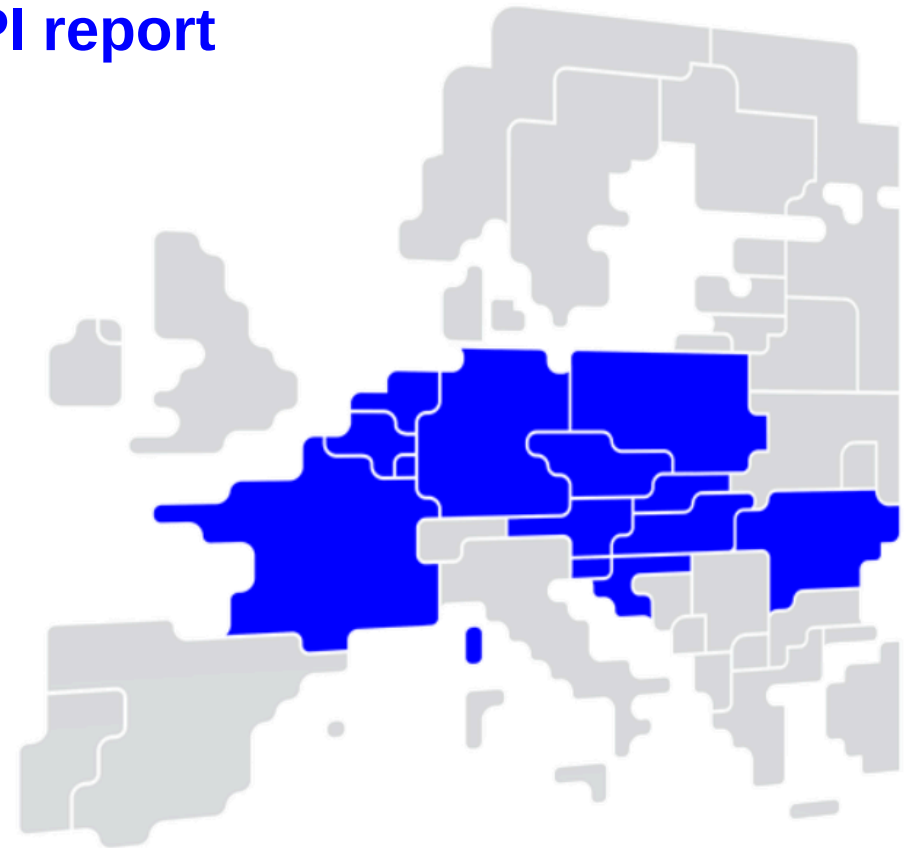




Core FB MC Operational KPI report

March 2025



Overview of Operational KPIs



Adjustment for minimum RAM Inclusion

- KPI 1: Average maximum AMR per CNE
- KPI 2: Average maximum AMR per TSO

TSOs' adjustment after validation

- KPI 3: Share of MTUs with intervention per TSO
- KPI 4: Average IVA applied for each CNE affected by TSO intervention

Power System Impact Analysis

- KPI 5: Min & max net positions per BZ hub
- KPI 6: Virtual margins at market balance for CORE TSOs
- KPI 7: Non-Core exchanges delta flow

Non-costly Remedial Action Optimization Analysis

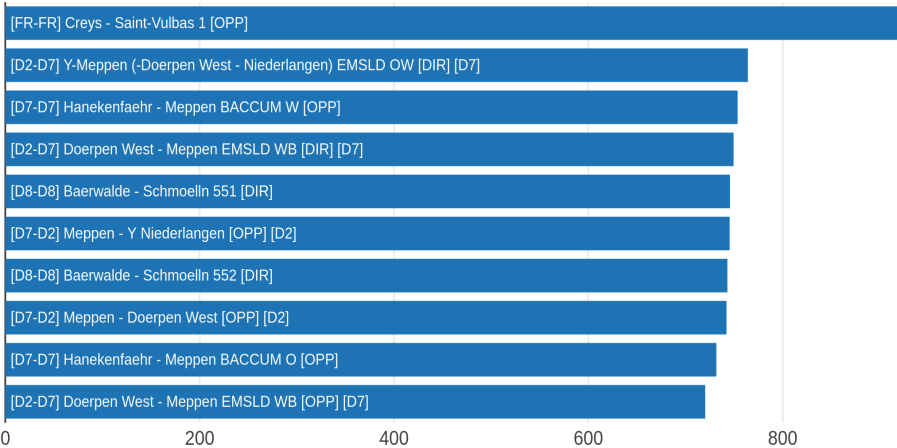
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

Market Impact Assessment

- KPI 11: Most often presolved CNEs (top 20)
- KPI 12: Most limiting CNEs (top 20)
- KPI 13: Allocation Constraints

KPI 1: Average maximum AMR per CNE (Top 10)

CNE	Avg. Max. AMR (MW)	AMR/Fmax% (MTUs with AMR > 0 MW)	AMR/Fmax% (all MTUs)
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	918.02	39.44%	39.17%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	764.23	32.44%	17.99%
[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	753.63	32.74%	17.40%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	749.51	31.83%	18.64%
[D8-D8] Baerwalde - Schmoelln 551 [DIR]	745.78	29.90%	29.70%
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	745.46	37.34%	24.33%
[D8-D8] Baerwalde - Schmoelln 552 [DIR]	743.14	29.80%	29.16%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	742.20	37.16%	25.20%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	731.77	31.61%	16.72%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	720.30	30.59%	17.09%



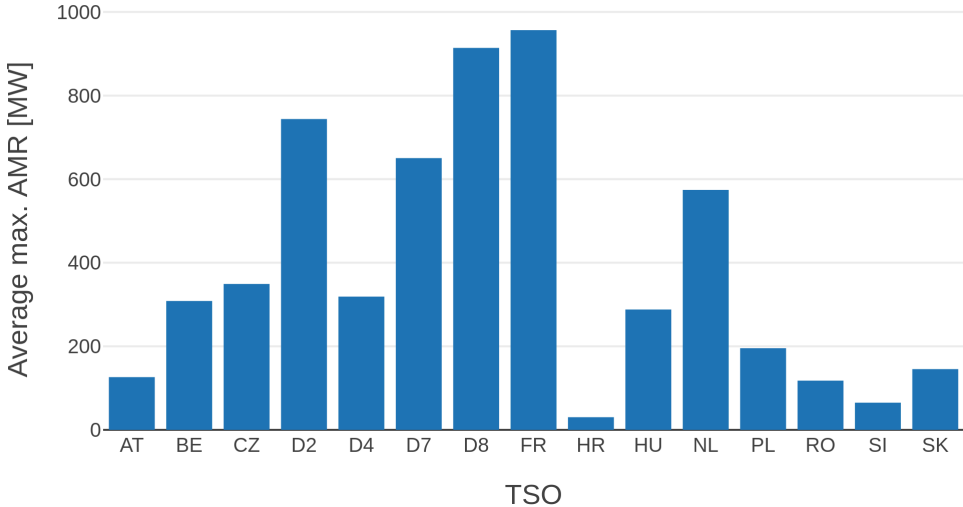
Average max. AMR [MW]

KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	126.18
BE	308.35
CZ	349.27
D2	743.98
D4	318.92
D7	650.41
D8	914.01
FR	956.66
HR	30.19
HU	287.96

TSO	Average maximum AMR per TSO
NL	574.32
PL	195.29
RO	117.66
SI	65.00
SK	145.33



KPI 3: Share of MTUs with intervention per TSO



Total BDs
31

Total MTUs
743

MTUs without IVA
106

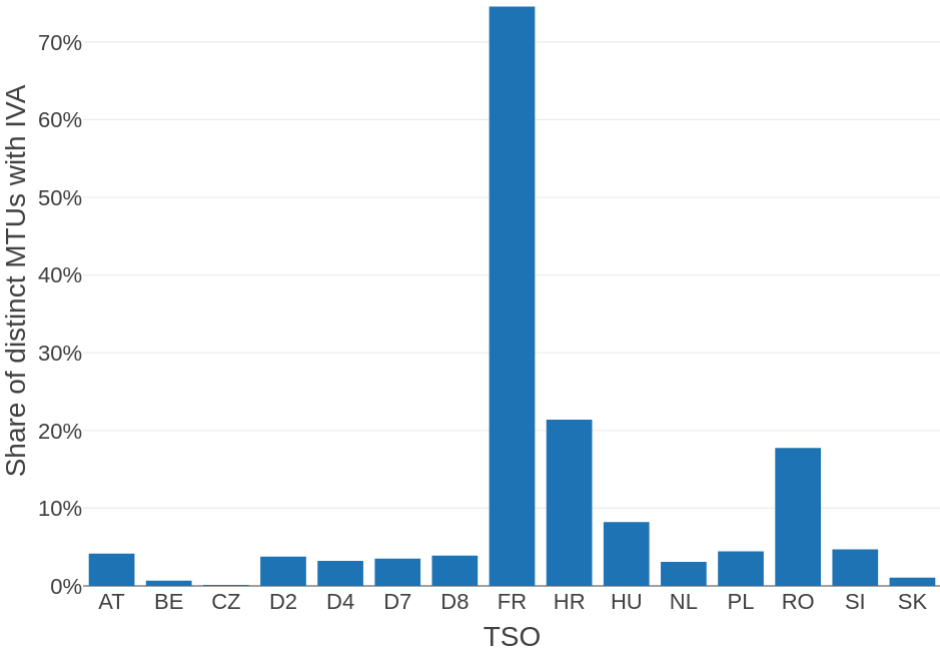
Share of distinct MTUs without IVA
14.27%

MTUs with IVA
637

Share of distinct MTUs with IVA
85.7%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	4.17%	31
BE	0.67%	5
CZ	0.13%	1
D2	3.77%	28
D4	3.23%	24
D7	3.50%	26
D8	3.90%	29
FR	74.56%	554
HR	21.40%	159
HU	8.21%	61

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
NL	3.10%	23
PL	4.44%	33
RO	17.77%	132
SI	4.71%	35
SK	1.08%	8



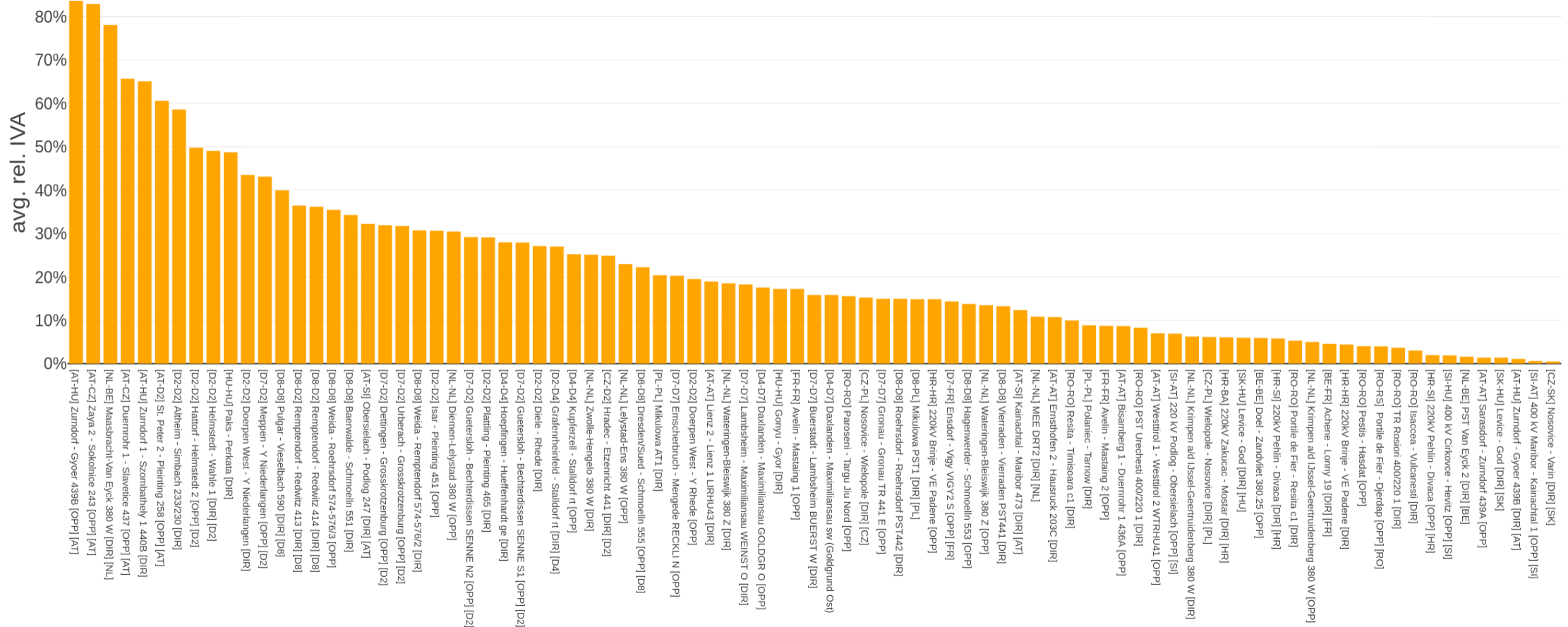
A map of Europe with the countries of Central Europe highlighted in green. These countries include Poland, Czech Republic, Slovakia, Austria, Hungary, and parts of Germany, France, and the Balkans.



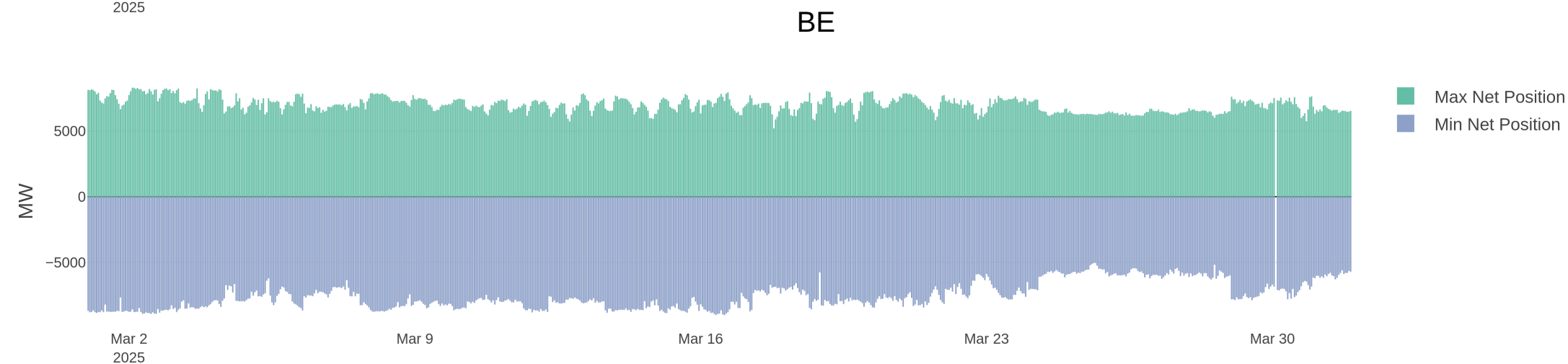
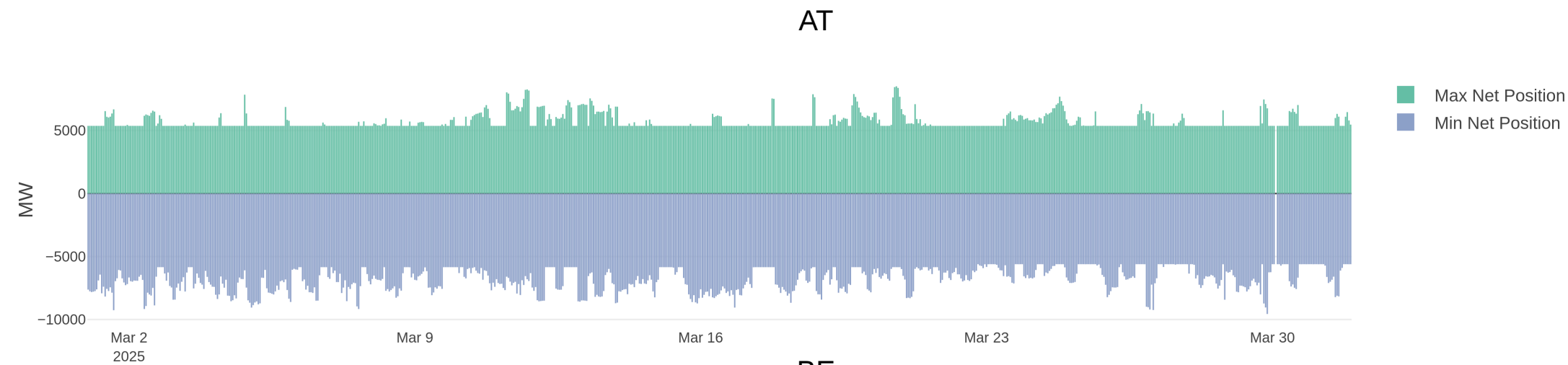
KPI 4b: Average relative IVA applied for each CNE affected by TSO intervention



$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{maxCNEC, MTU}[IVA_{CNEC, MTU} > 0]}$$



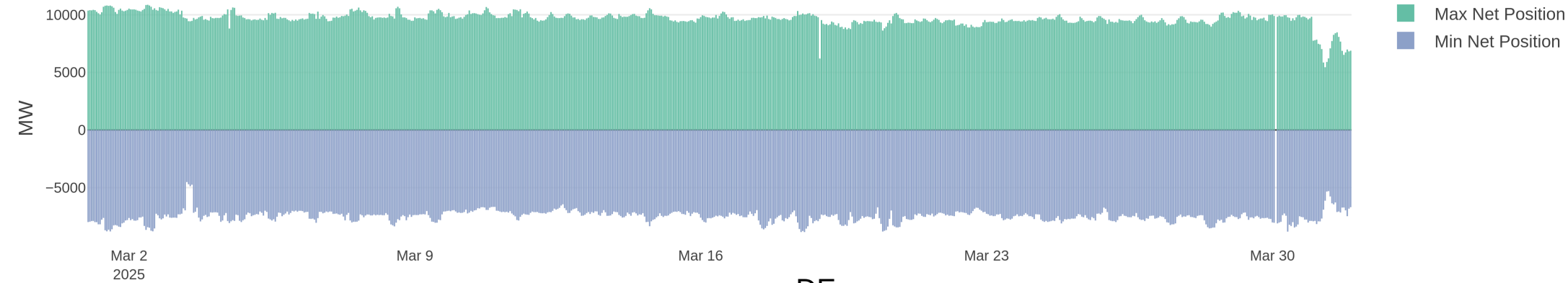
KPI 5: Min & max net positions per BZ hub



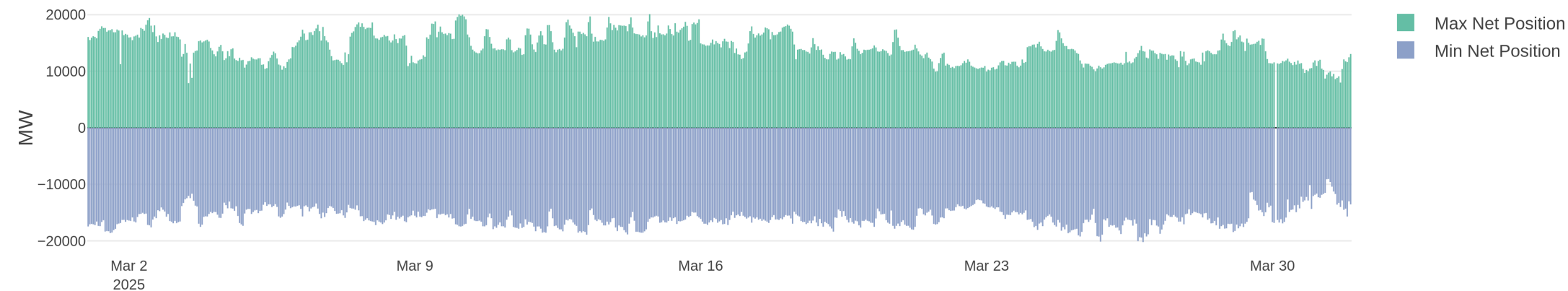
KPI 5: Min & max net positions per BZ hub



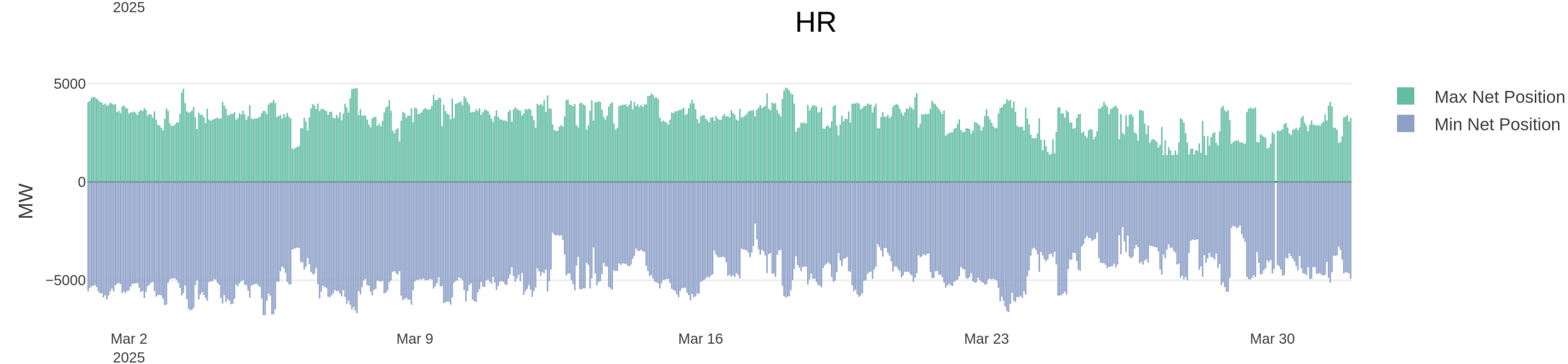
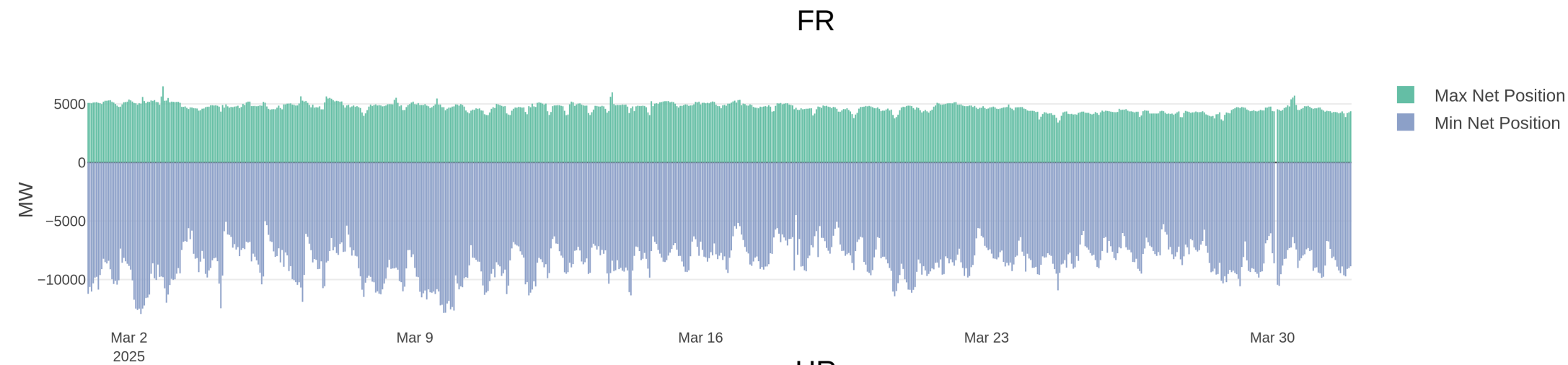
CZ



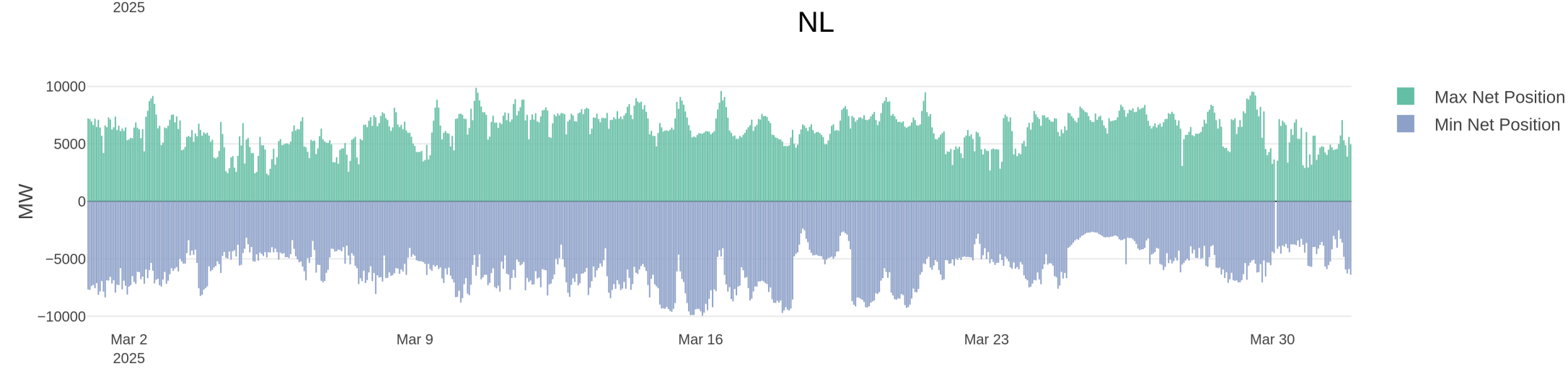
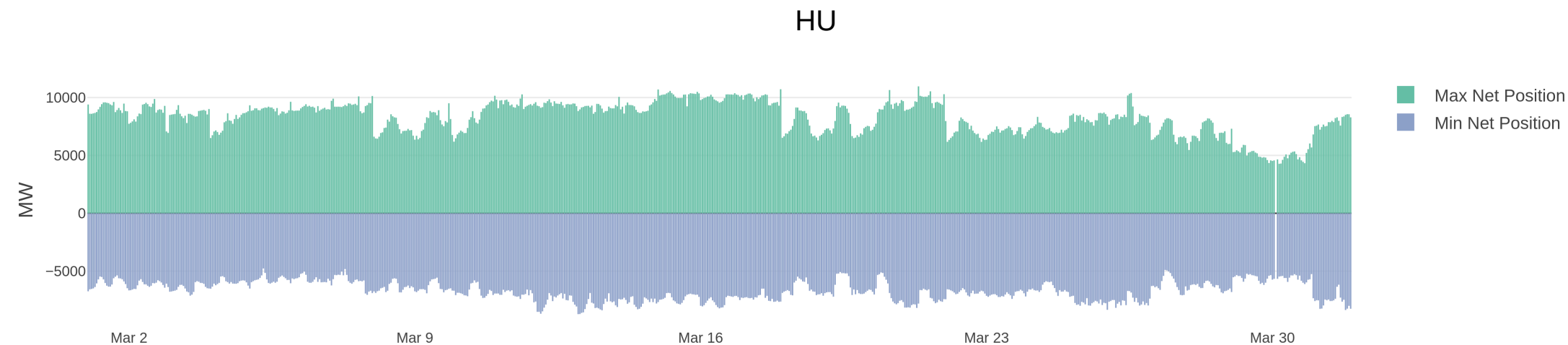
DE



KPI 5: Min & max net positions per BZ hub



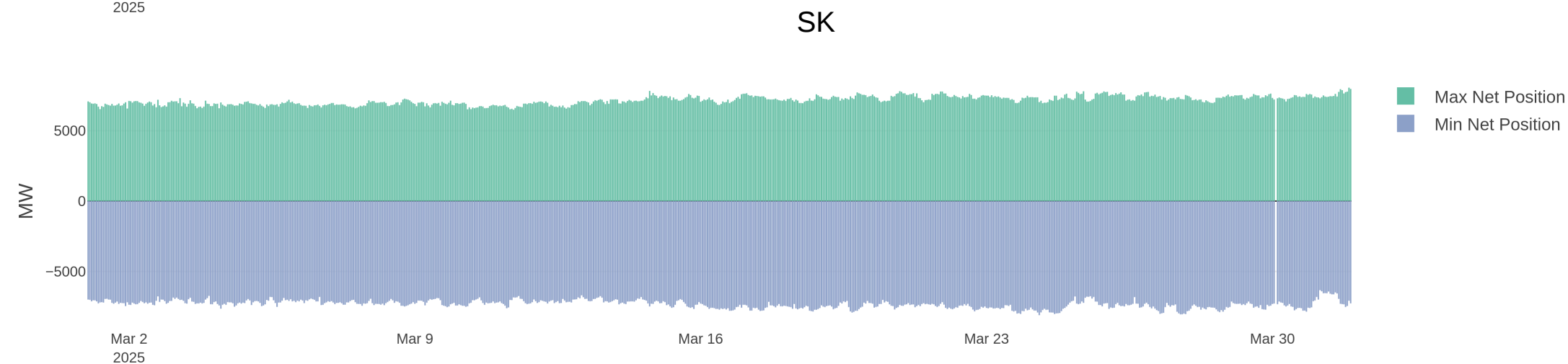
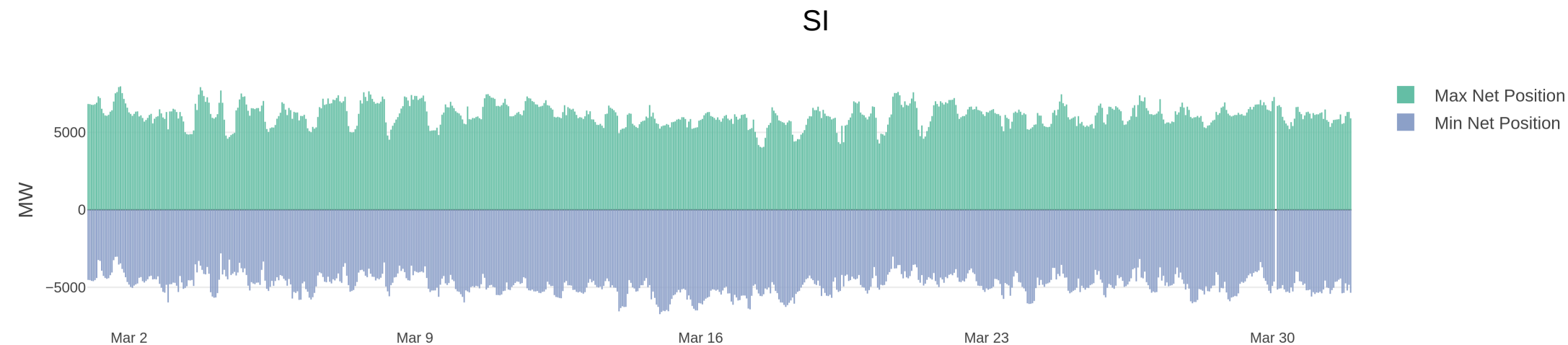
KPI 5: Min & max net positions per BZ hub



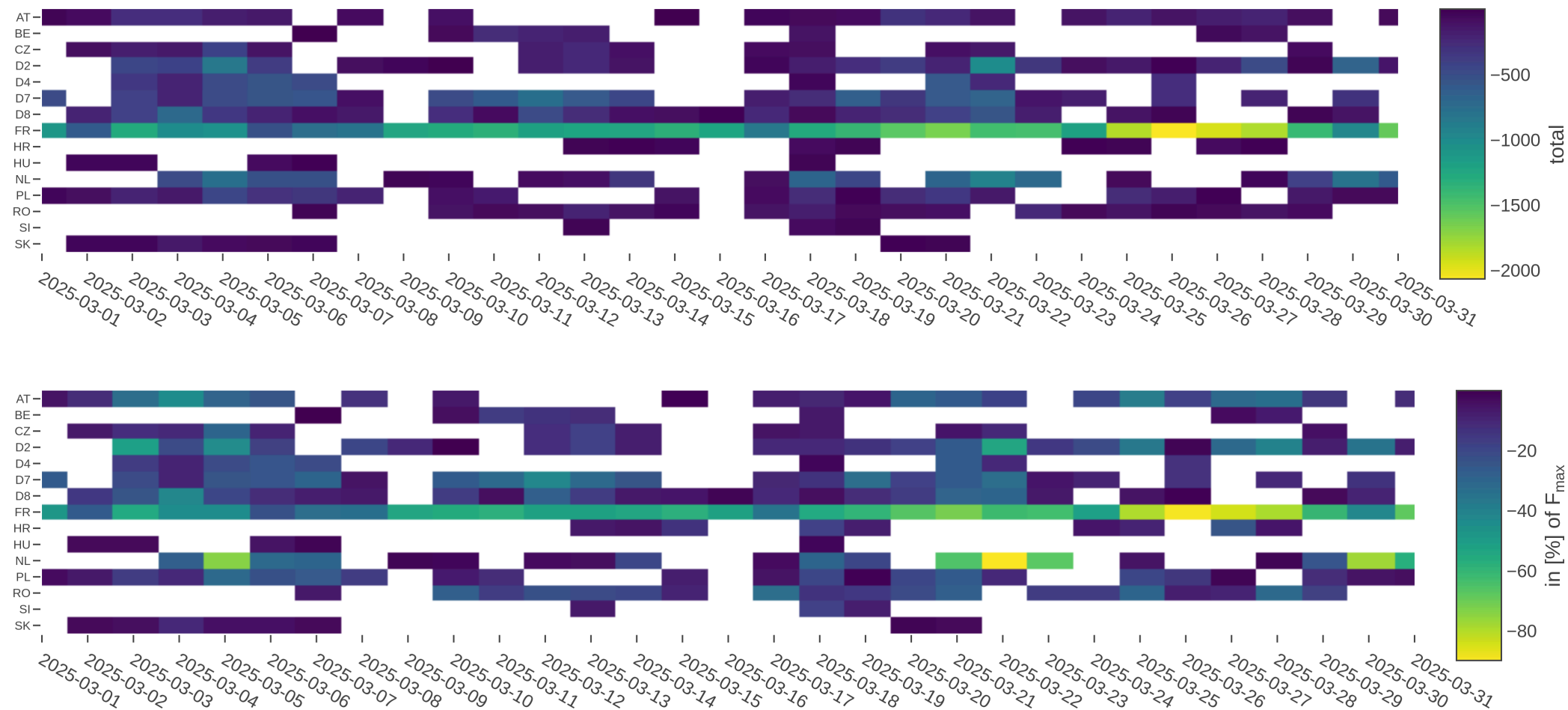
KPI 5: Min & max net positions per BZ hub



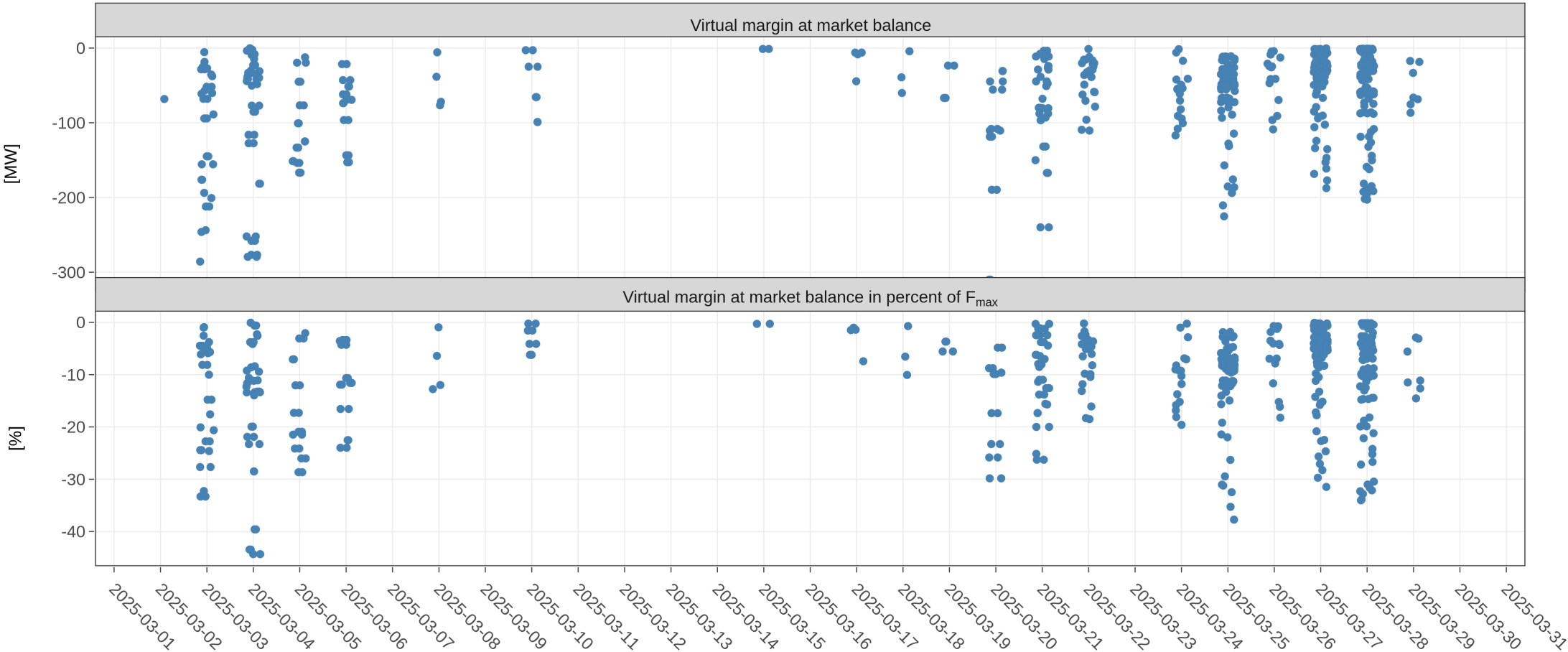
KPI 5: Min & max net positions per BZ hub



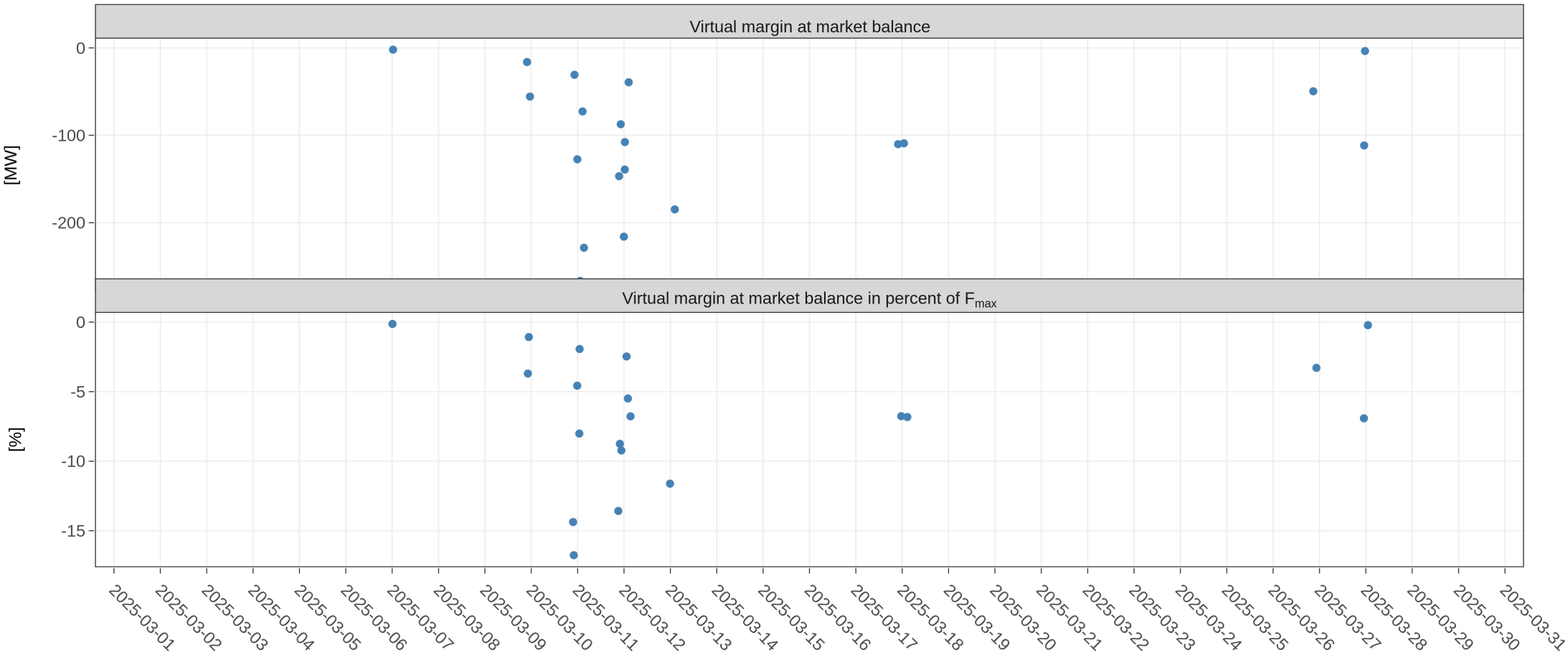
KPI 6a: Highest virtual margins at market balance for CORE TSOs



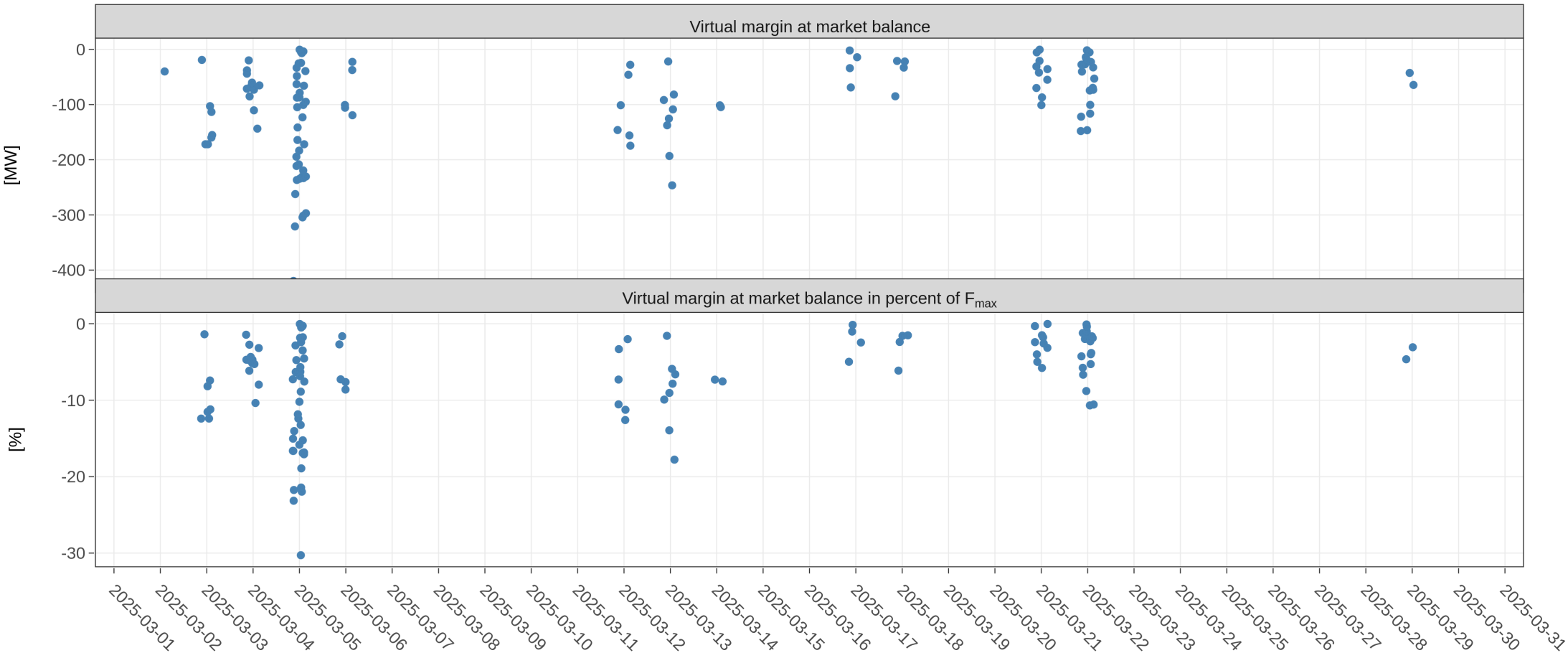
KPI 6b: Virtual margins at market balance AT



KPI 6b: Virtual margins at market balance BE



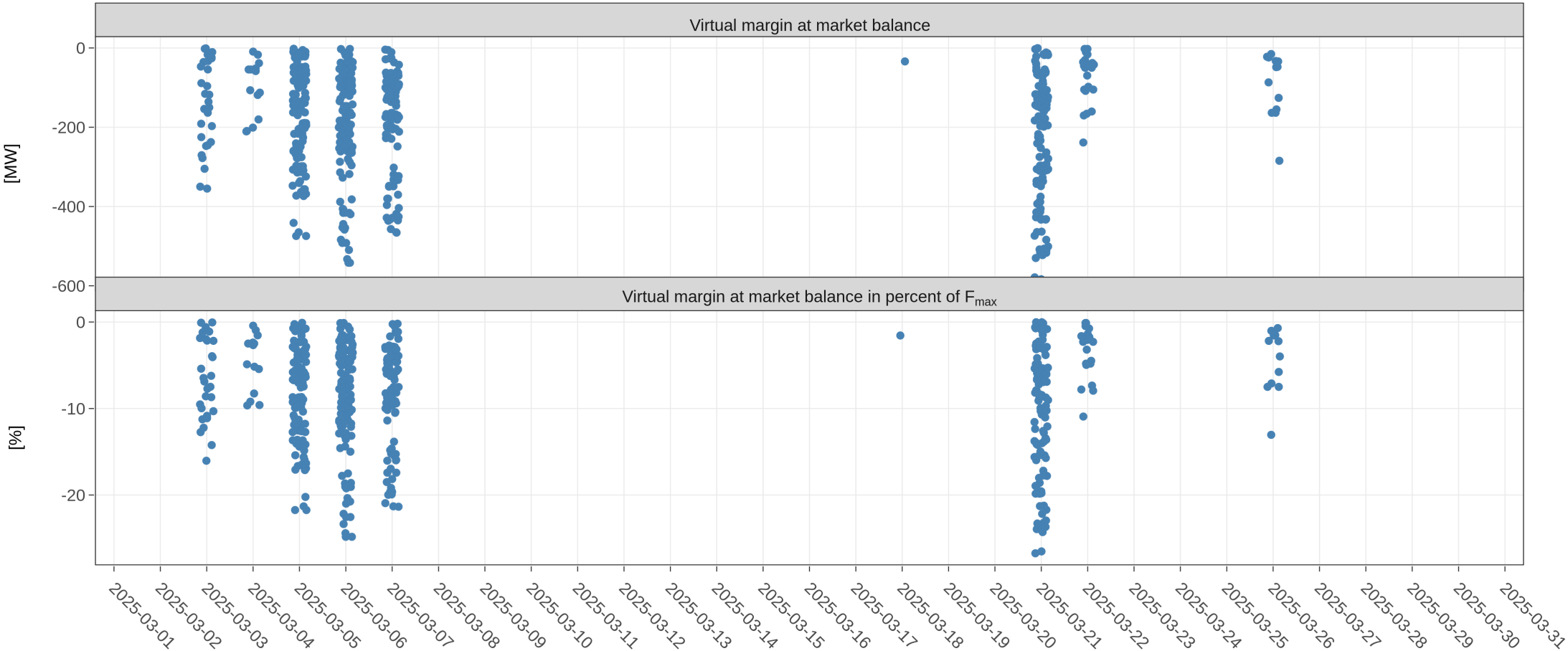
KPI 6b: Virtual margins at market balance CZ



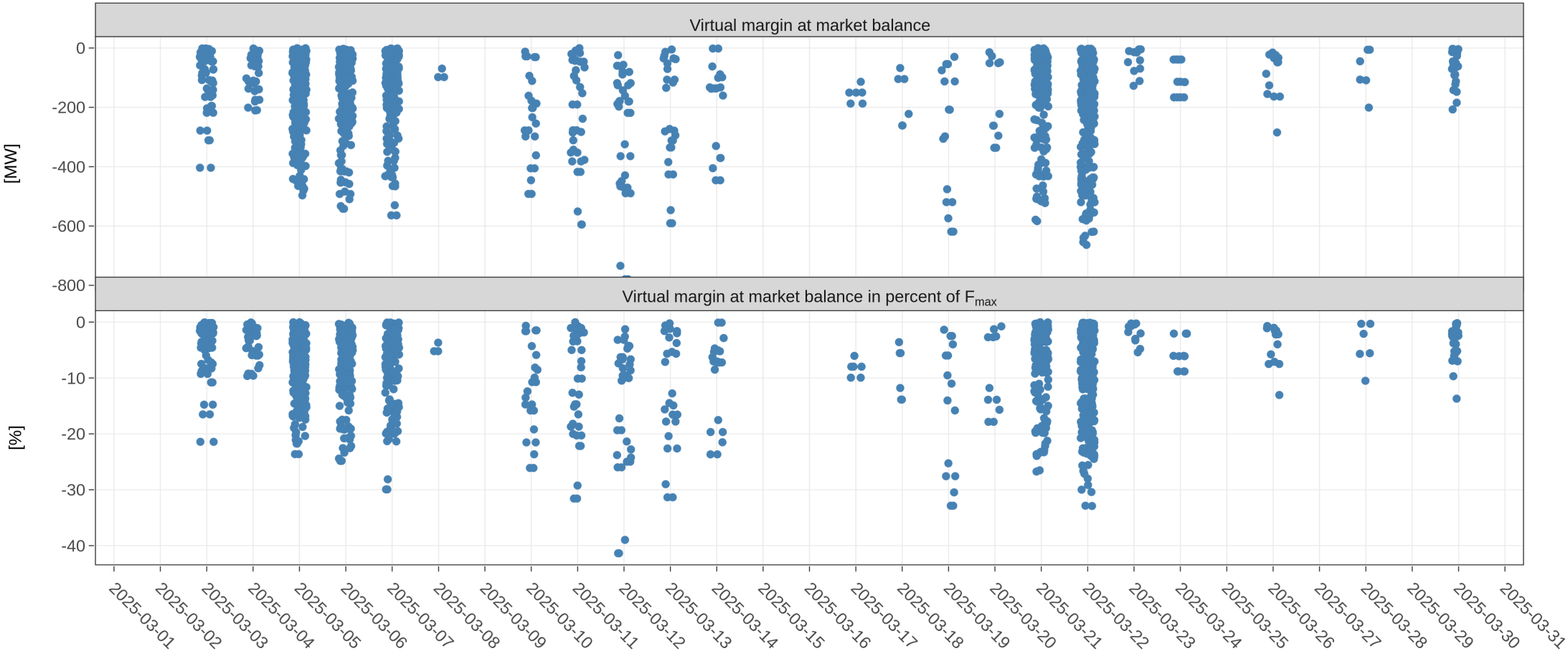
KPI 6b: Virtual margins at market balance D2



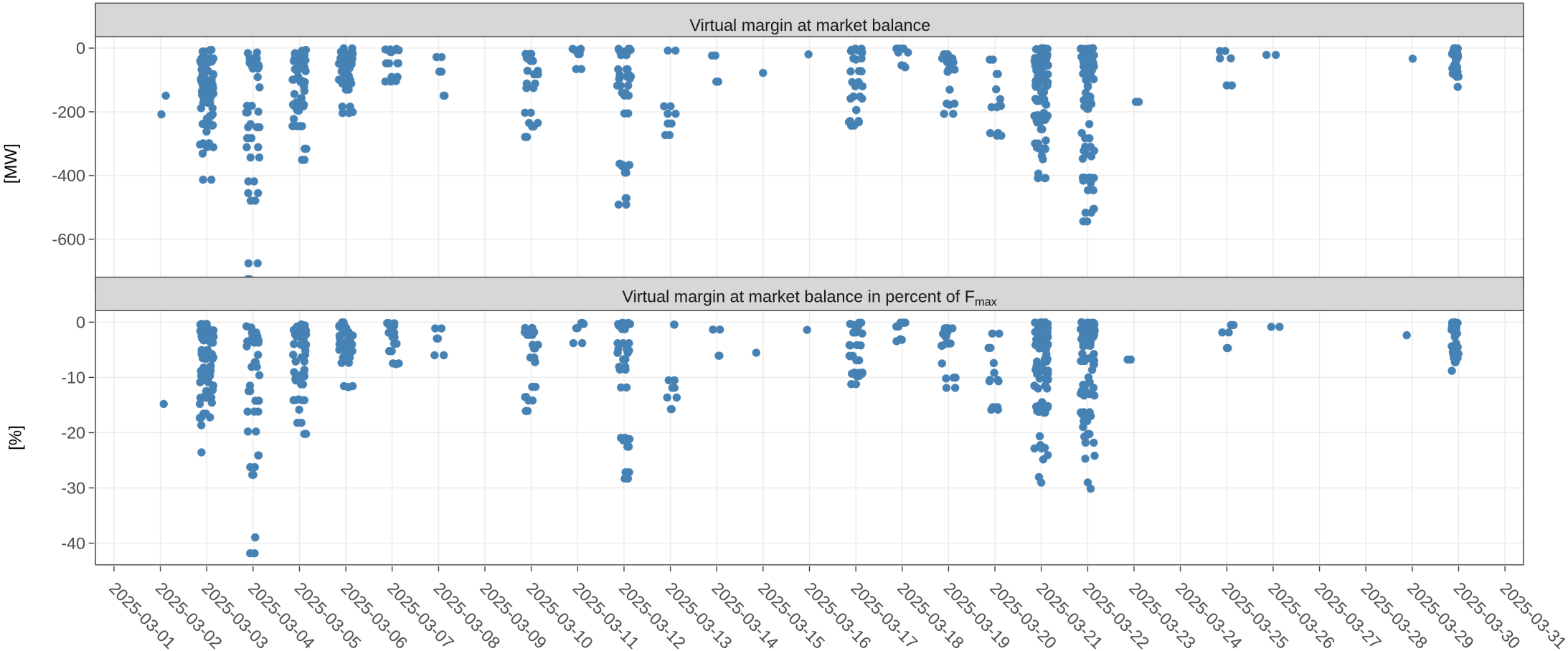
KPI 6b: Virtual margins at market balance D4



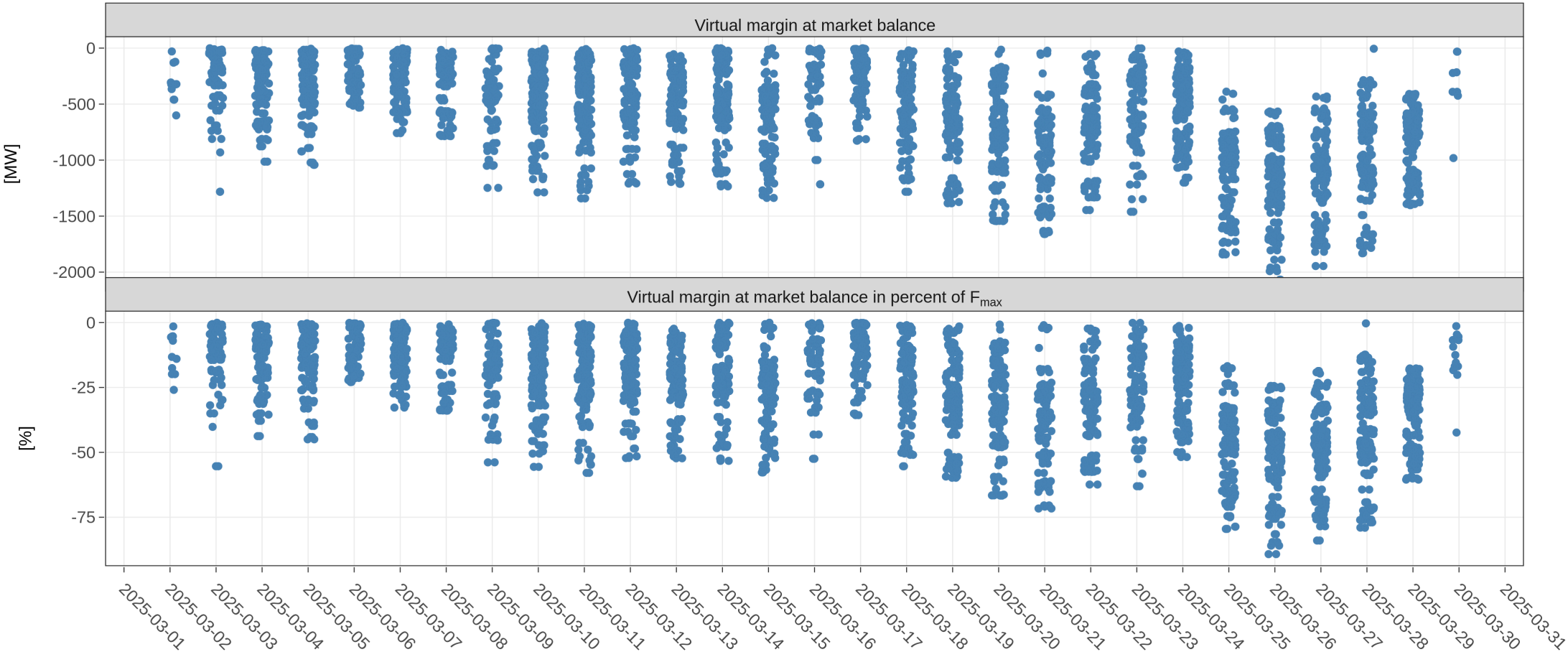
KPI 6b: Virtual margins at market balance D7



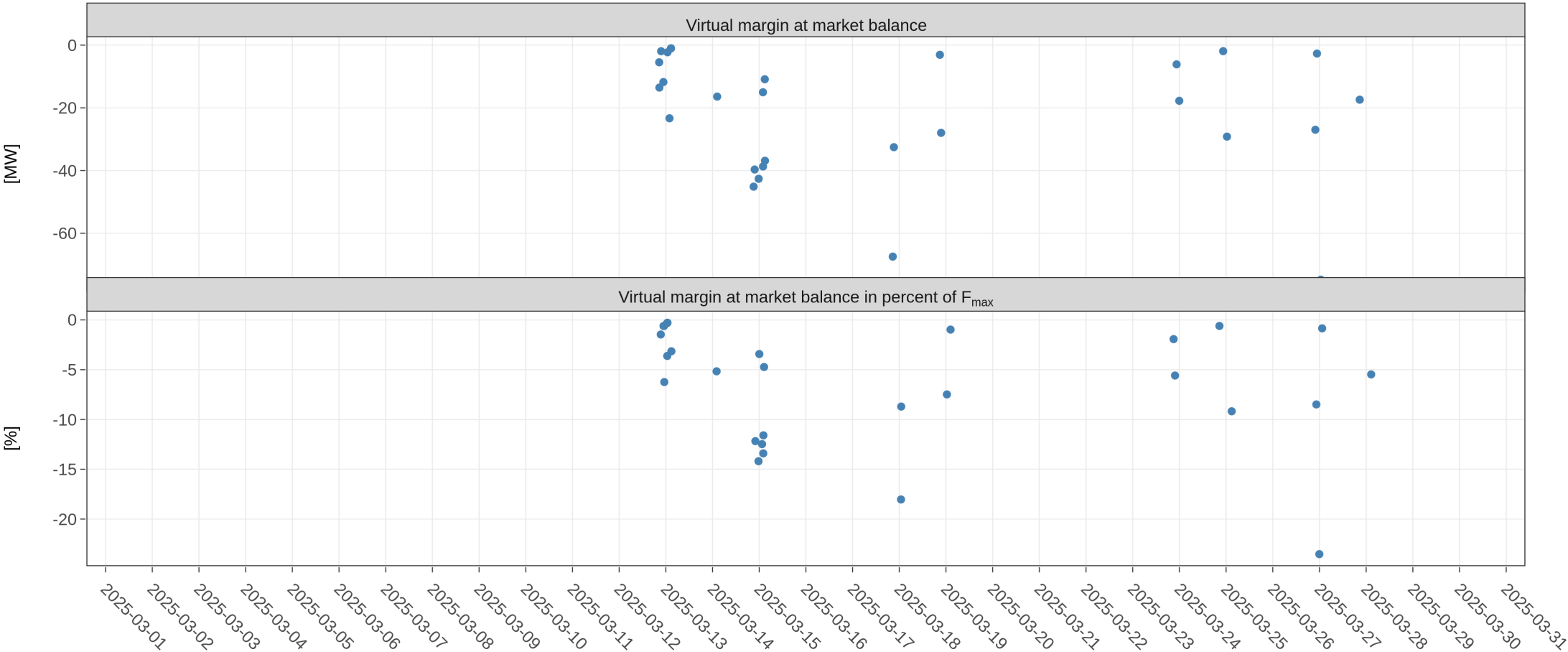
KPI 6b: Virtual margins at market balance D8



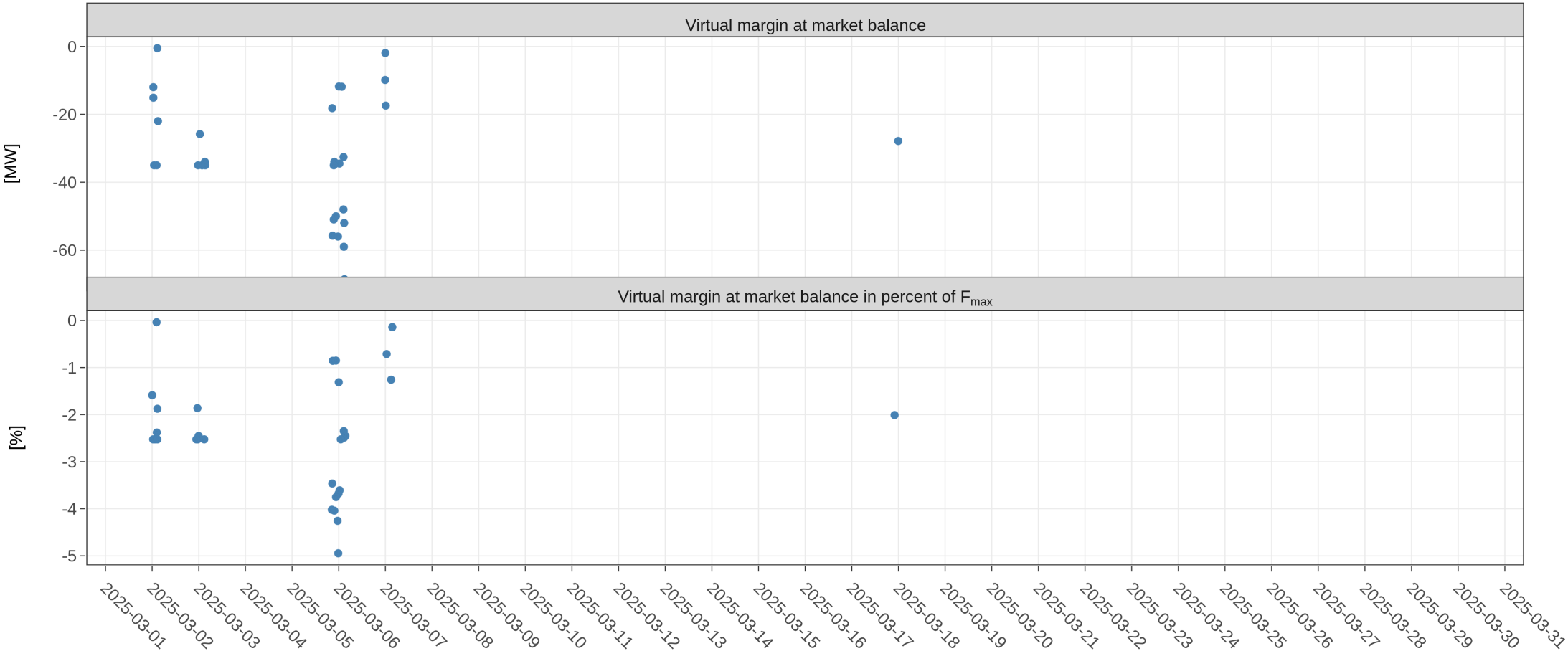
KPI 6b: Virtual margins at market balance FR



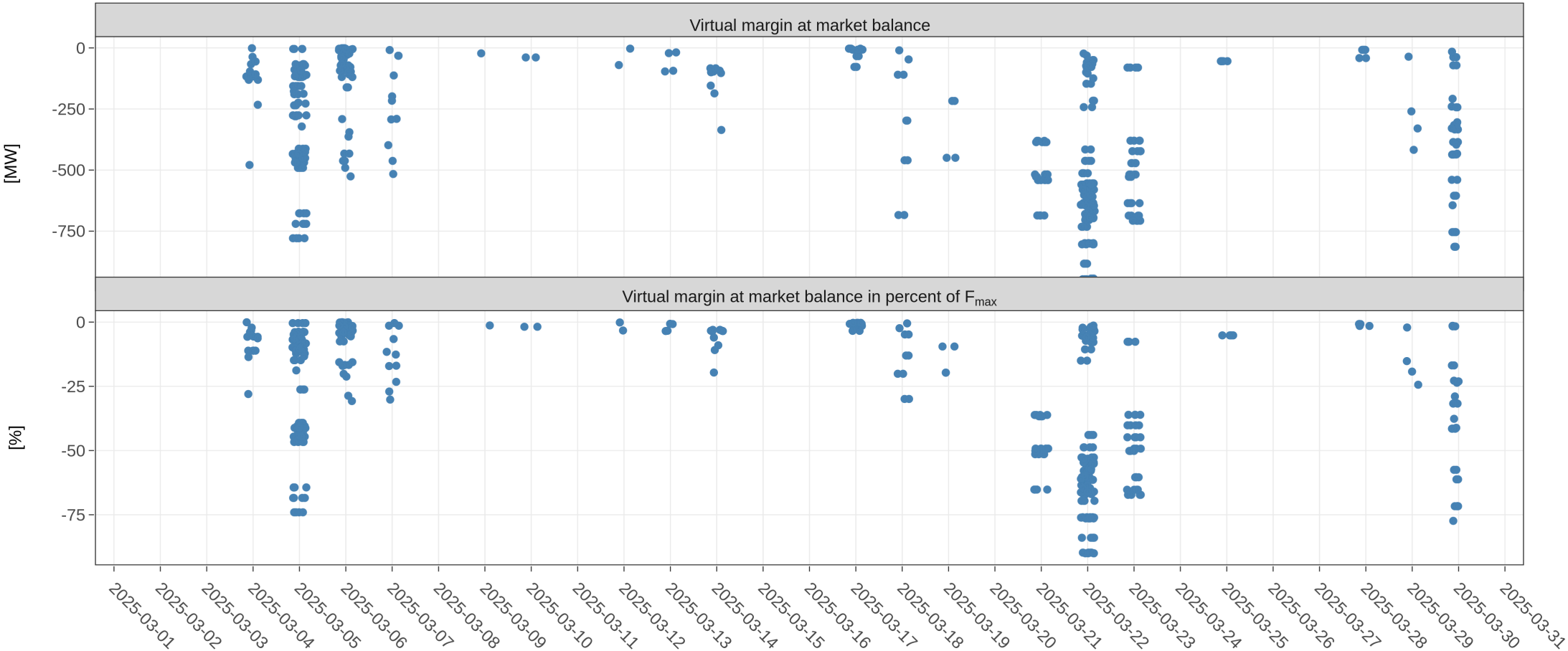
KPI 6b: Virtual margins at market balance HR



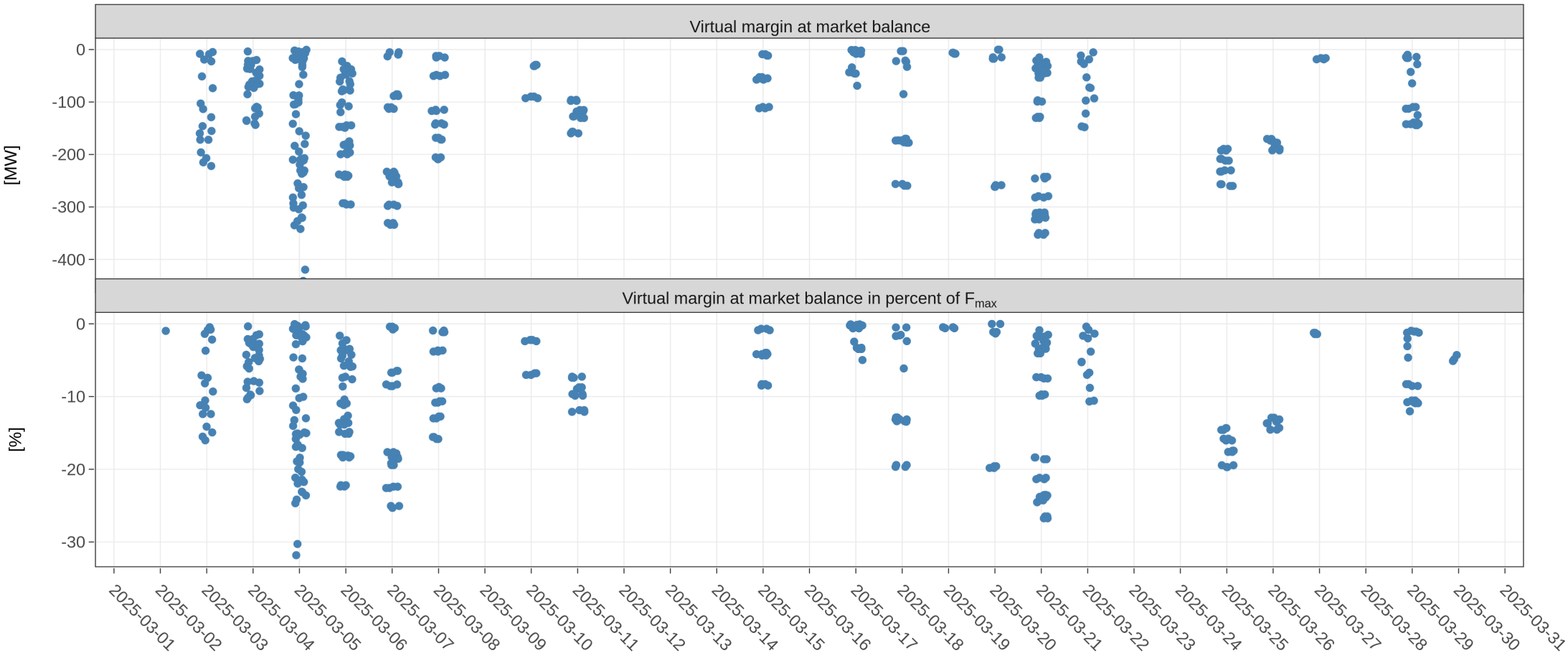
KPI 6b: Virtual margins at market balance HU



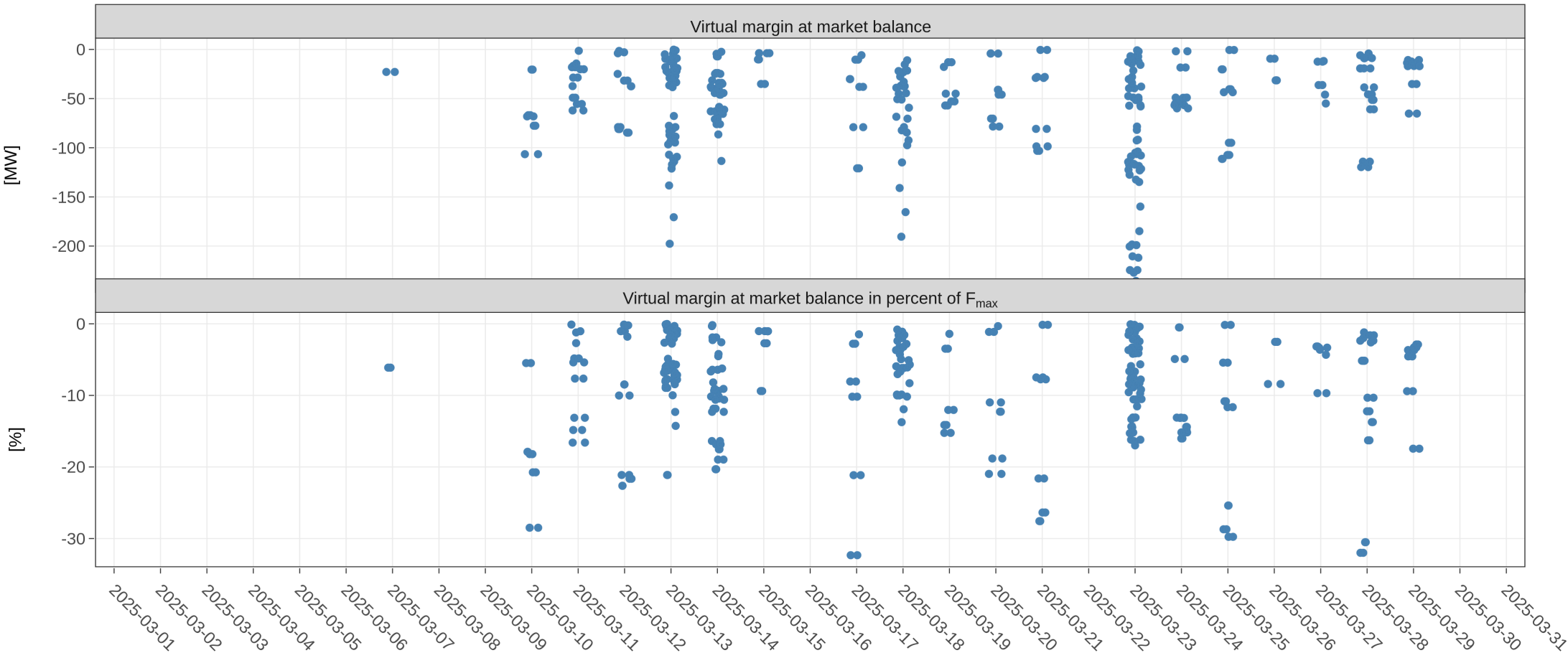
KPI 6b: Virtual margins at market balance NL



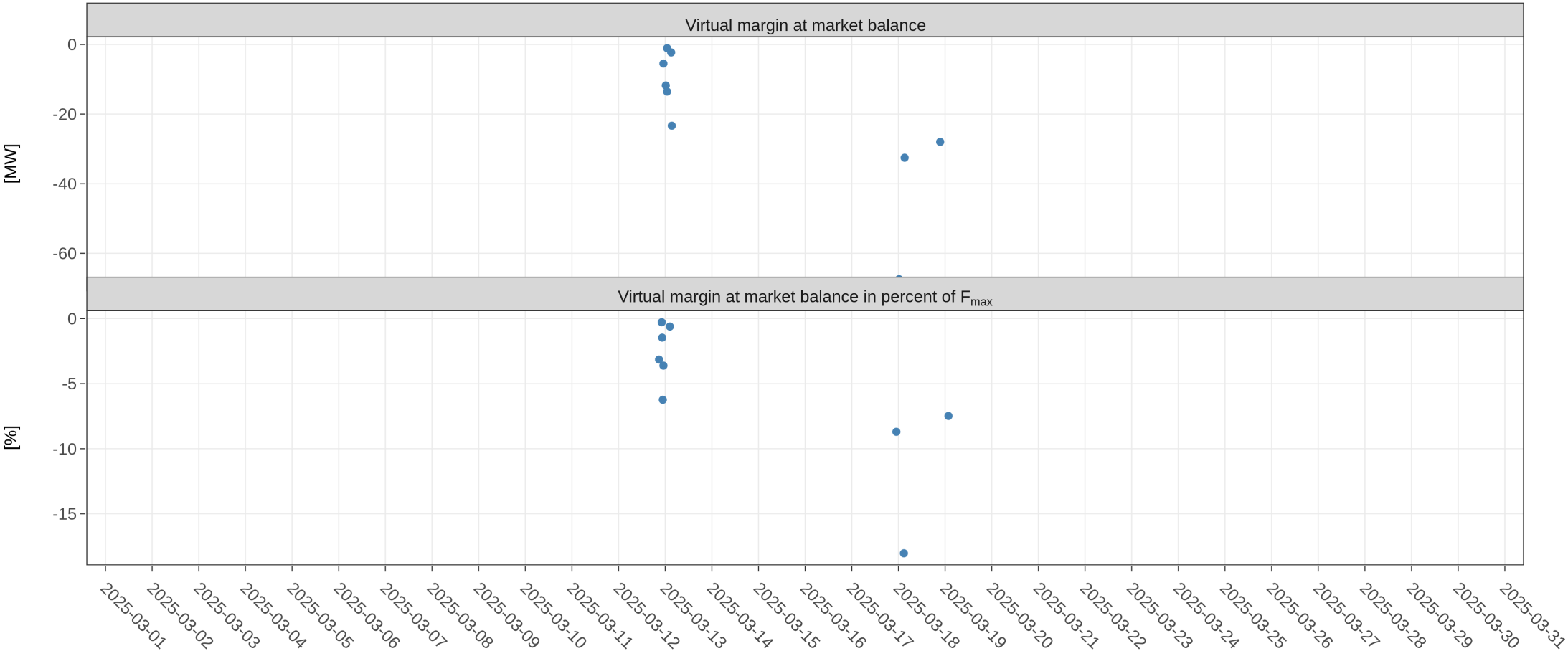
KPI 6b: Virtual margins at market balance PL



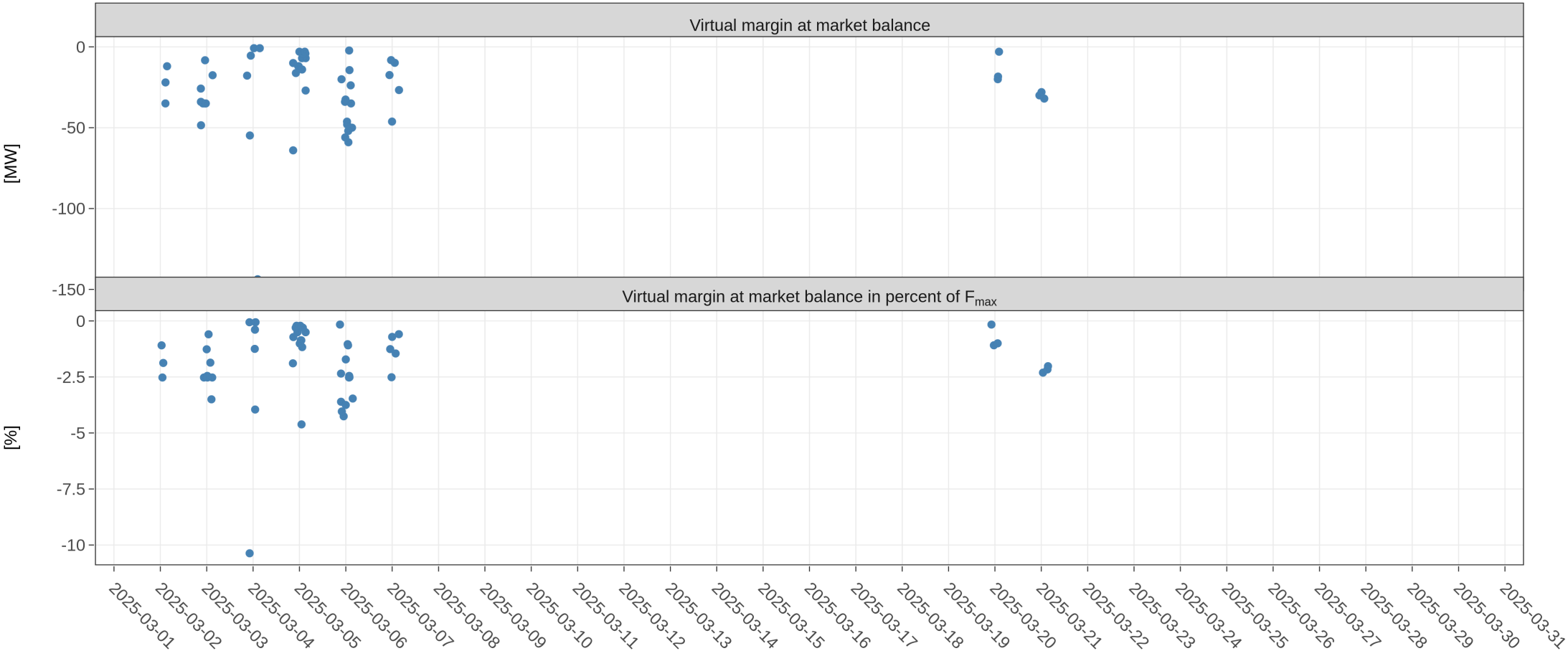
KPI 6b: Virtual margins at market balance RO



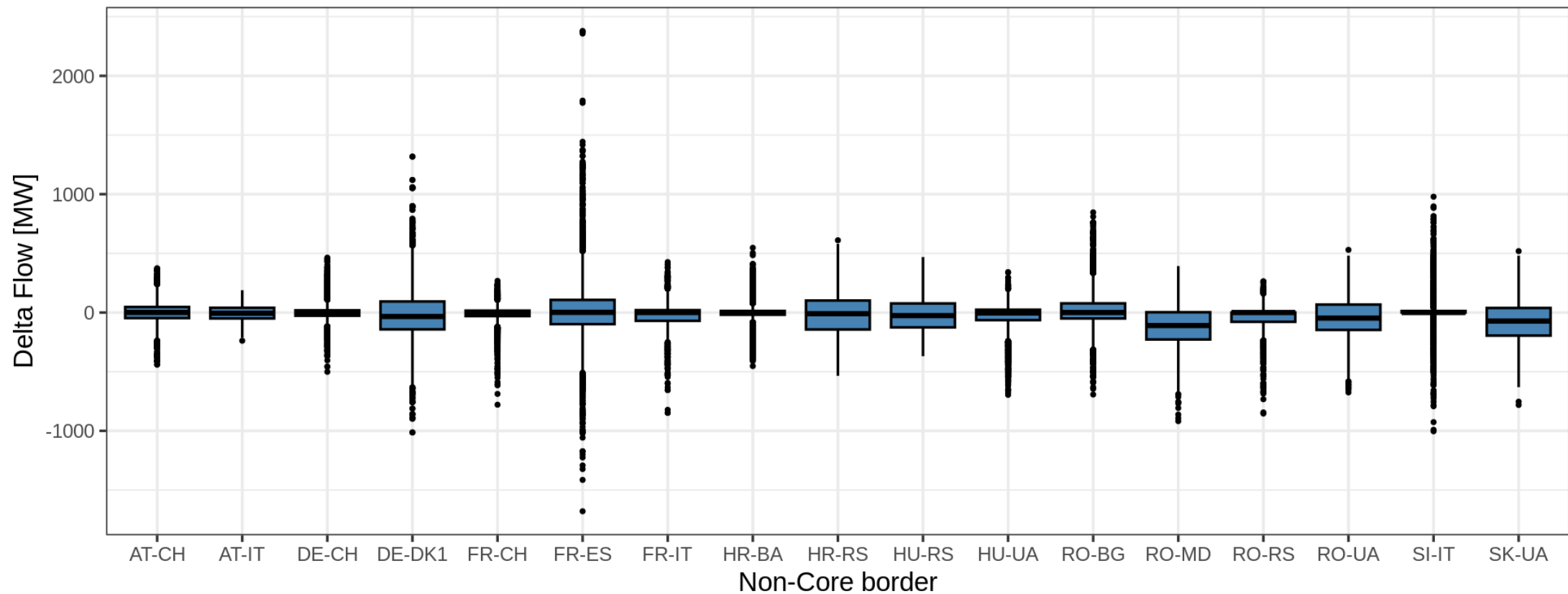
KPI 6b: Virtual margins at market balance SI



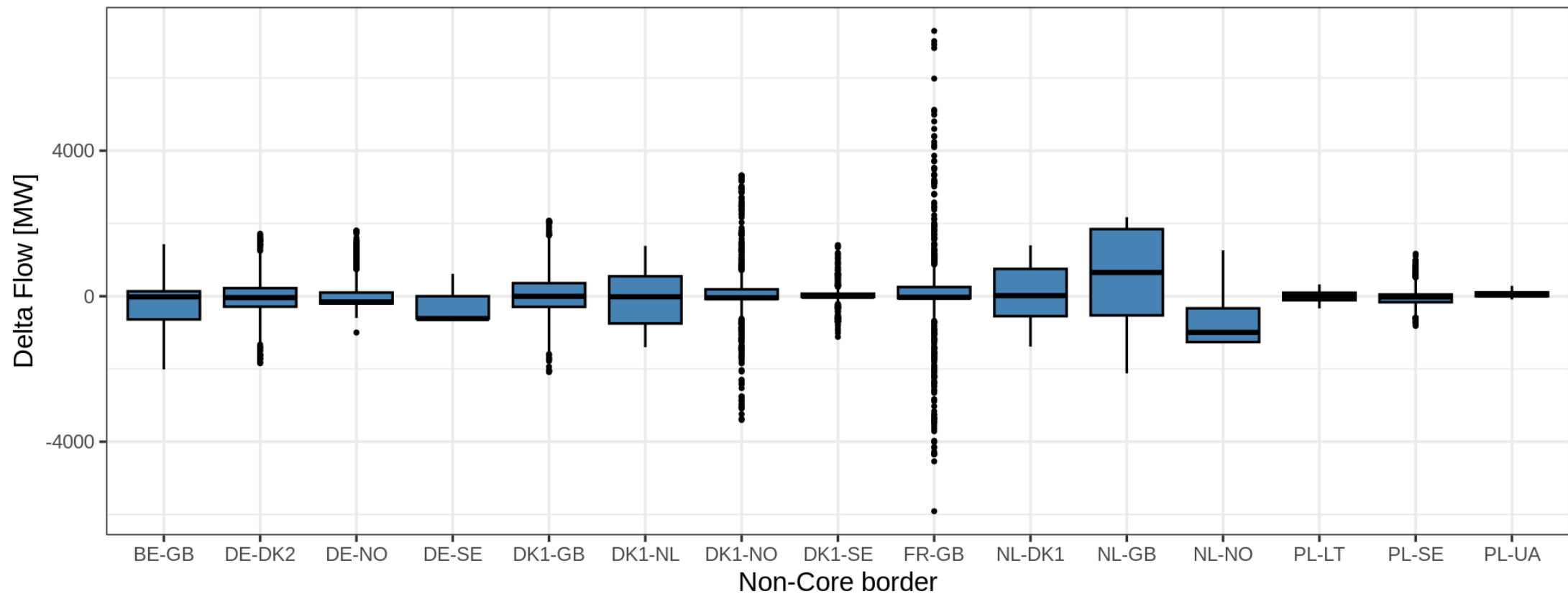
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



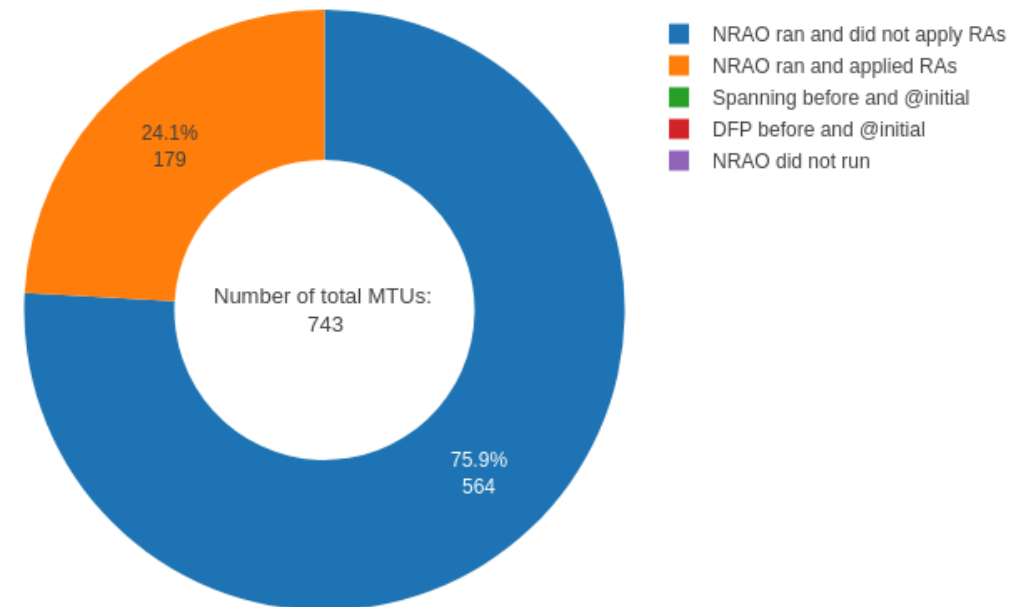
KPI 8: NRAO – Applied Remedial Action



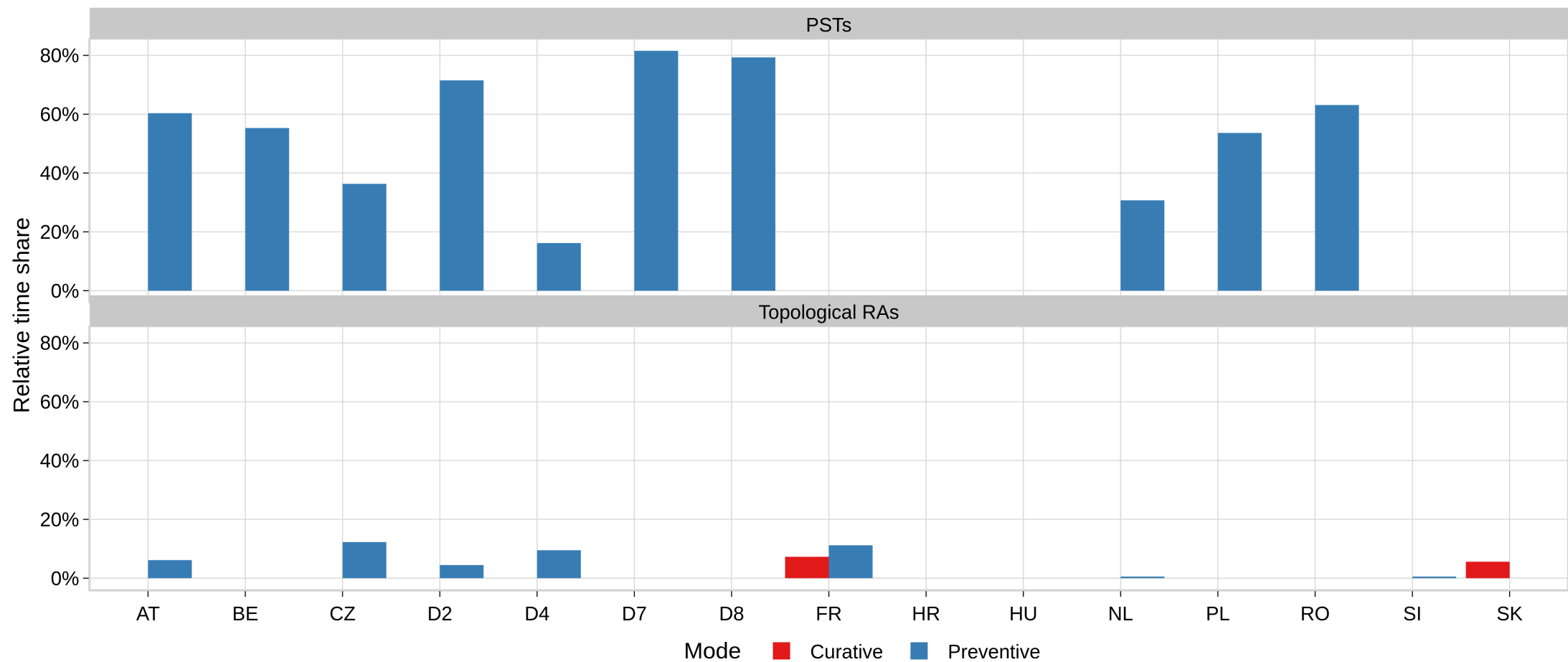
In the following plots, the relative time share relates to the hours labeled 'NRAO Ran and Applied RAs'.

Total MTUs: 743 hours

Category	Hours (%)
NRAO ran and did not apply RAs	564 hours (75.9%)
NRAO ran and applied RAs	179 hours (24.1%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

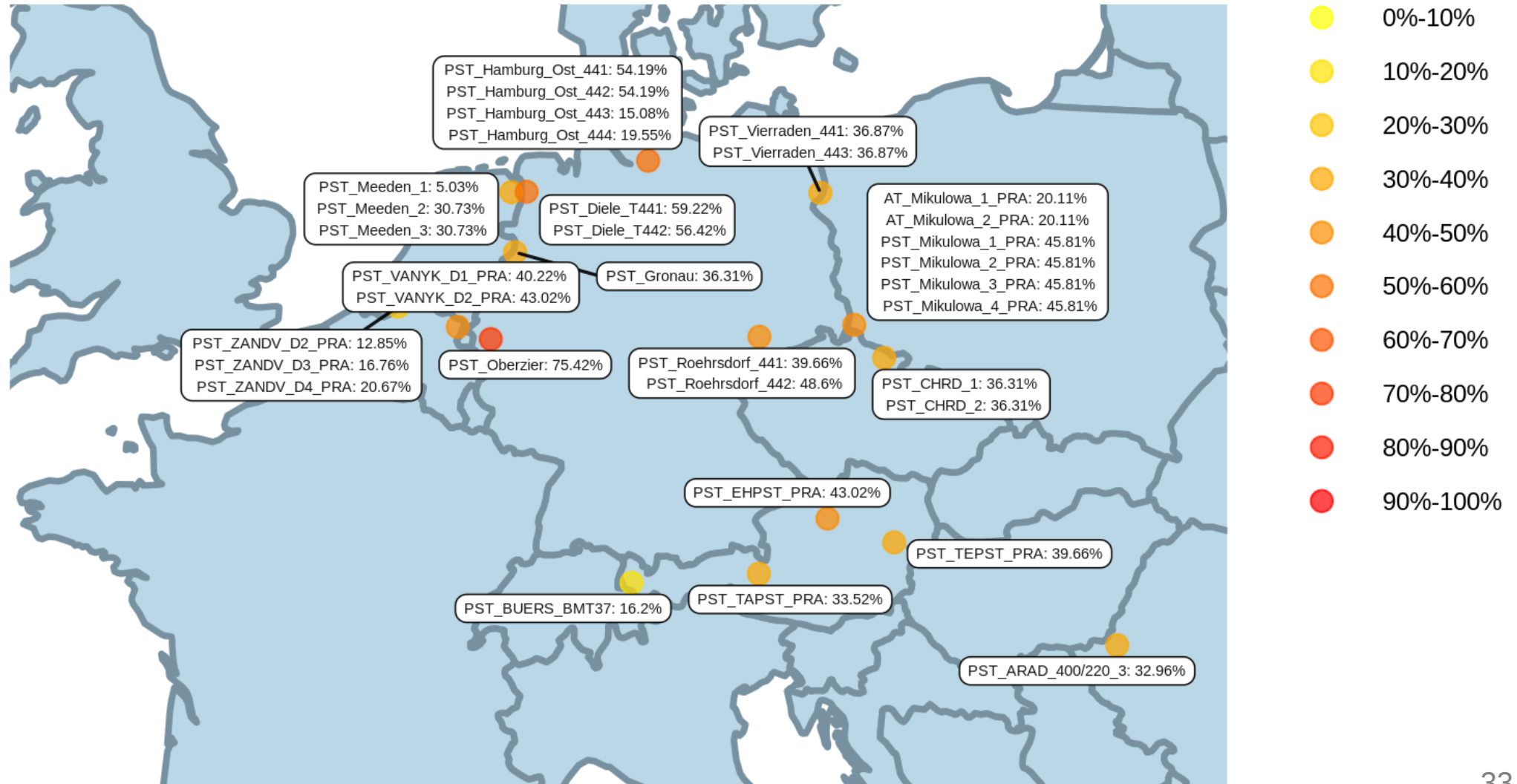


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Preventive Mode



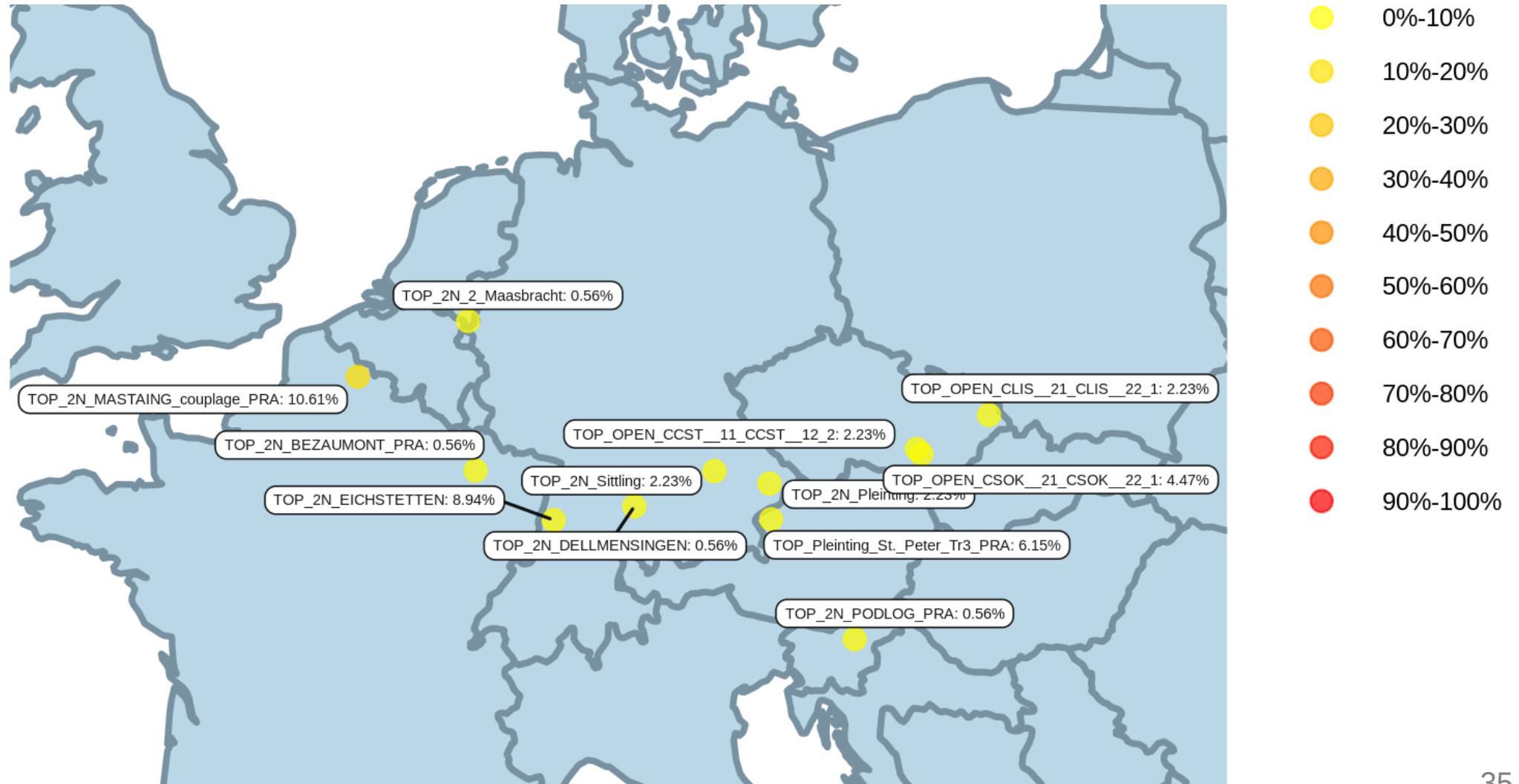
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



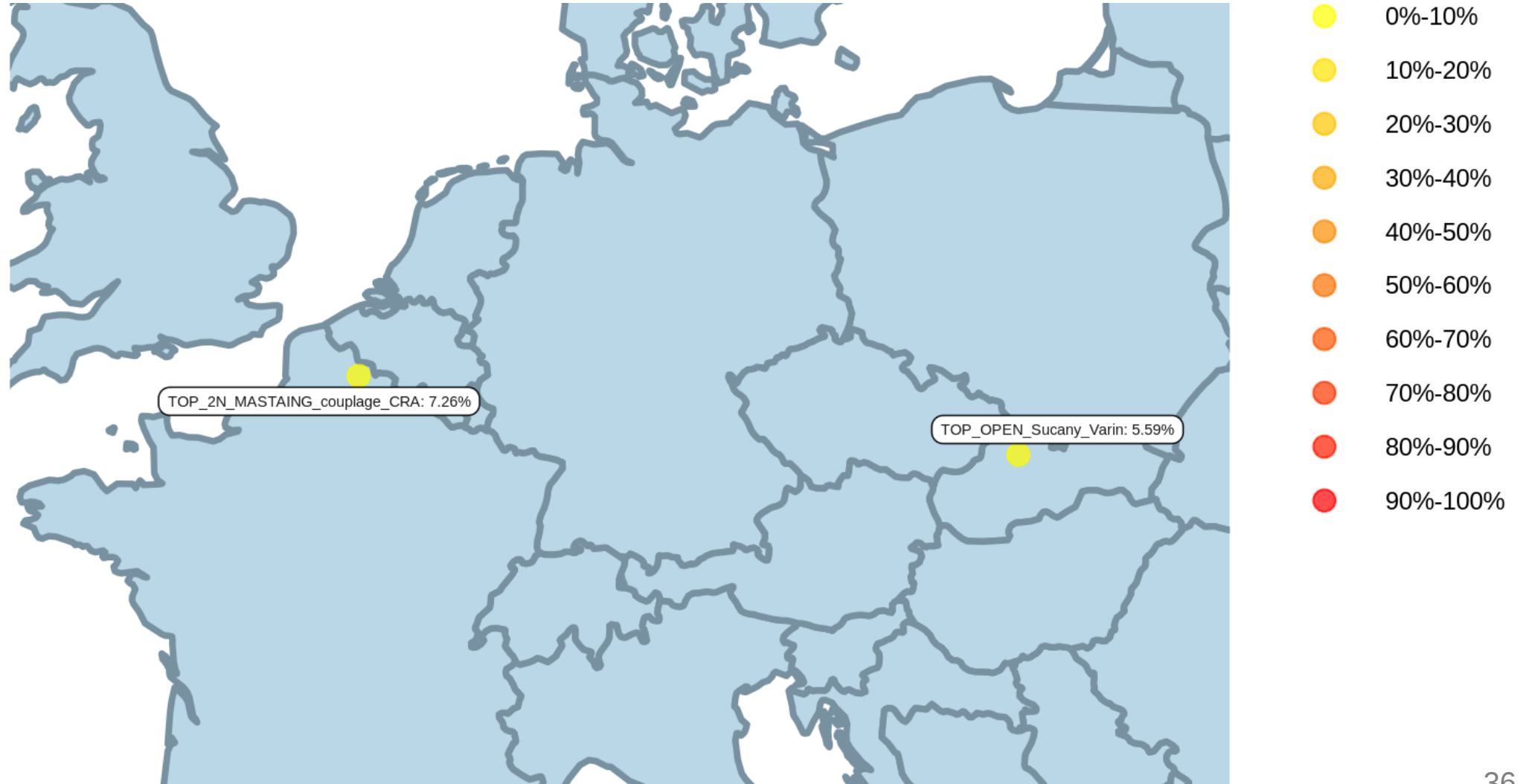
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

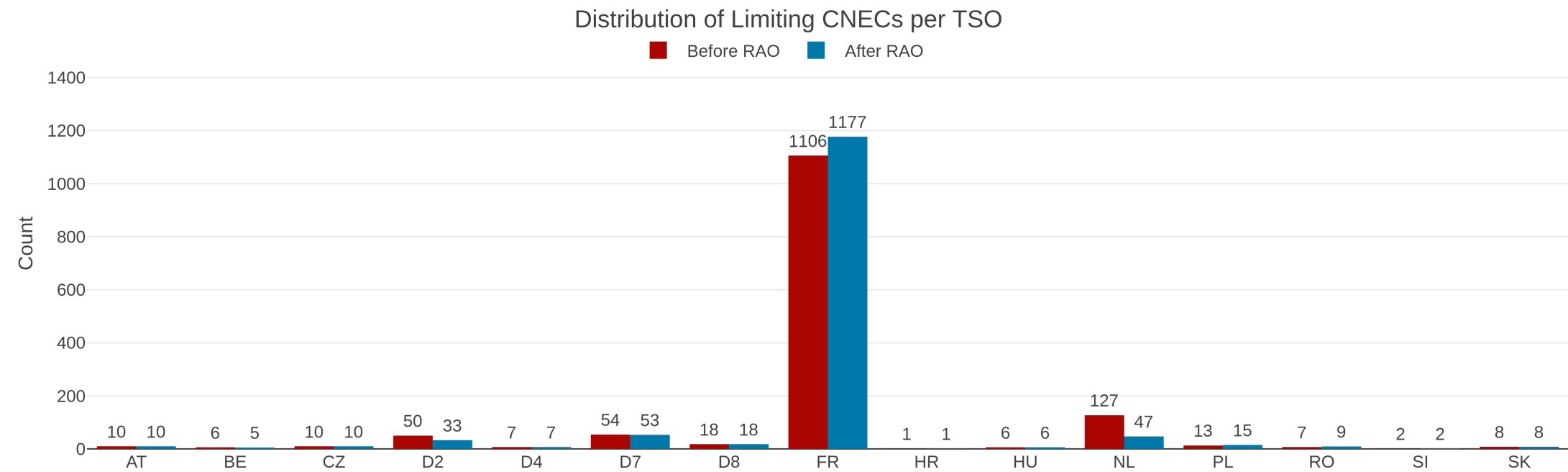
Relative Time Share of Applied Topological RAs in Curative Mode



KPI 9: Most limiting CNEC per TSO (NRAO)



The graph below shows the distribution of CNECs which are the most limiting from NRAO perspective, these are the CNECs with lowest relative RAM per MTU



As expected, there is redistributing of the most limiting CNECs. This is because the application of Remedial Actions does not eliminate flows but re-routes, reducing the flows on some limiting CNECs and increasing the load on others, which at the end impacts also the RAM values.

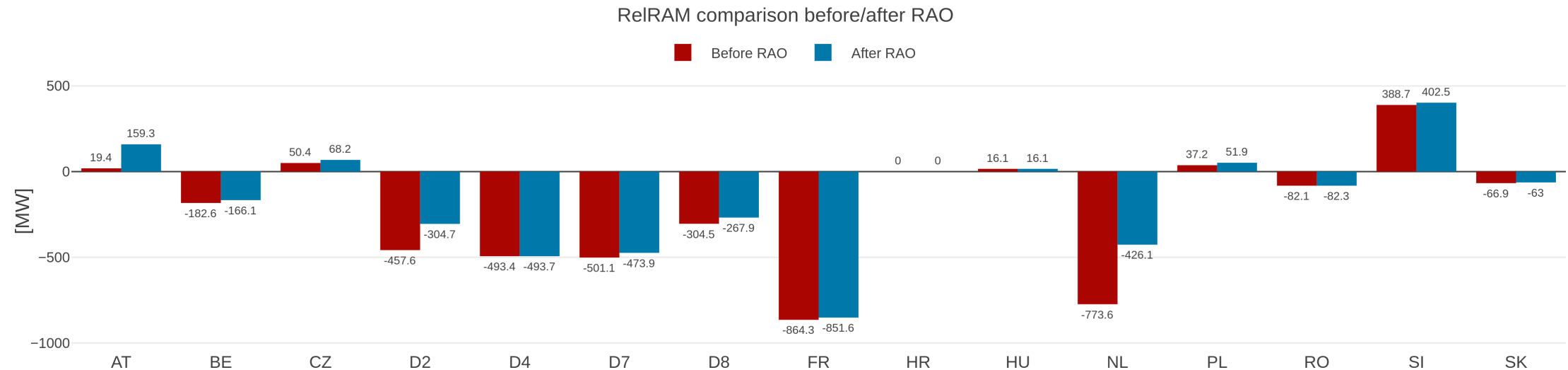
KPI 10: Average variation of relative RAM before and after NRAO



The graph shows average values of relative RAM before and after NRAO, per TSO on the most limiting CNECs from NRAO perspective. Selected CNECs before RAO are the same as after RAO, and average computed for MTUs when was used further in the process.

- Most limiting element from NRAO perspective is the one which has the lowest relative RAM per MTU
- To determine value of relative RAM, the following formula was used

$$RAM_{rel} = \begin{cases} \frac{RAM_{nrao}}{\sum_{(A,B) \in \text{neighbouring Core bidding zones pairs}} |PTDF_{A \rightarrow B, nrao}|}, & \text{if } RAM_{nrao} \geq 0 \\ RAM_{nrao}, & \text{if } RAM_{nrao} < 0 \end{cases}$$



KPI 11: Most often presolved CNEs (top 20)



CNE	Distinct hours CNE was presolved	Count of presolved CNECs	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max z2zPTDF	Max sum z2zPTDF
[HU-HU] Gonyu - Gyor [DIR]	743	1307	79.54%	50.79%	108.51%	0.263	1.3392
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	743	1888	59.82%	38.67%	77.42%	0.3262	1.1832
[CZ-SK] Nosovice - Varin [DIR] [CZ]	743	995	81.27%	56.20%	98.20%	0.3257	1.2825
[CZ-SK] Nosovice - Varin [OPP] [CZ]	743	757	97.20%	81.75%	123.74%	0.3257	1.2825
[CZ-SK] Nosovice - Varin [OPP] [SK]	743	1056	98.33%	81.39%	130.88%	0.3704	1.4142
[HU-HU] Gonyu - Gyor [OPP]	743	921	99.33%	67.75%	141.70%	0.263	1.3392
[SK-SK] Gabcikovo - P.Biskupice [DIR]	743	743	86.58%	73.86%	103.42%	0.29	1.0235
[SK-SK] V.Dur - Levice 1 [DIR]	743	743	52.15%	36.65%	67.48%	0.213	0.8386
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	743	1485	82.83%	60.69%	107.57%	0.176	0.9405
[CZ-SK] Nosovice - Varin [DIR] [SK]	743	1331	79.17%	47.91%	95.74%	0.3728	1.4146
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	740	1472	97.11%	72.41%	121.82%	0.176	0.9405
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	737	1415	114.08%	78.34%	170.05%	0.2668	0.6326
[SK-HU] Levice - God [DIR] [HU]	736	1370	65.09%	39.97%	82.61%	0.287	0.9395
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	735	743	54.67%	17.38%	93.58%	0.2668	0.6326
[RO-RO] Resita - Timisoara c1 [DIR]	732	732	37.96%	20.59%	79.41%	0.1252	0.1828
[AT-HU] Zurndorf - Gyoer 439B [DIR] [AT]	727	2207	80.22%	49.42%	105.34%	0.3586	1.5146
[SI-HU] Cirkovce - Heviz [OPP] [HU]	723	723	82.80%	62.12%	107.72%	0.2293	1.0726
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	722	906	80.87%	20.30%	138.60%	0.1698	0.6546
[BE-BE] Lixhe - Gramme 380.11 [OPP]	720	720	63.86%	51.16%	76.81%	0.1495	0.3629
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	719	719	56.02%	19.93%	97.86%	0.2993	1.2536

Note 1: The shown z2zPTDF values do not correspond to the maximum zone-to-zone PTDFs according to equation 5 of the Day-ahead CCM and hence are not the ones used for the CNEC Selection. The z2zPTDFs are calculated only between neighbouring BZs. See KPI reading guide on JAO.

Note 2: RAM for Core exchanges can be higher than 100% due to the relieving effect of Fuaf: $RAM_Core = CEP_target - Fuaf$. So if Fuaf is very negative you can get above 100%.

KPI 12: Most limiting CNEs (top 20)



CNE	Distinct hours CNE has shadow price	Count of hours CNECs have shadow price	Max shadow price [€/MW]	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max z2zPTDF
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	415	415	887.31	20.06%	19.98%	27.06%	0.1742
[SK-HU] Levice - God [DIR] [HU]	130	131	730.36	58.72%	39.97%	73.52%	0.2735
[CZ-SK] Nosovice - Varin [DIR] [SK]	106	106	356.95	67.43%	47.91%	85.21%	0.3728
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	105	108	344.68	57.52%	44.73%	62.70%	0.3242
[RO-RO] Resita - Timisoara c1 [DIR]	87	87	1492	38.12%	20.59%	69.79%	0.1251
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	75	75	922.4	72.84%	20.30%	102.33%	0.1669
[NL-NL] MEE DRT2 [DIR] [NL]	71	71	574.36	23.28%	19.96%	51.43%	0.2321
[AT-AT] Zell am Ziller 1 - Zell am Ziller 2 ZZRHU41 [DIR]	55	55	19.99	37.35%	19.75%	61.17%	0.2456
[NL-NL] Maasbracht-Eindhoven 380 W [OPP]	55	57	164.94	82.51%	49.56%	120.78%	0.4698
[NL-BE] PST Zandvliet 4 [DIR] [BE]	49	49	148.54	75.54%	58.12%	110.48%	0.5292
[FR-D7] Vigy - Enseldorf VIGY2 S [DIR] [D7]	43	43	782.75	22.25%	19.90%	38.69%	0.2388
[RO-RO] TR Rosiori 400/220 1 [DIR]	36	36	727.65	48.10%	36.67%	62.08%	0.0989
[FR-FR] Avelin - Mastaing 1 [OPP]	35	35	300.47	46.97%	35.30%	60.93%	0.2618
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	35	35	358.5	48.95%	19.93%	57.86%	0.2969
[NL-NL] Krimpen a/d IJssel-Geertruidenberg 380 W [DIR]	34	34	365.39	49.35%	19.95%	123.05%	0.5318
[BE-BE] Doel - Zandvliet 380.25 [OPP]	32	32	138.76	75.38%	57.12%	99.48%	0.3706
[RO-RS] Portile de Fier - Djerdap [OPP] [RO]	31	31	694.88	36.47%	20.13%	76.49%	0.3224
[SK-SK] V.Dur - Levice 1 [DIR]	28	28	140.27	48.42%	39.59%	57.42%	0.2066
[D8-PL] Mikulowa PST1 [DIR] [PL]	24	24	370.47	50.53%	25.38%	57.65%	0.2625
[D8-D8] Vierraden - Vierraden PST441 [DIR]	23	23	399.09	47.37%	24.96%	57.36%	0.2666

Note 1: The RAM values (expressed as % of Fmax) should not be interpreted as "the capacities offered by the Core TSOs to the market coupling". Indeed, since the introduction of Ext LTA inclusion Euphemia performs an optimization where it takes a portion of the FB domain and a portion of the LTA domain to maximize welfare. The RAM value shown in this KPI report correspond to the "portion of the FB domain" resulting from this optimization

Example:

- RAM = 500MW
- Portion of FB Domain = 40%
- RAM offered by Core TSOs = 500MW/0.4 = 1250MW

KPI 13 : Allocation Constraints - Poland



	# MTUs
AC was limiting MC	170
AC < 0 MW	57
AC = 0 MW	83
AC > 0 MW	30

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-1426.51	4623.97
Min.	-10677.00	0.00
Max.	0.00	15834.00

