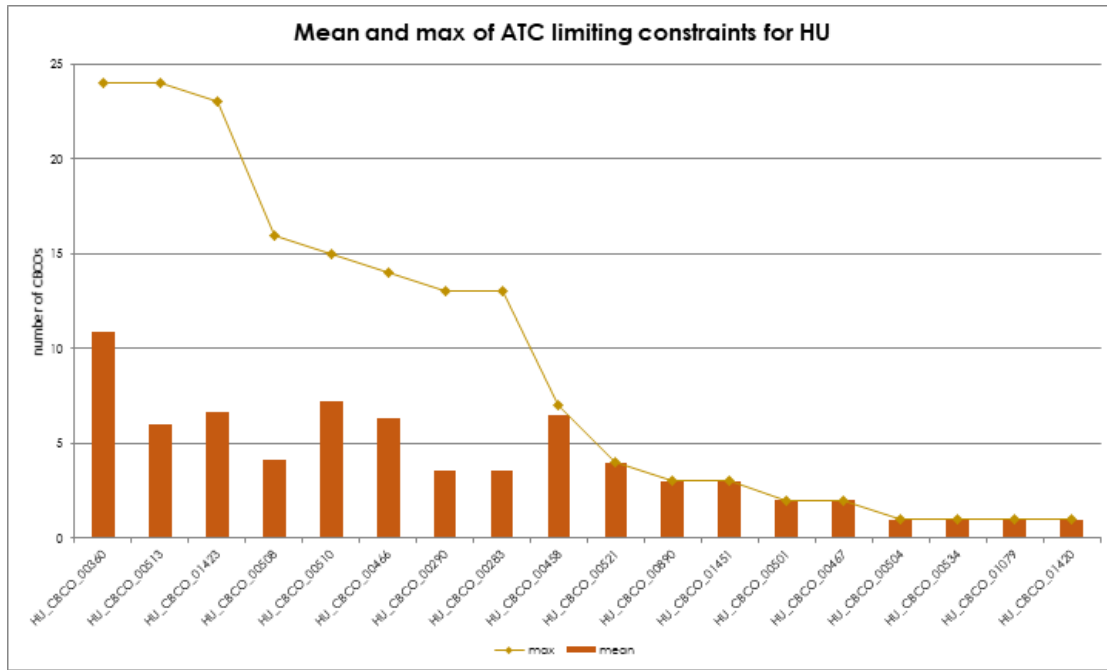
20 most ATC limiting constraints	% of hours when CBCO is limiting (09.06-01.08)
[HU-HU] Gonyu - Gyor [DIR] / N-1 Gabcikovo - Gyor	40,15%
[AT-SI] Obersielach - Podlog 247 [DIR] [AT] / N-1 Cirkovce-Podlog	29,30%
[SI-HU] Cirkovce - Heviz [OPP] [HU] / N-1 Zerjavinec - Heviz	21,24%
[D8-PL] Mikulowa PST1 [OPP] [PL] / N-1 Hagenwerder - Mikulowa 1	18,51%
[D8-PL] Mikulowa PST2 [OPP] [PL] / N-1 Hagenwerder - Mikulowa 1	18,51%
[SK-SK] V.Dur - Levice 1 [DIR] / N-1 V.Dur - Levice 2	16,70%
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [DIR] / N-1 Westtirol - Voehringen	15,76%
[CZ-D8] Hradec - Rohrsdorf 446 [OPP] [D8] / N-1 Hradec - Rohrsdorf 1	14,15%
[D8-D8] Neuenhagen - Vierraden 304 [DIR] [D8] / N-1 TR Vierraden 220/400 404	12,43%
[D8-D8] Neuenhagen - Vierraden 304 [DIR] [D8] / N-1 Vierraden - Pasewalk 306	12,43%
[CZ-SK] Nosovice - Varin [DIR] [SK] / N-1 Krizovany - Sokolnice	10,28%
[CZ-SK] Nosovice - Varin [DIR] [CZ] / N-1 Krizovany - Sokolnice	10,28%
[D8-D8] Pasewalk - Vierraden 306 [DIR] / N-1 TR Vierraden 220/400 402	9,21%
[AT-SI] Obersielach - Podlog 247 [OPP] [AT] / N-1 Cirkovce-Podlog	8,33%
[D8-D8] Pasewalk - Vierraden 306 [DIR] / N-1 Bertikow - Vierraden 304-303	7,59%
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR] / N-1 Melina - Divaca	7,53%
[SI-HR] 220kV Divaca - Pehlin [OPP] [SI] / N-1 Melina - Divaca	7,49%
[D2-NL] Diele - Meeden SCHWARZ [DIR] [D2] / N-1 Diele - Meeden WEISS/W	5,61%
[D2-NL] Diele - Meeden WEISS [DIR] [D2] / N-1 Diele - Meeden SCHWARZ/Z	5,61%
[HU-AT] Gyor - Wien [OPP] [HU] / N-1 Neusiedl - Wien Suedost 246A	5,07%

**Example Visualisation**

1) Per TSO



2) Per CBCO

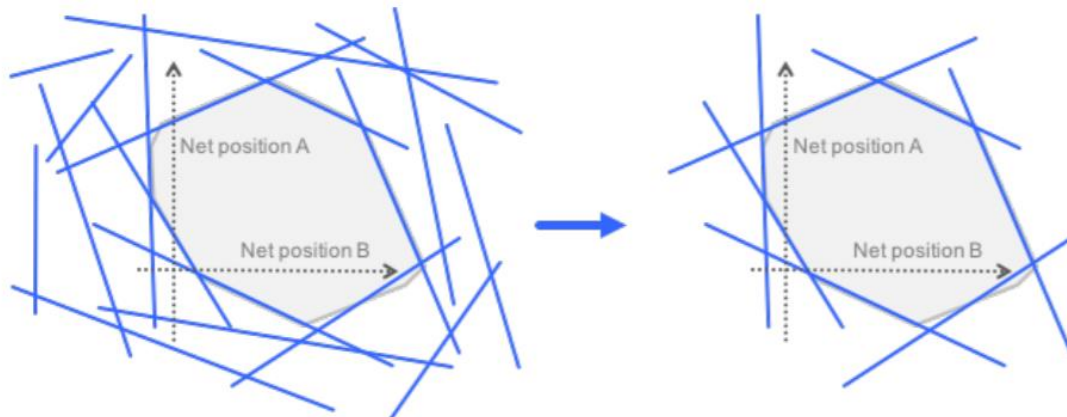


2.3.2 KPI 7 - Most often pre-solved CNECs

<b>Short Name of KPI</b>	KPI 7 – Most often pre-solved CNECs
<b>Article in ID CCM</b>	Article 19. Validation of flow-based parameters
<b>Granularity</b>	Per timestamp
<b>Aggregation</b>	Per TSO and per CBCO

**KPI Description**

During the final FB computation, the presolved FB domain provides the list of FB domain limiting (presolved) constraints which will be used as an input domain to the ID ATC extraction.



The KPIs will include the

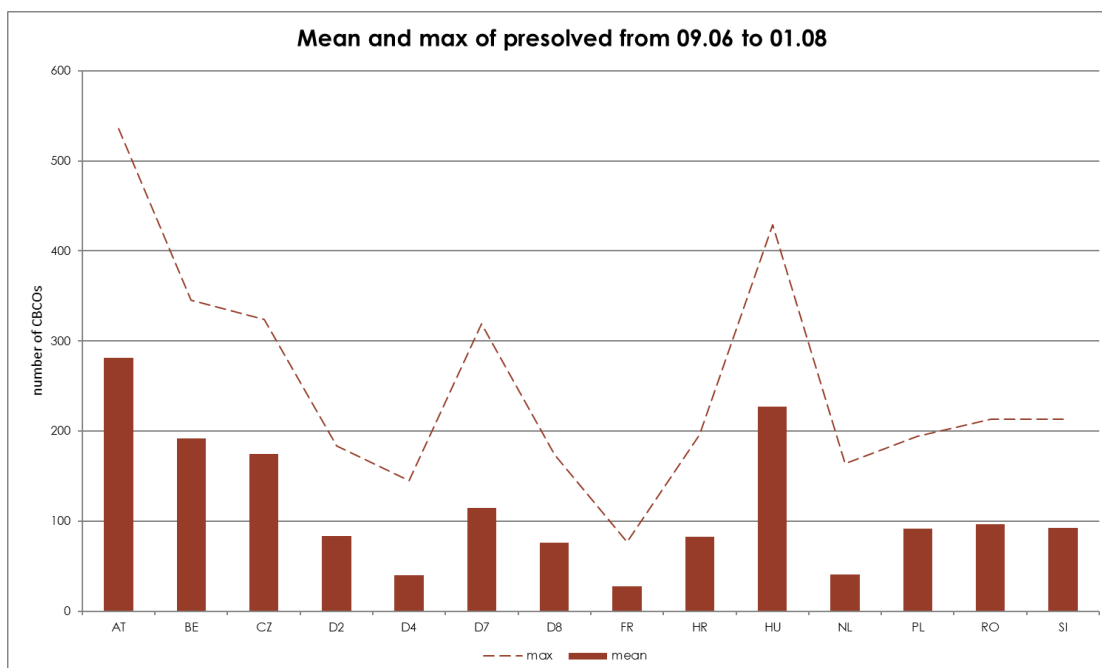
- The list of top 20 most frequently limiting constraints of the final FB domain
- Per TSO: Generate a diagram with the mean and max number of presolved constraints at TSO level for a certain period of time (example below). Note if the same CNEC limited the final FB domain 24 hours a day then it needs to be counted as 24 in the mean calculation

- Per CBCO: Generate a diagram with the mean and max number of presolved constraints at CBCO level with the mean and max number of presolved constraints at TSO level for a certain period of time (example below).

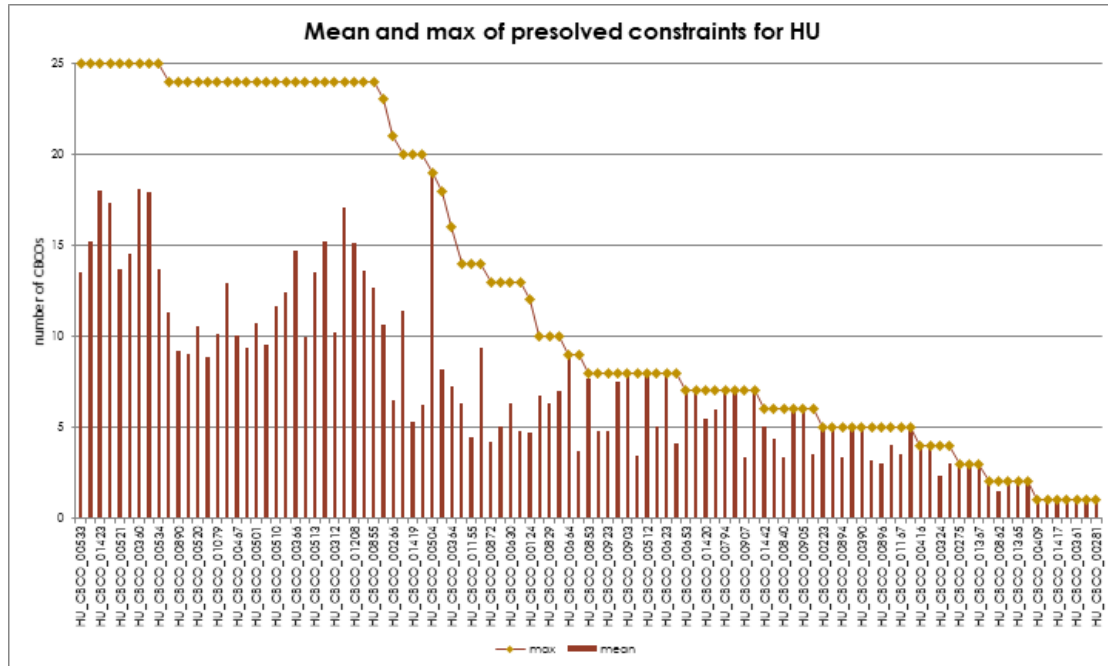
20 most limiting presolved constraint	% of hours when CBCO is limiting (09.06-01.08)
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR] / N-1 Melina - Divaca	75,56%
[HU-HU] Gonyu - Gyor [DIR] / N-1 Gabcikovo - Gyor	75,38%
[SI-HU] Cirkovce - Heviz [OPP] [HU] / N-1 Zerjavinec - Heviz	75,14%
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR] / N-1 Melina - Divaca	75,03%
[SK-HU] Levice - God [DIR] [HU] / N-1 R.Sobota - Sajoivanka	74,48%
[CZ-SK] Nosovice - Varin [OPP] [CZ] / N-1 Krizovany - Sokolnice	73,26%
[RO-RO] TR Rosiori 400/220 1 [DIR] / N-1 Rosiori - Gadalin	72,85%
[SI-HU] Cirkovce - Heviz [DIR] [HU] / N-1 Zerjavinec - Heviz	72,19%
[SK-SK] V.Dur - Levice 1 [DIR] / N-1 V.Dur - Levice 2	72,05%
[CZ-SK] Nosovice - Varin [DIR] [CZ] / N-1 Krizovany - Sokolnice	70,00%
[CZ-AT] Slavetice - Durnrohr - V438 [DIR] [CZ] / N-1 Slavetice - Durnrohr 1	69,13%
[AT-SI] Obersielach - Podlog 247 [OPP] [AT] / N-1 Cirkovce-Podlog	68,72%
[SK-CZ] Krizovany - Sokolnice [OPP] [SK] / N-1 Sokolnice - Stupava	68,40%
[AT-SI] Obersielach - Podlog 247 [DIR] [AT] / N-1 Cirkovce-Podlog	68,33%
[CZ-SK] Nosovice - Varin [OPP] [SK] / N-1 Sp.Nova Ves - Lemesany	68,06%
[CZ-D8] Hradec - Rohrsdorf 446 [OPP] [D8] / N-1 Hradec - Rohrsdorf 1	67,08%
[RO-RS] Portile de Fier - Djerdap [OPP] [RO] / N-1 Tantareni-Kozlodui	65,17%
[CZ-SK] Sokolnice - Senice [OPP] [CZ] / N-1 Krizovany - Sokolnice	65,07%
[CZ-SK] Sokolnice - Senice [DIR] [CZ] / N-1 Krizovany - Sokolnice	62,29%
[CZ-SK] Nosovice - Varin [DIR] [SK] / N-1 Sp.Nova Ves - Lemesany	61,32%

**Example Visualisation**

1) Per TSO



2) Per CBCO



## 2.4 Net positions

### 2.4.1 KPI 8 - Min and Max Net Positions per bidding zone

<b>Short Name of KPI</b>	KPI 8 – Min and Max Net Positions per bidding zone
<b>Article in DA CCM</b>	Article 23. Publication of data
<b>Granularity</b>	Per Timestamp
<b>Aggregation</b>	No aggregation

<b>KPI Description</b>
<p><b>This KPI is meant to give an overview of the upper and lower bound of the capacities offered to the market.</b></p> <p>Min and Max net positions are provided per bidding zone and per timestamp. This KPI is an output of the capacity calculation process and subject to publication as required by the CCM in article 23.2.b.i.</p> <p>This KPI is a combination of specific net positions meaning that Min and Max net positions for different bidding zones are mostly exclusive and mostly theoretical.</p> <p>In addition to Min and Max NPs calculated based on final FB domain, second part of this KPI shows minimum and maximum net positions computed from extracted ATCs. While allocation is in ATC this way of calculation relates more to the actual possibilities of the market.</p> <p>E.g. max NP of FR would be ATC FR--&gt;BE + ATC FR--&gt;DE.</p>

**Example Visualisation**

