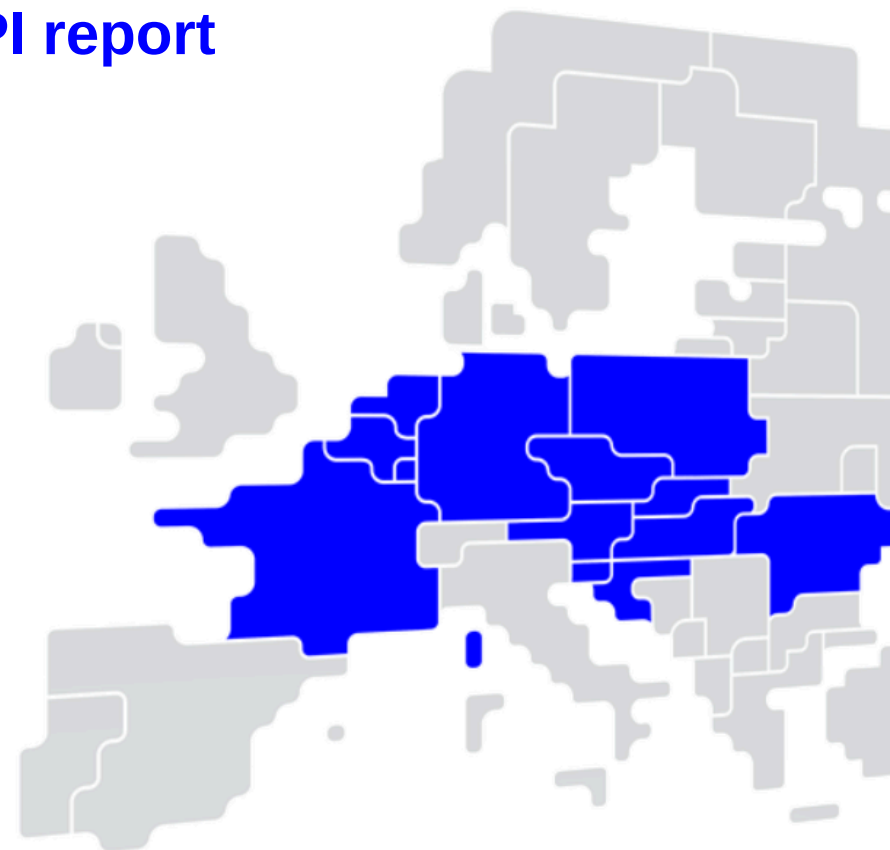




Core FB MC Operational KPI report

March 2026



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

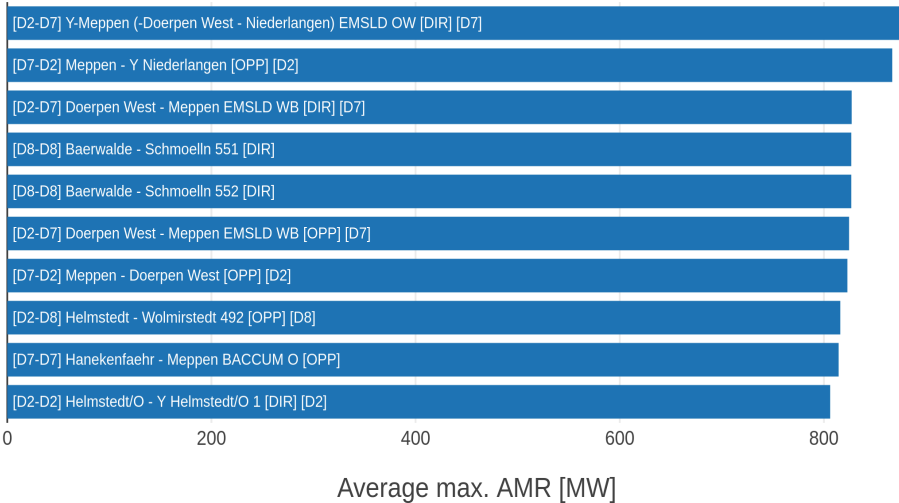
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

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)
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	873.88	35.04%	23.49%
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	866.96	43.32%	32.77%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	827.21	33.17%	22.36%
[D8-D8] Baerwalde - Schmoelln 552 [DIR]	826.79	33.15%	33.15%
[D8-D8] Baerwalde - Schmoelln 551 [DIR]	826.79	33.15%	33.15%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	824.65	33.07%	21.72%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	822.99	41.12%	31.44%
[D2-D8] Helmstedt - Wolmirstedt 492 [OPP] [D8]	816.04	32.72%	17.44%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	814.40	33.47%	23.02%
[D2-D2] Helmstedt/O - Y Helmstedt/O 1 [DIR] [D2]	806.14	28.98%	12.56%

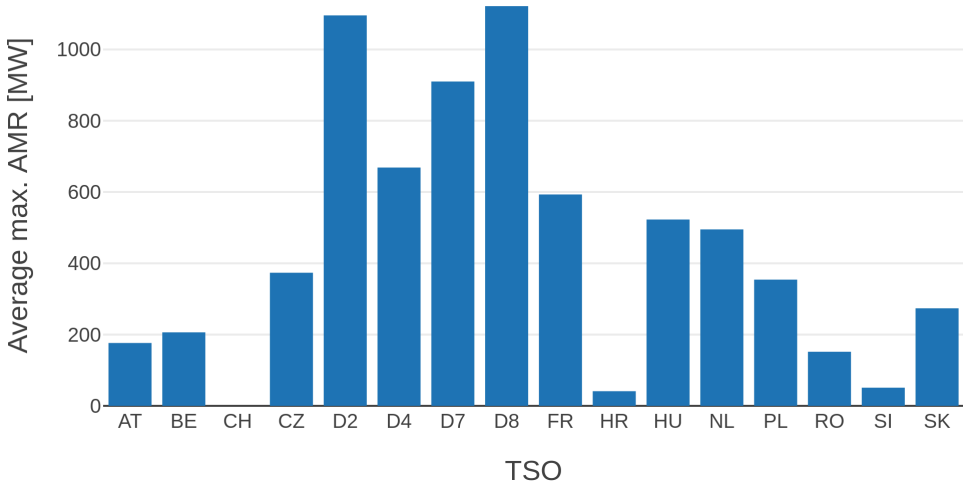


KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	176.47
BE	206.35
CH	0.00
CZ	373.34
D2	1095.37
D4	668.47
D7	910.11
D8	1121.52
FR	593.28
HR	41.14

TSO	Average maximum AMR per TSO
HU	522.82
NL	495.11
PL	354.18
RO	151.97
SI	50.85
SK	273.62



KPI 3: Share of MTUs with intervention per TSO



Total BDs
31

Total MTUs
743

MTUs without IVA
29

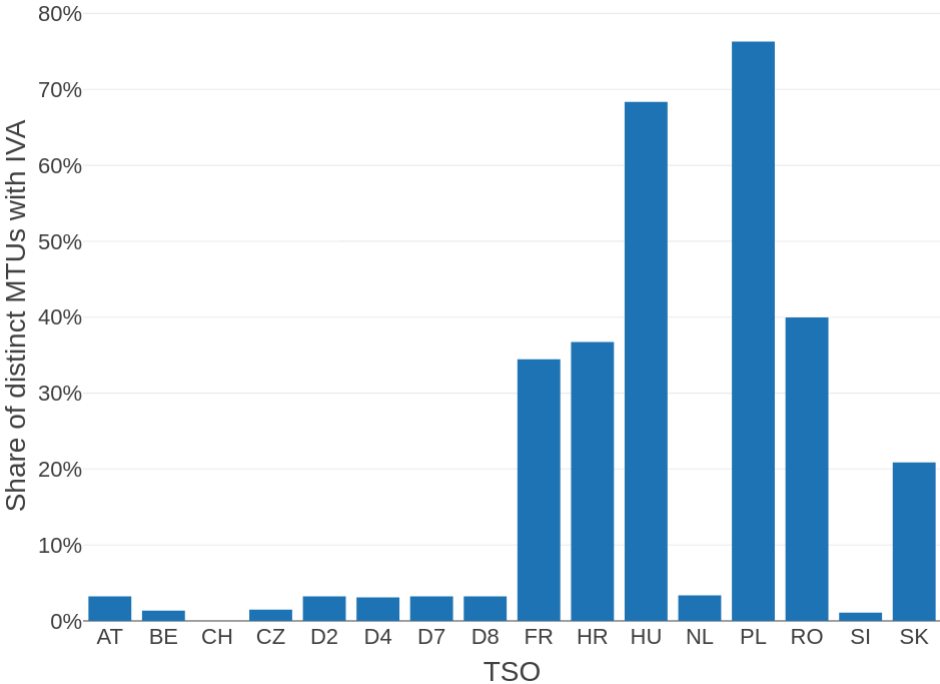
Share of distinct MTUs without IVA
3.9%

MTUs with IVA
714

Share of distinct MTUs with IVA
96.1%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	3.23%	24
BE	1.35%	10
CH	0.00%	0
CZ	1.48%	11
D2	3.23%	24
D4	3.10%	23
D7	3.23%	24
D8	3.23%	24
FR	34.45%	256
HR	36.74%	273

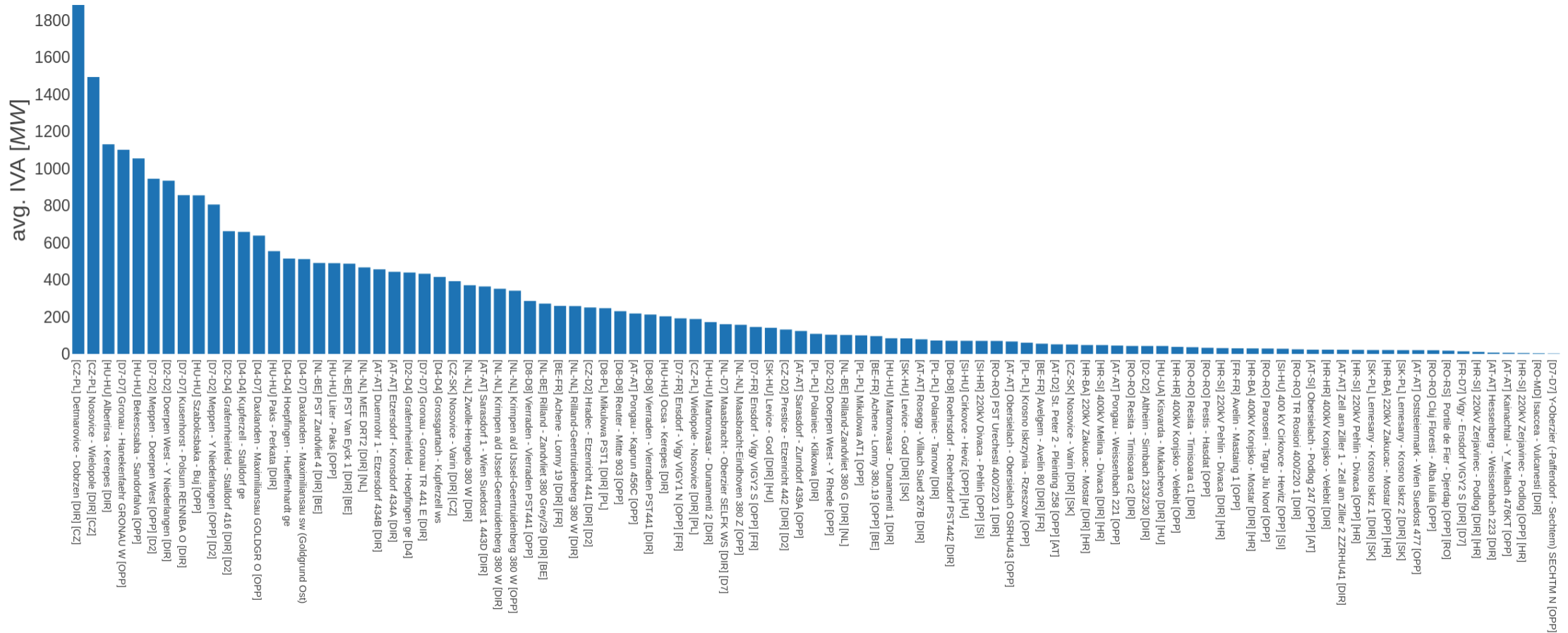
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
HU	68.37%	508
NL	3.36%	25
PL	76.31%	567
RO	39.97%	297
SI	1.08%	8
SK	20.86%	155



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



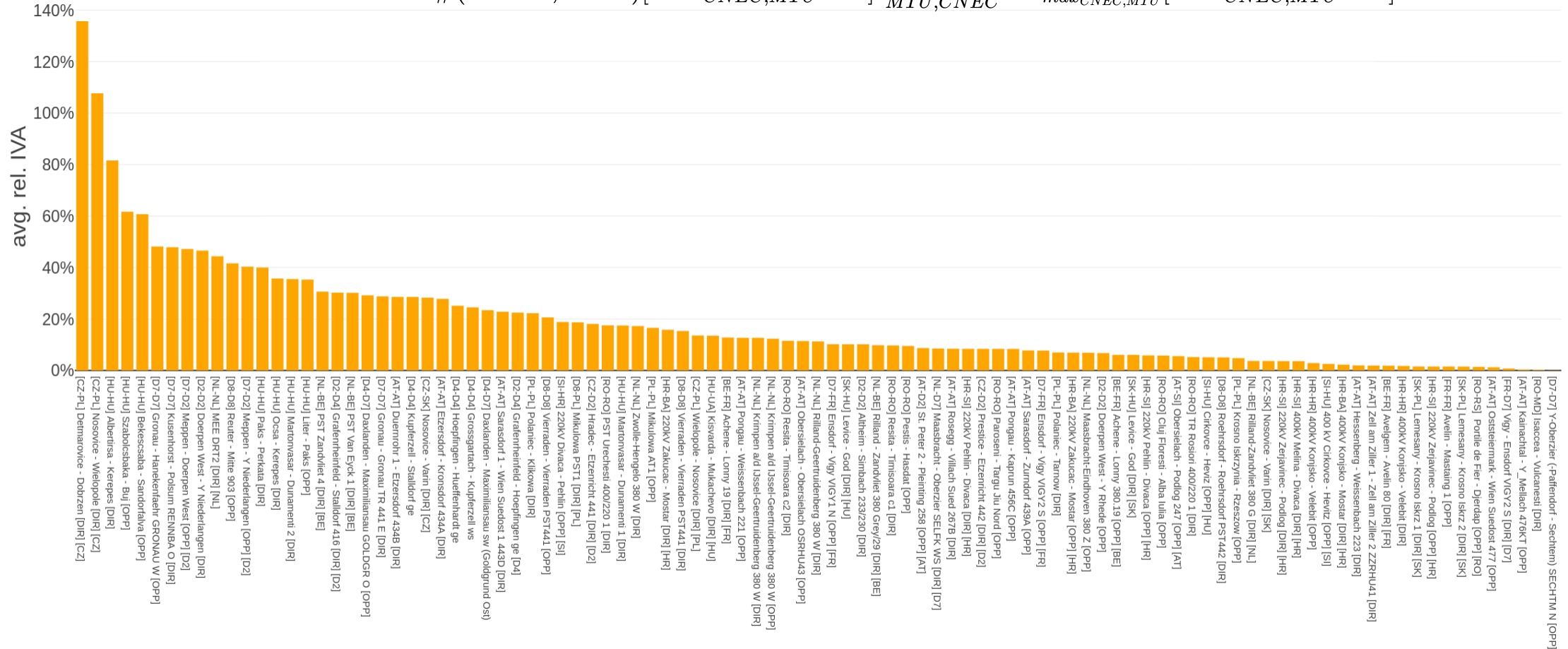
$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]$$



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



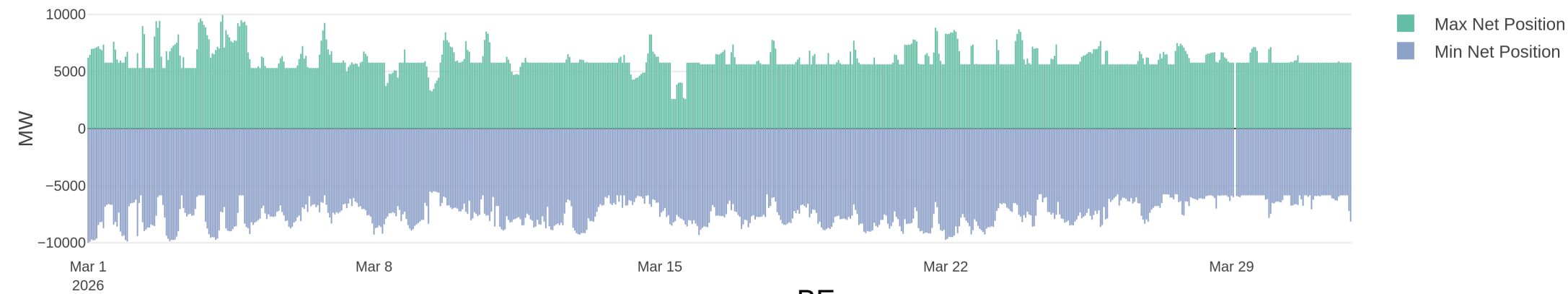
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{maxCNEC, MTU}[IVA_{CNEC, MTU} > 0]}$$



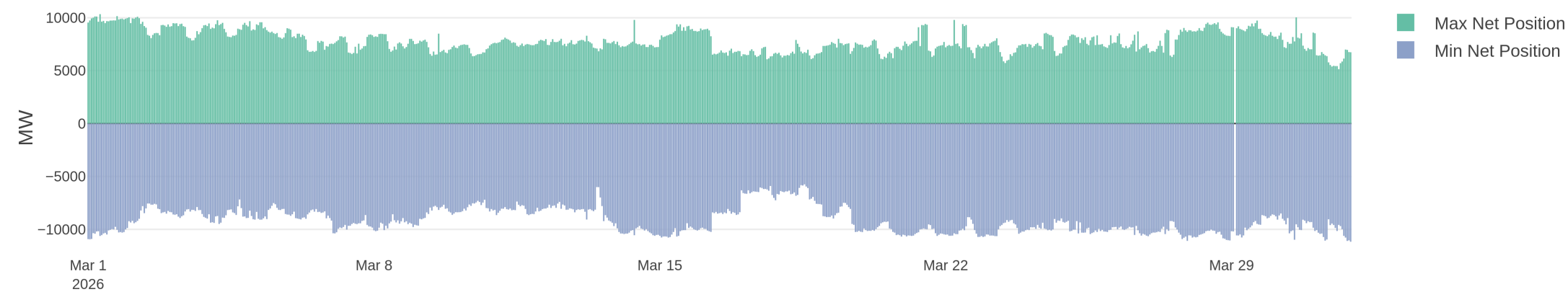
KPI 5: Min & max net positions per BZ hub



AT



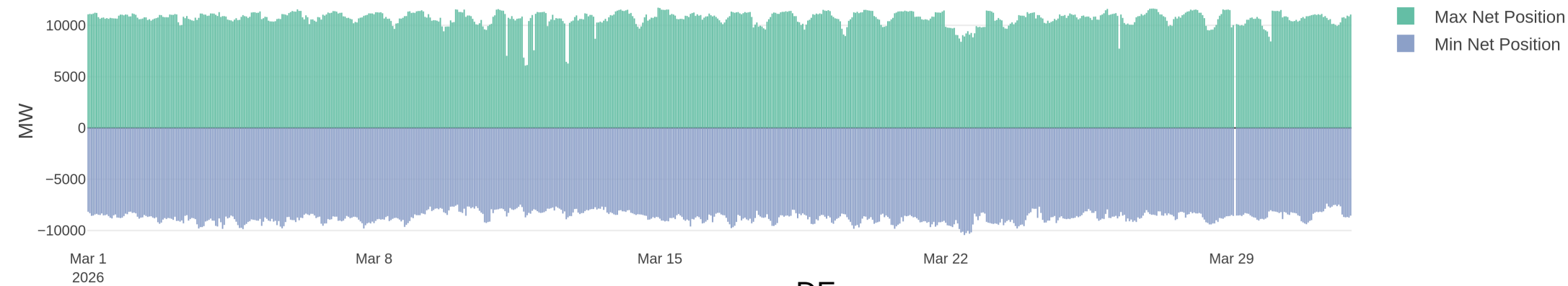
BE



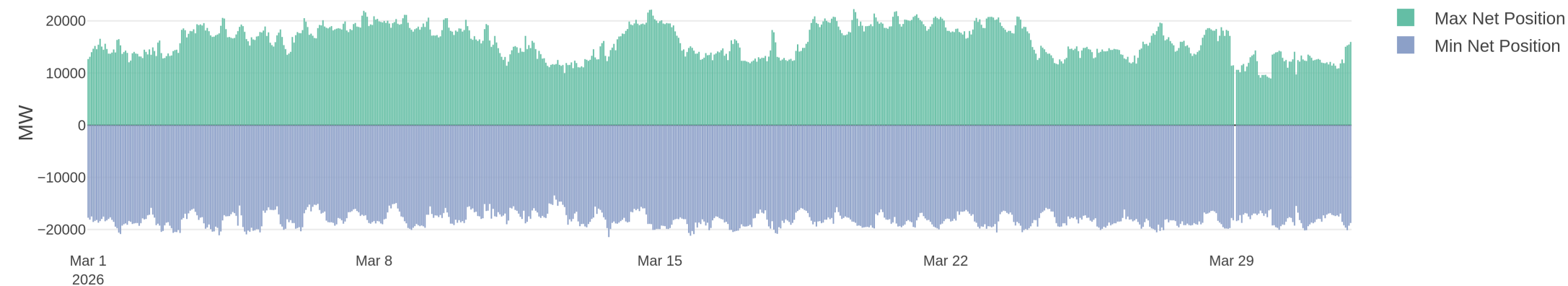
KPI 5: Min & max net positions per BZ hub



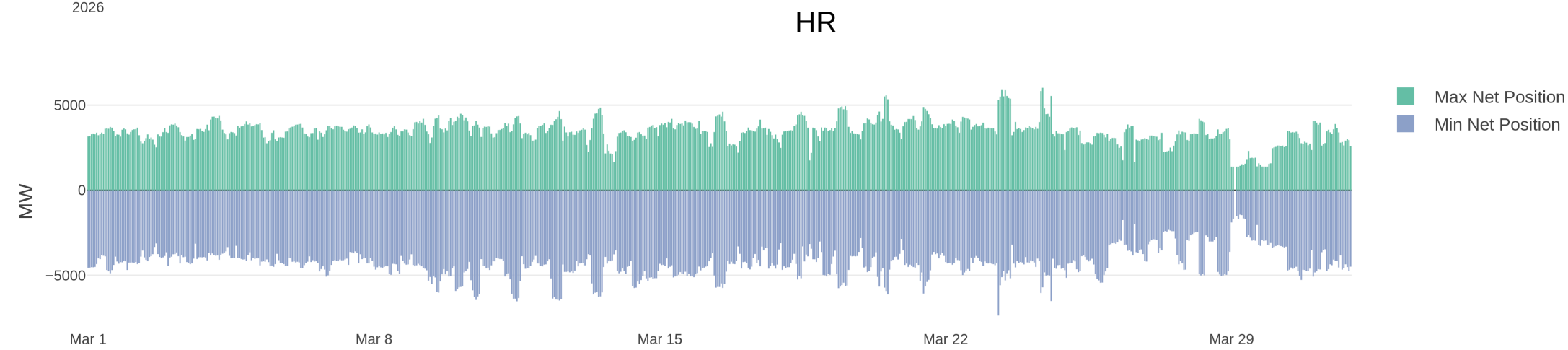
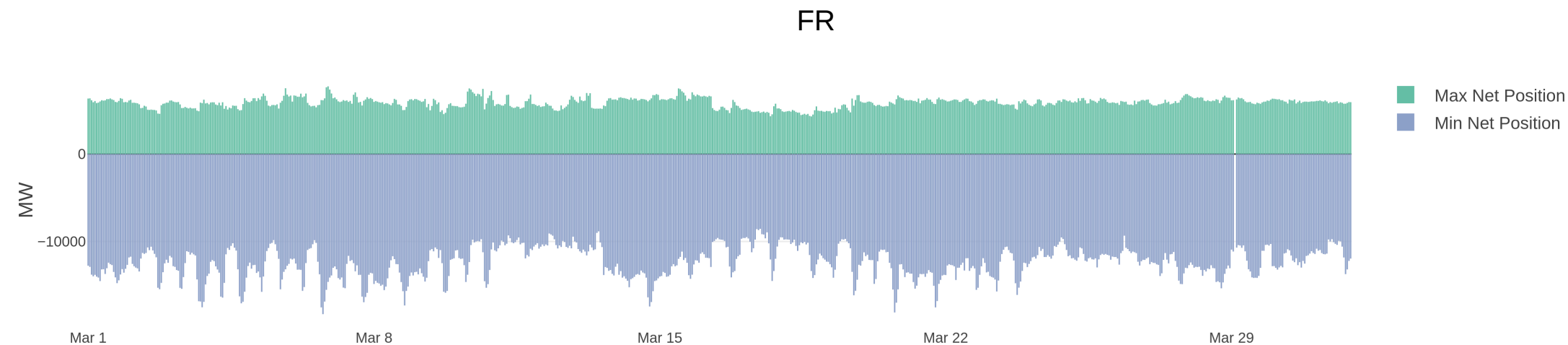
CZ



DE



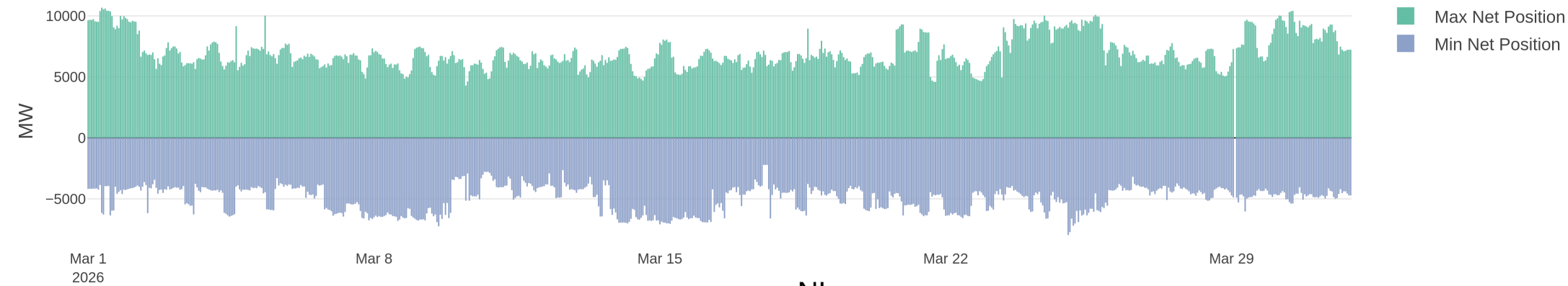
KPI 5: Min & max net positions per BZ hub



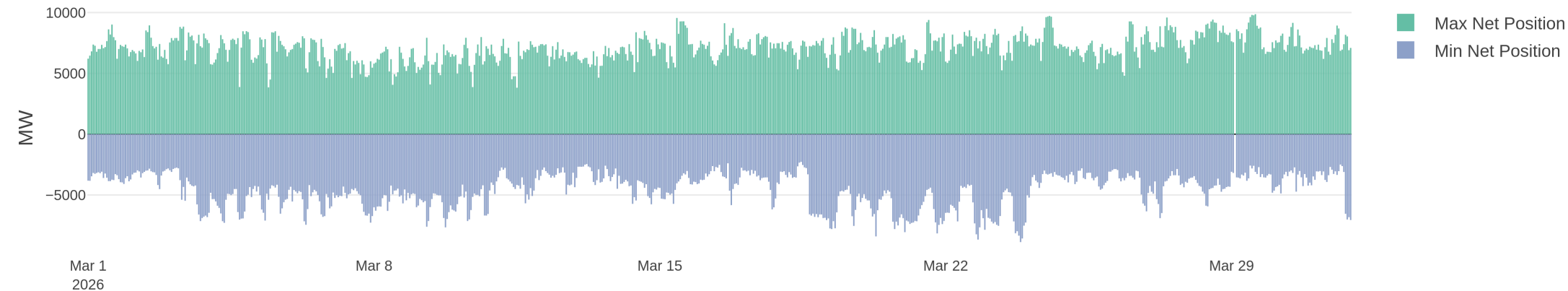
KPI 5: Min & max net positions per BZ hub



HU



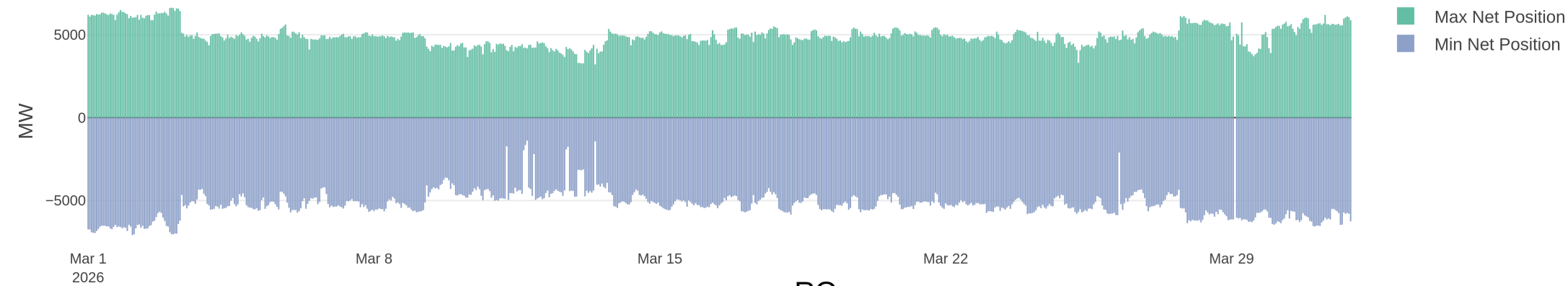
NL



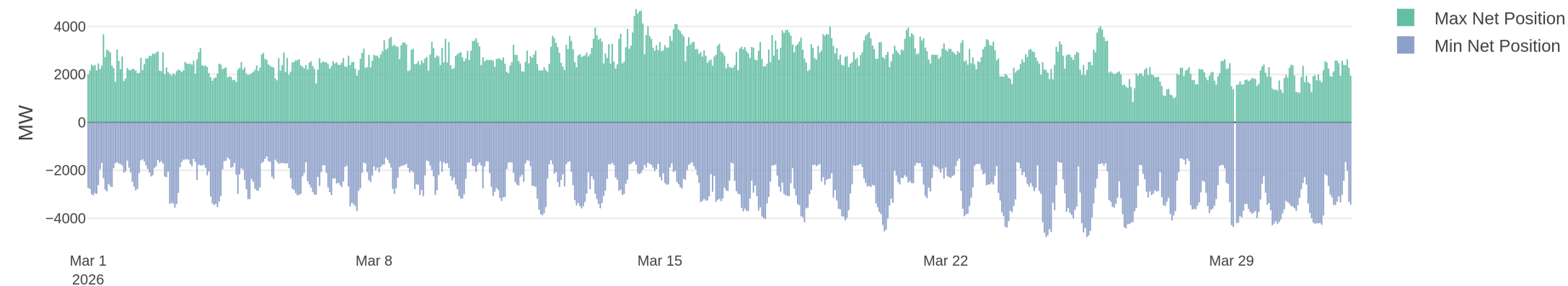
KPI 5: Min & max net positions per BZ hub



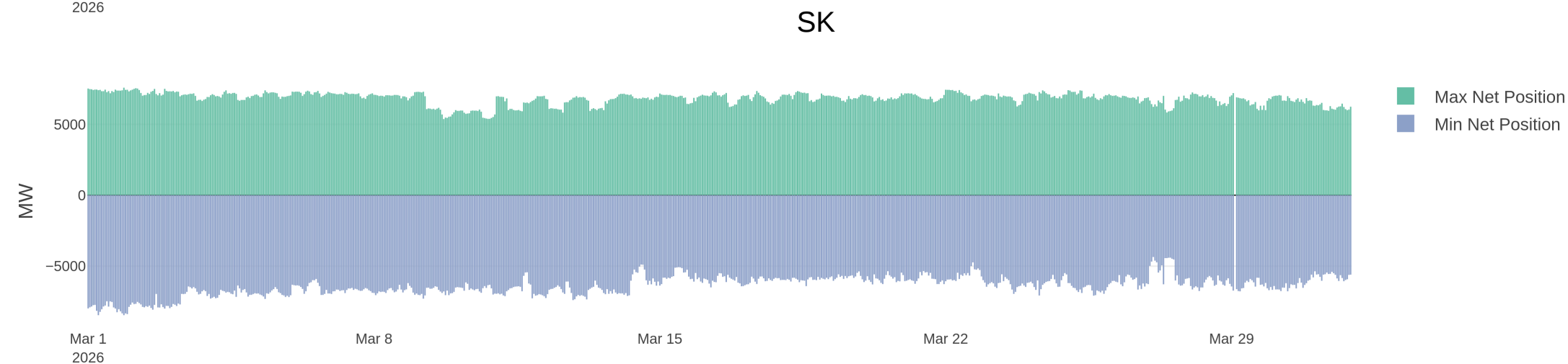
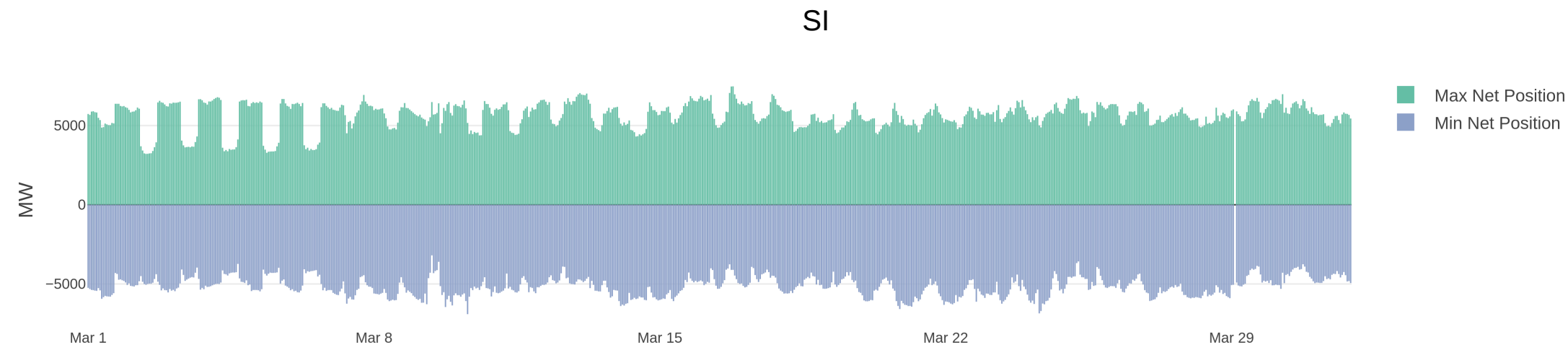
PL



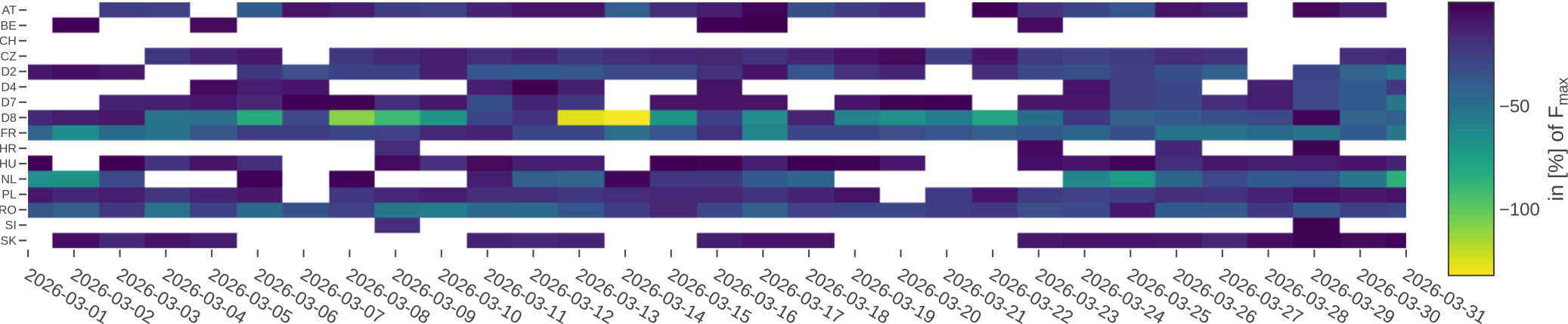
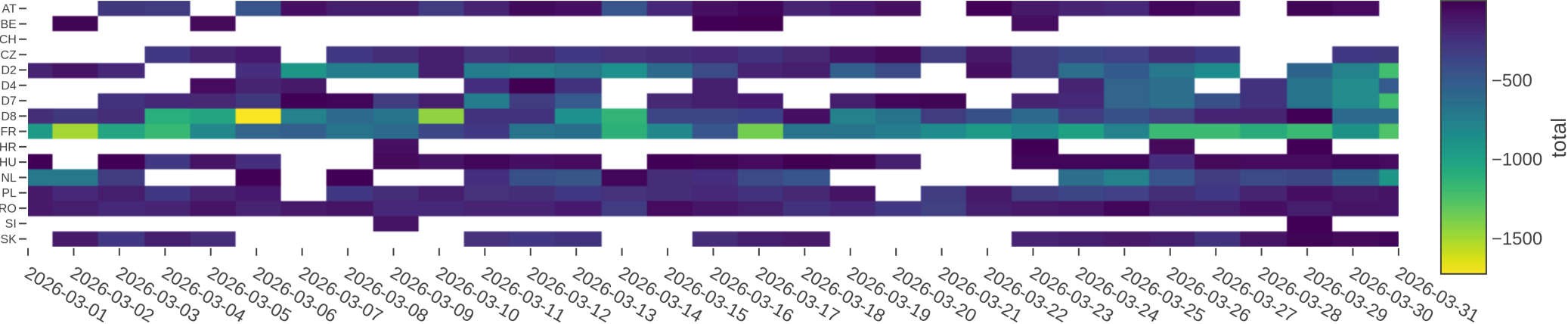
RO



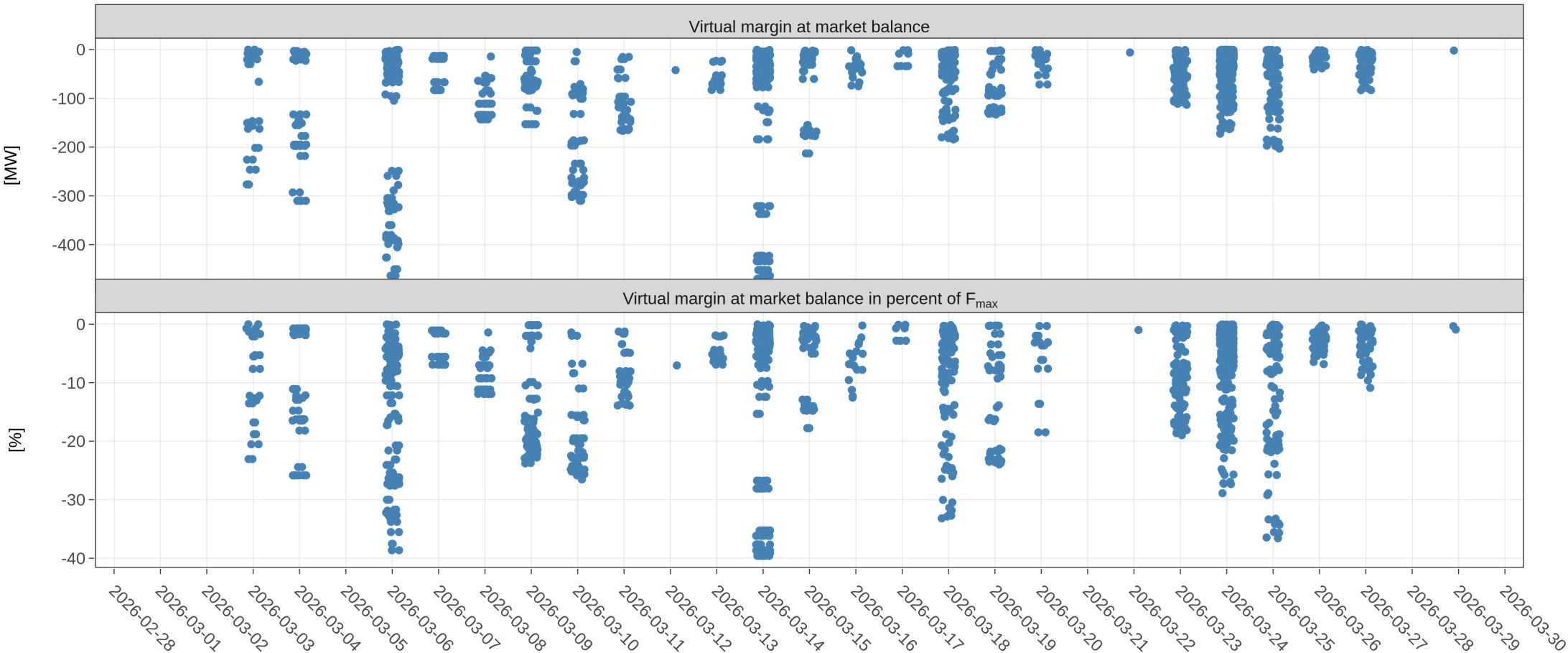
KPI 5: Min & max net positions per BZ hub



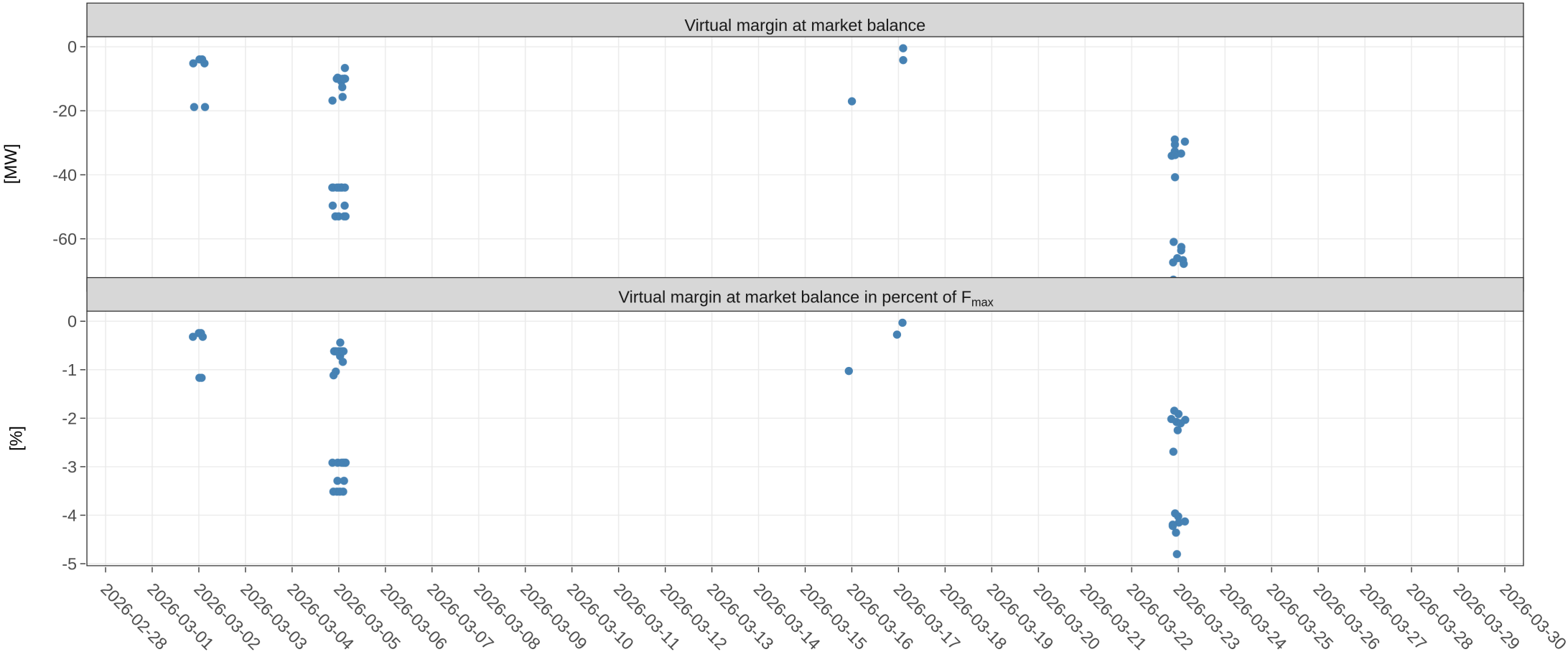
KPI 6a: Highest virtual margins at market balance for CORE TSOs



KPI 6b: Virtual margins at market balance AT



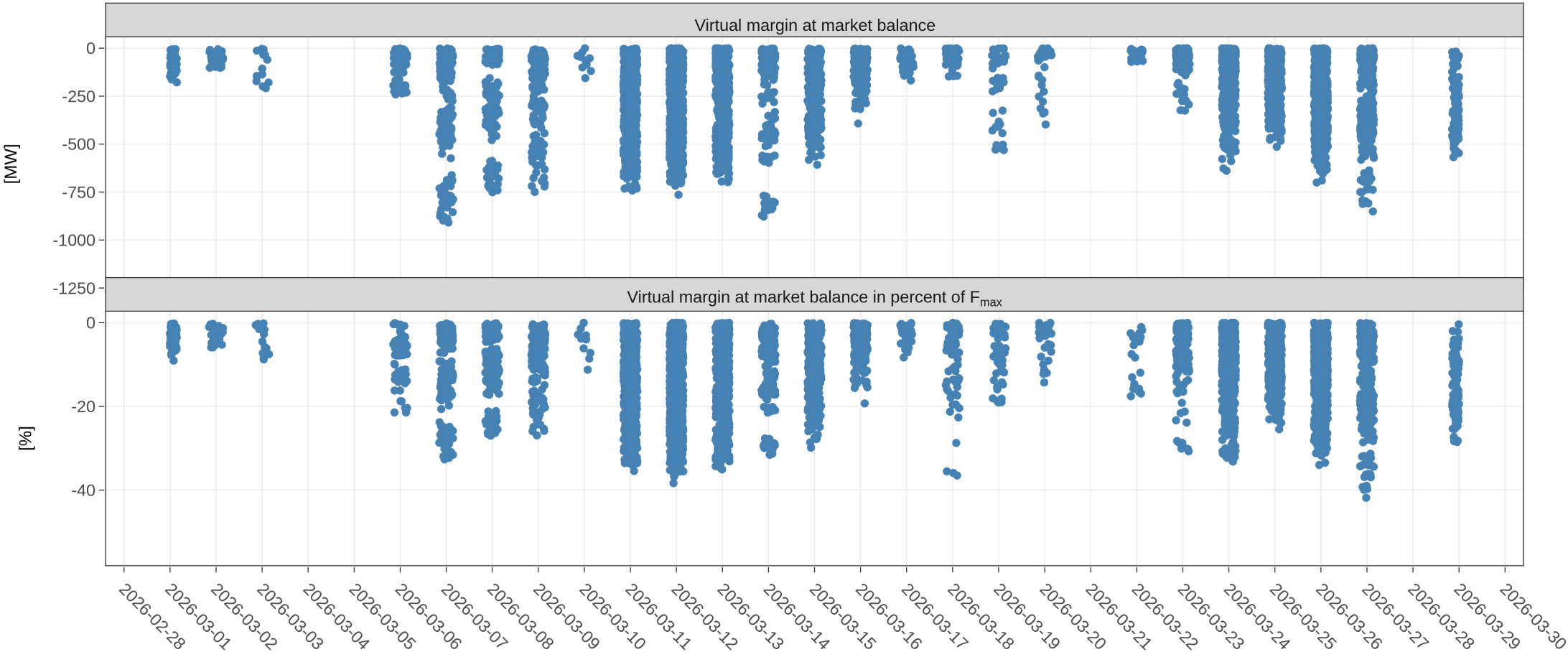
KPI 6b: Virtual margins at market balance BE



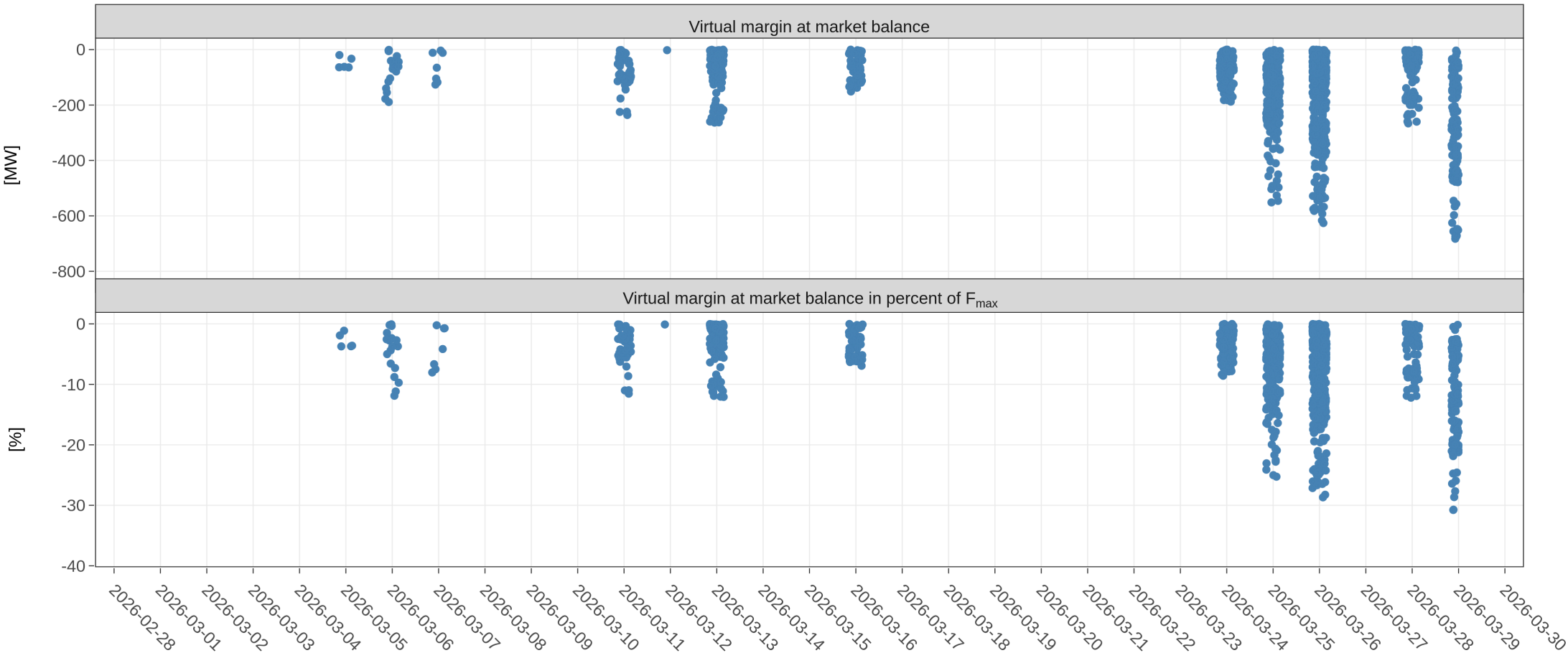
KPI 6b: Virtual margins at market balance CZ



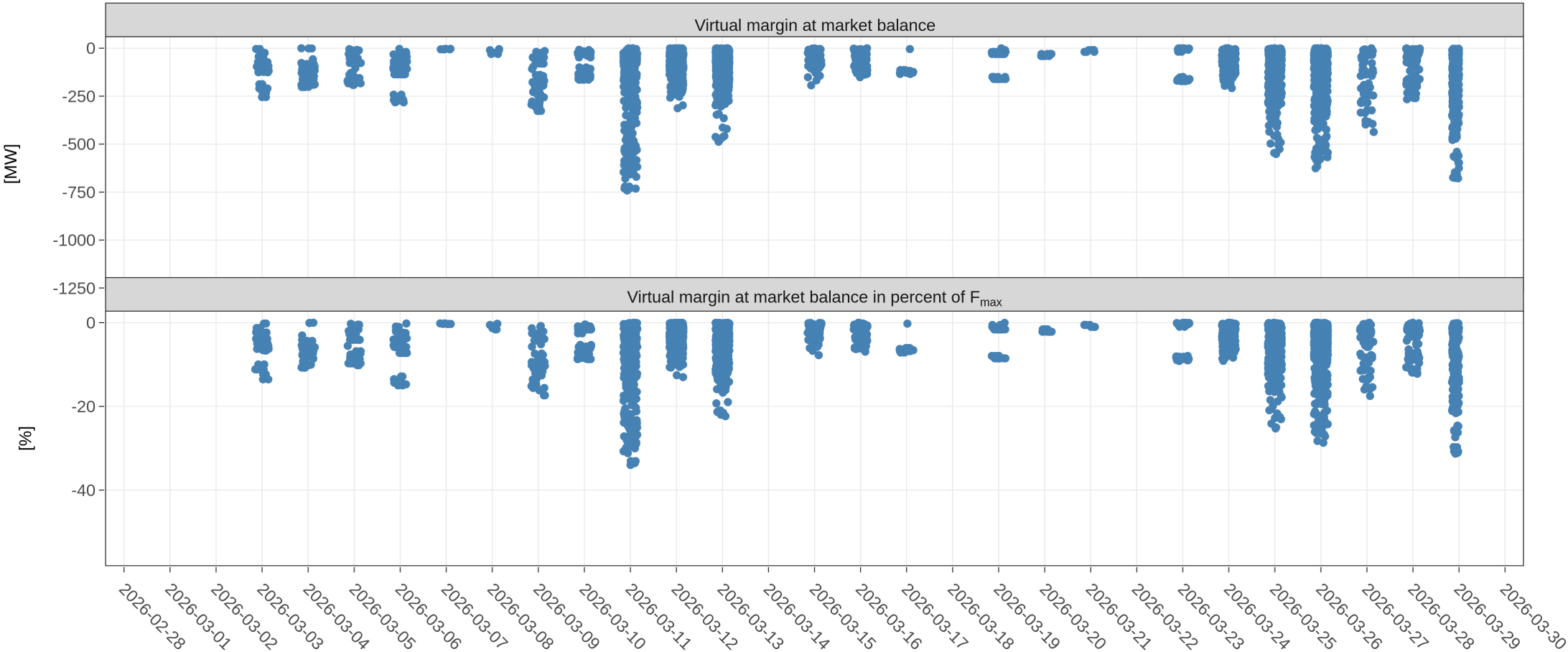
KPI 6b: Virtual margins at market balance D2



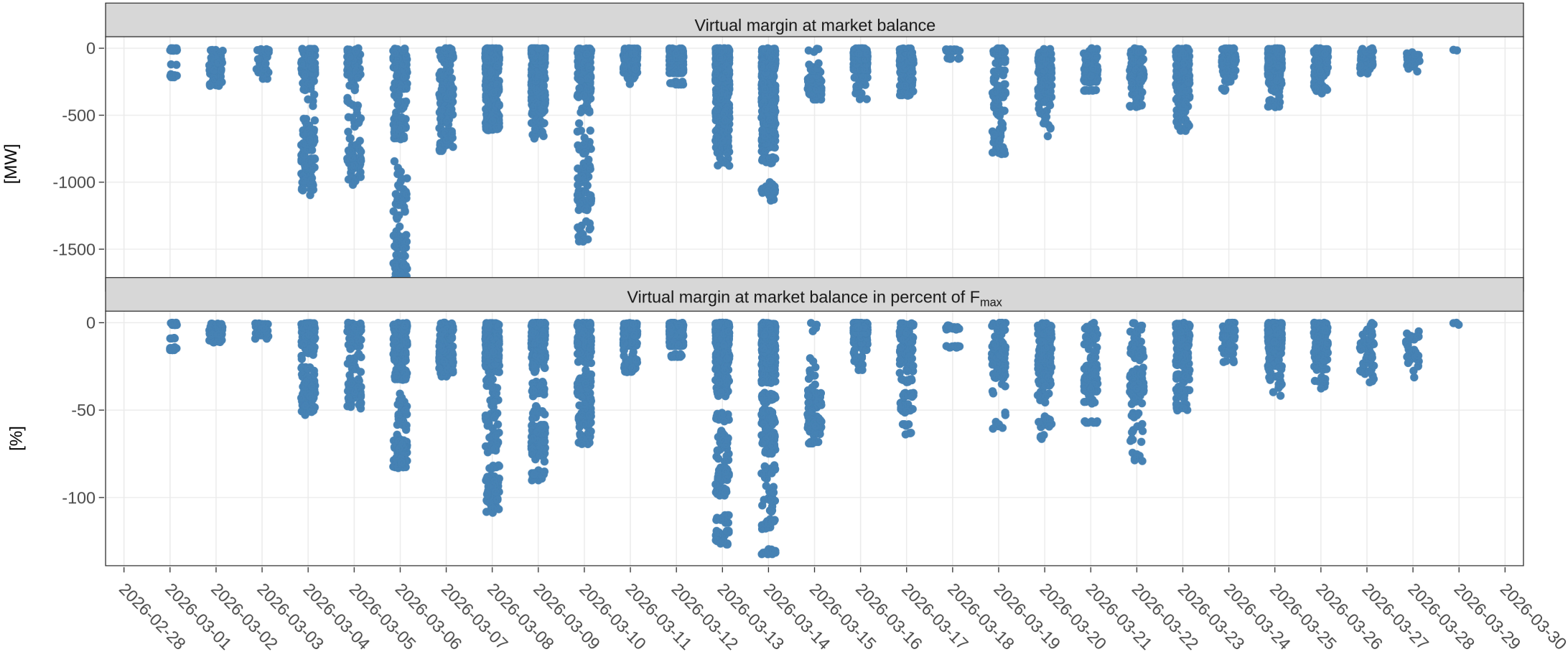
KPI 6b: Virtual margins at market balance D4



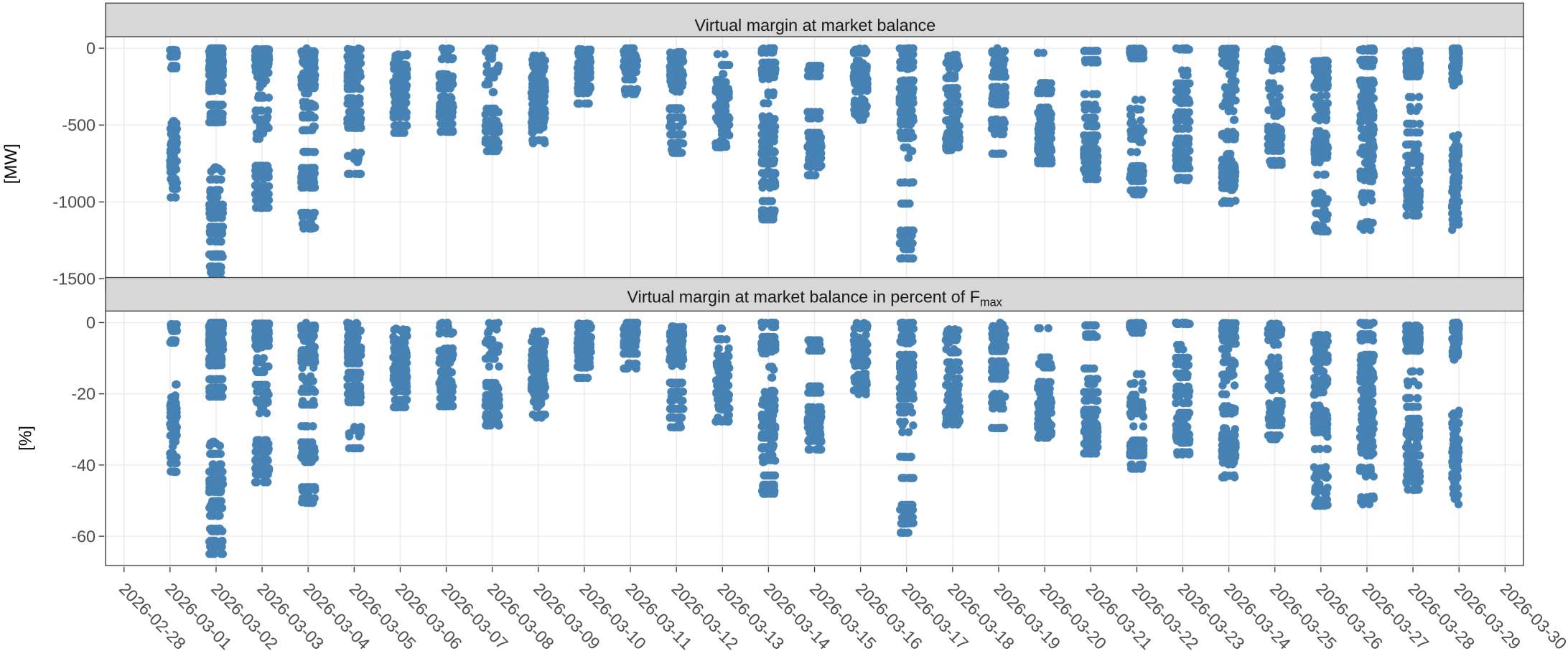
KPI 6b: Virtual margins at market balance D7



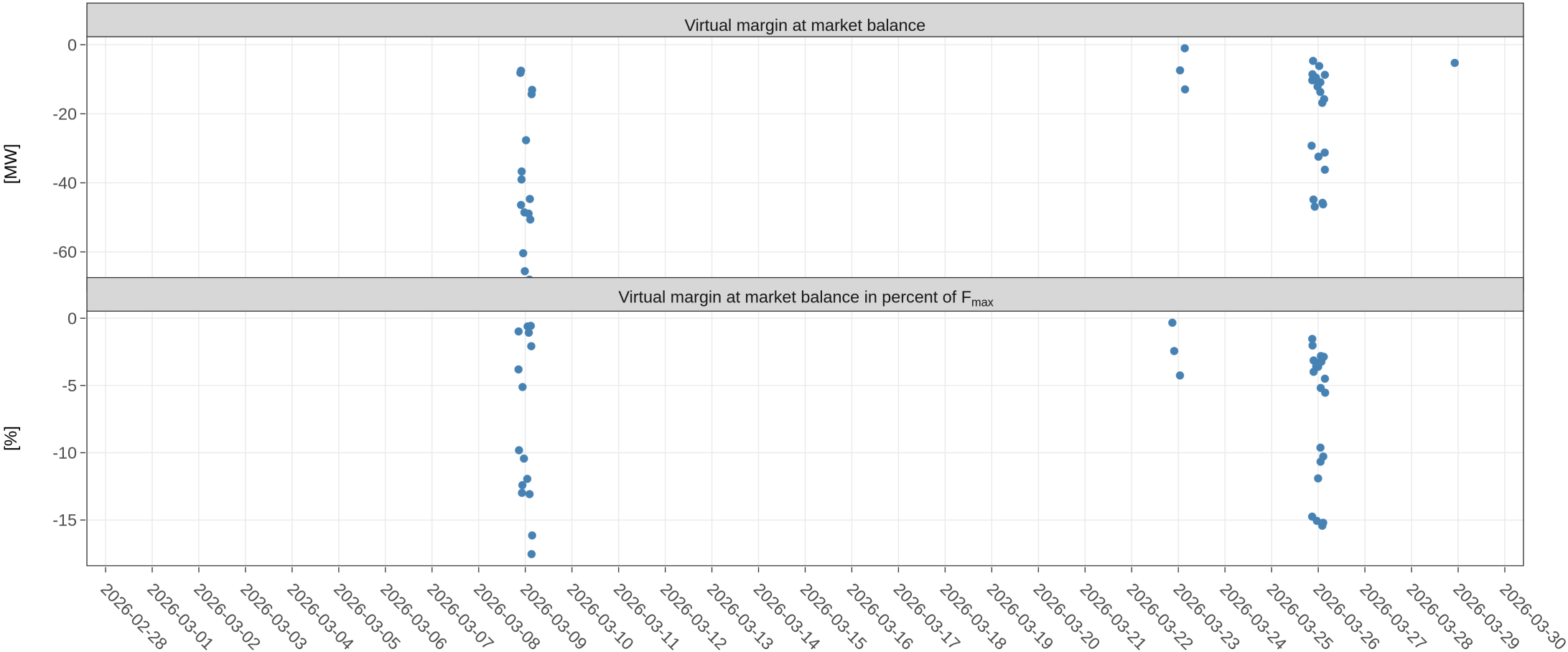
KPI 6b: Virtual margins at market balance D8



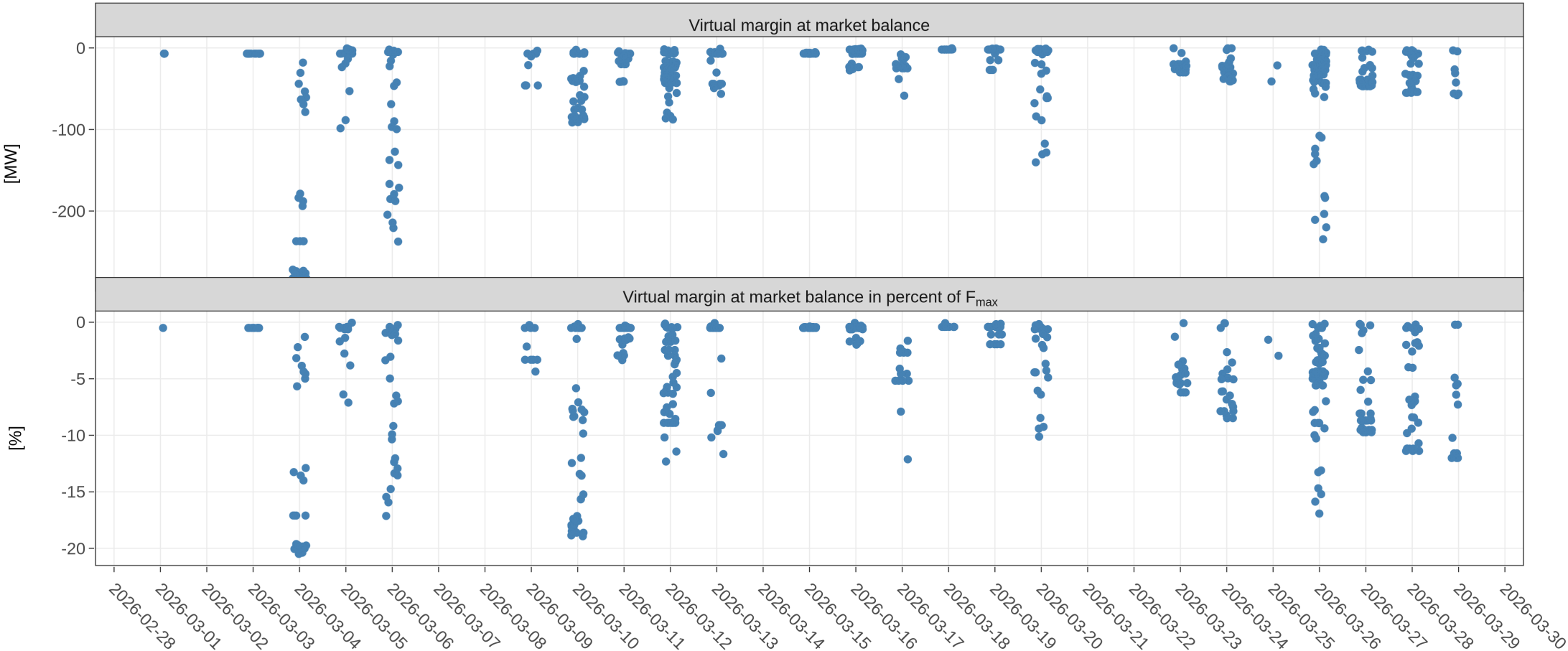
KPI 6b: Virtual margins at market balance FR



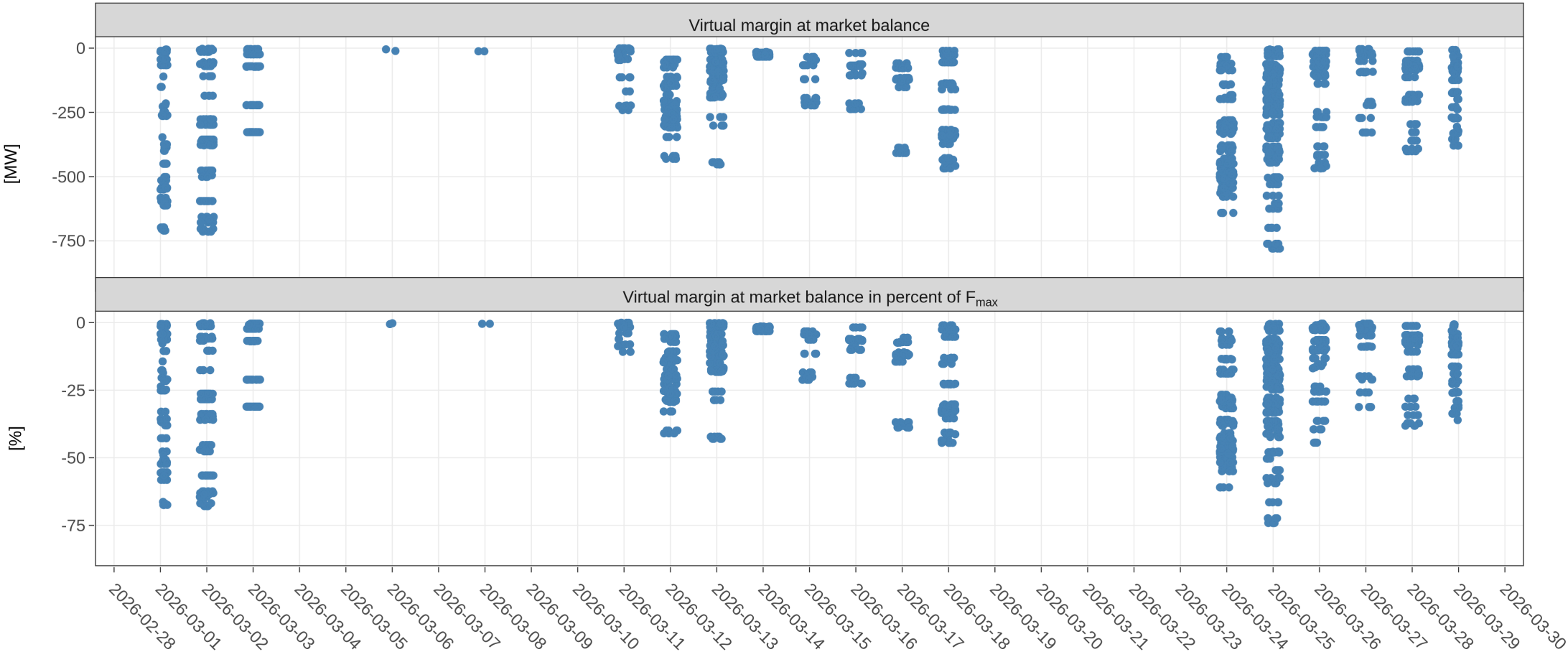
KPI 6b: Virtual margins at market balance HR



KPI 6b: Virtual margins at market balance HU



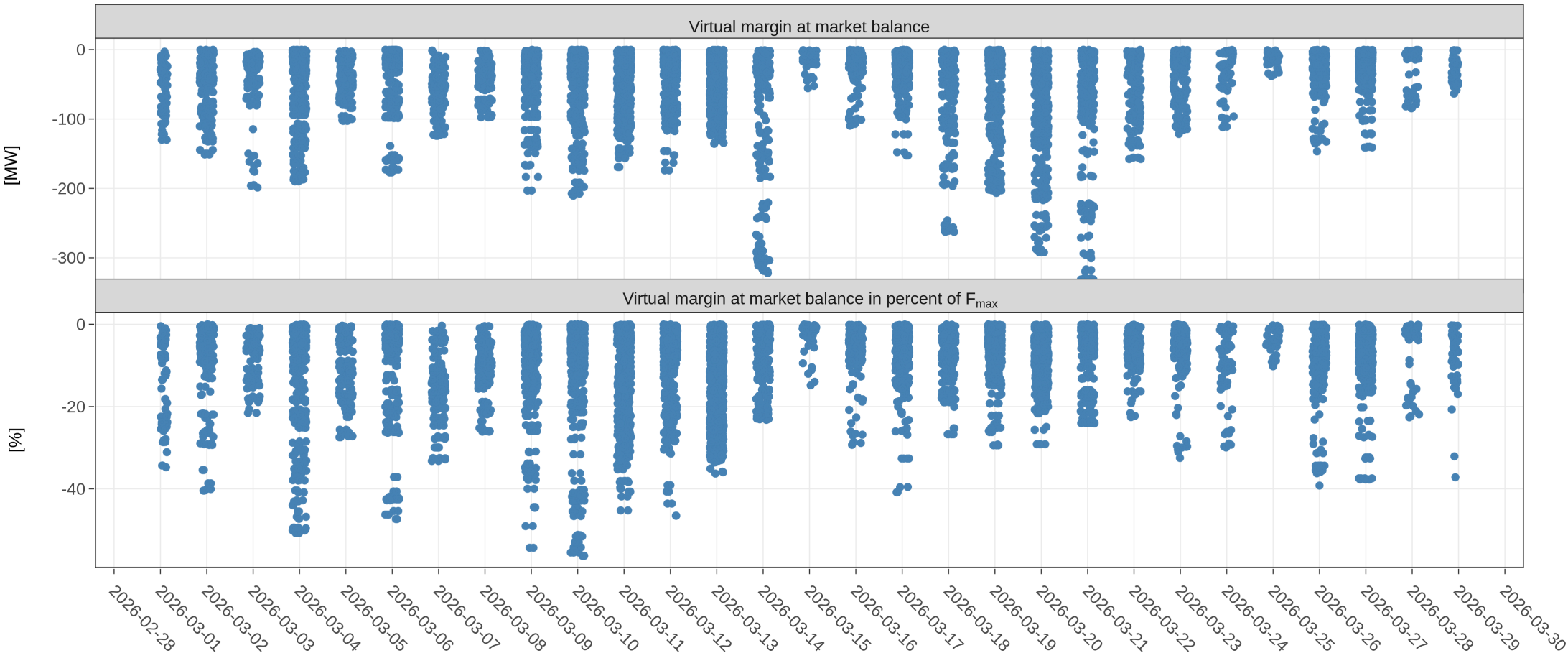
KPI 6b: Virtual margins at market balance NL



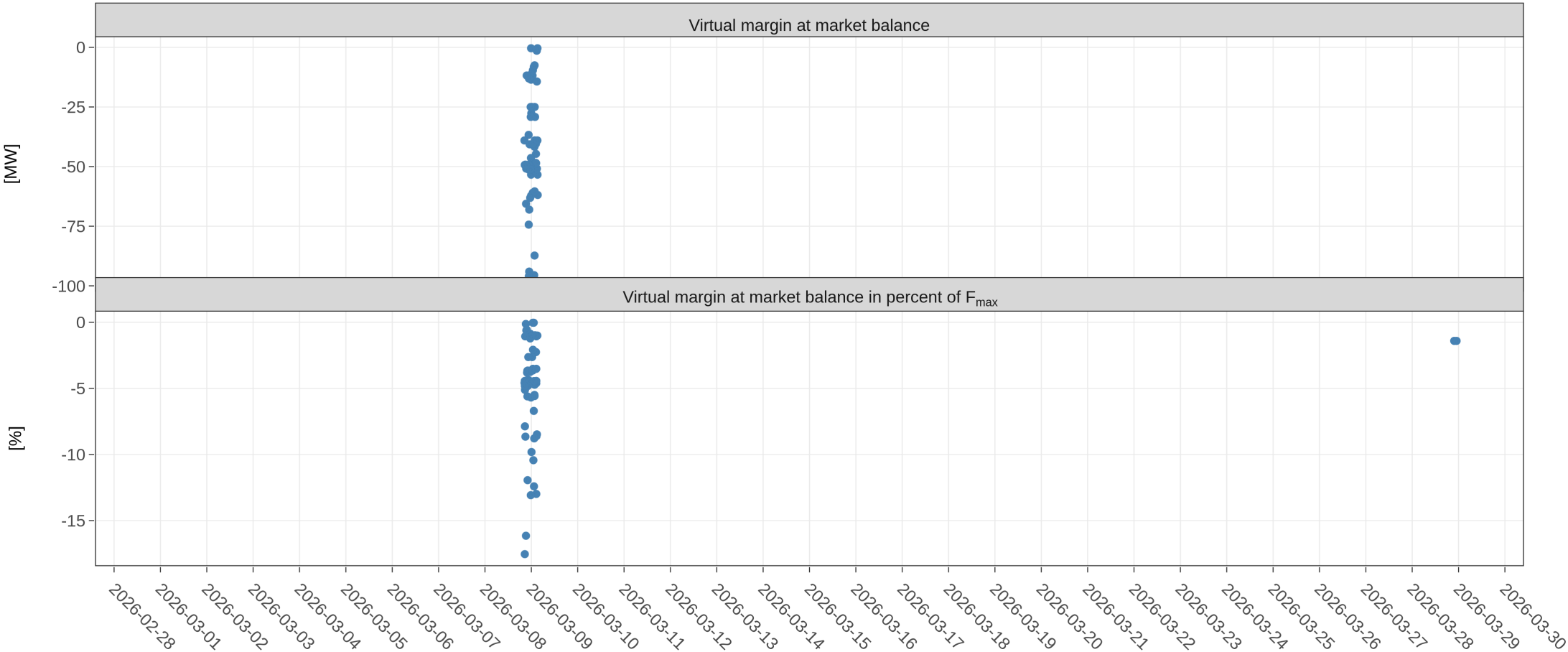
KPI 6b: Virtual margins at market balance PL



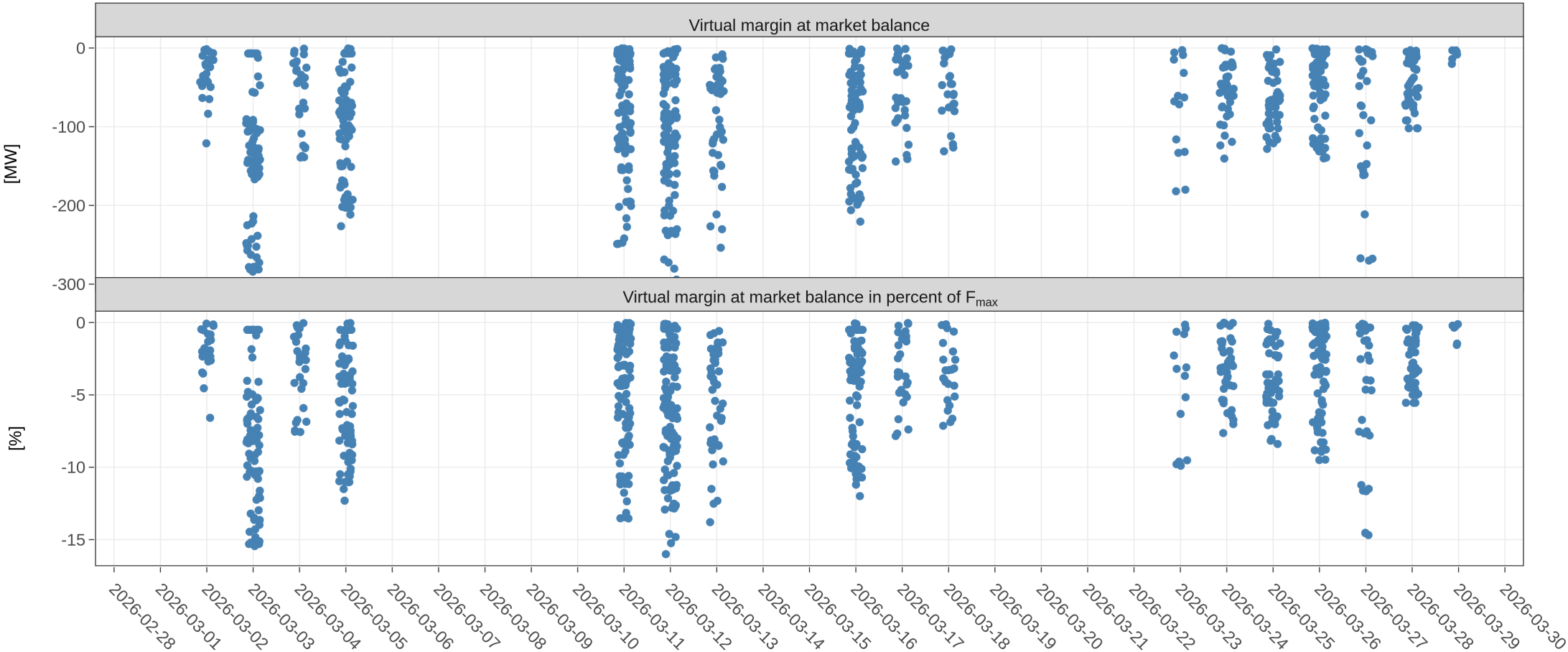
KPI 6b: Virtual margins at market balance RO



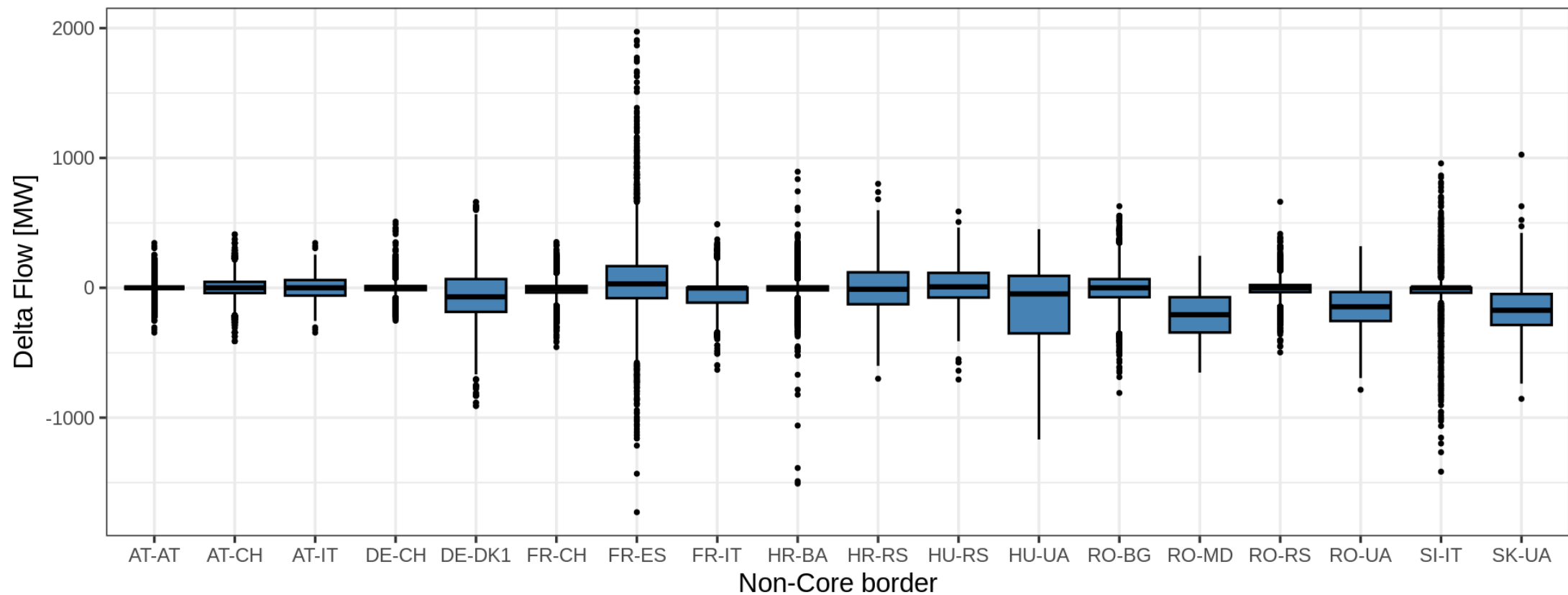
KPI 6b: Virtual margins at market balance SI



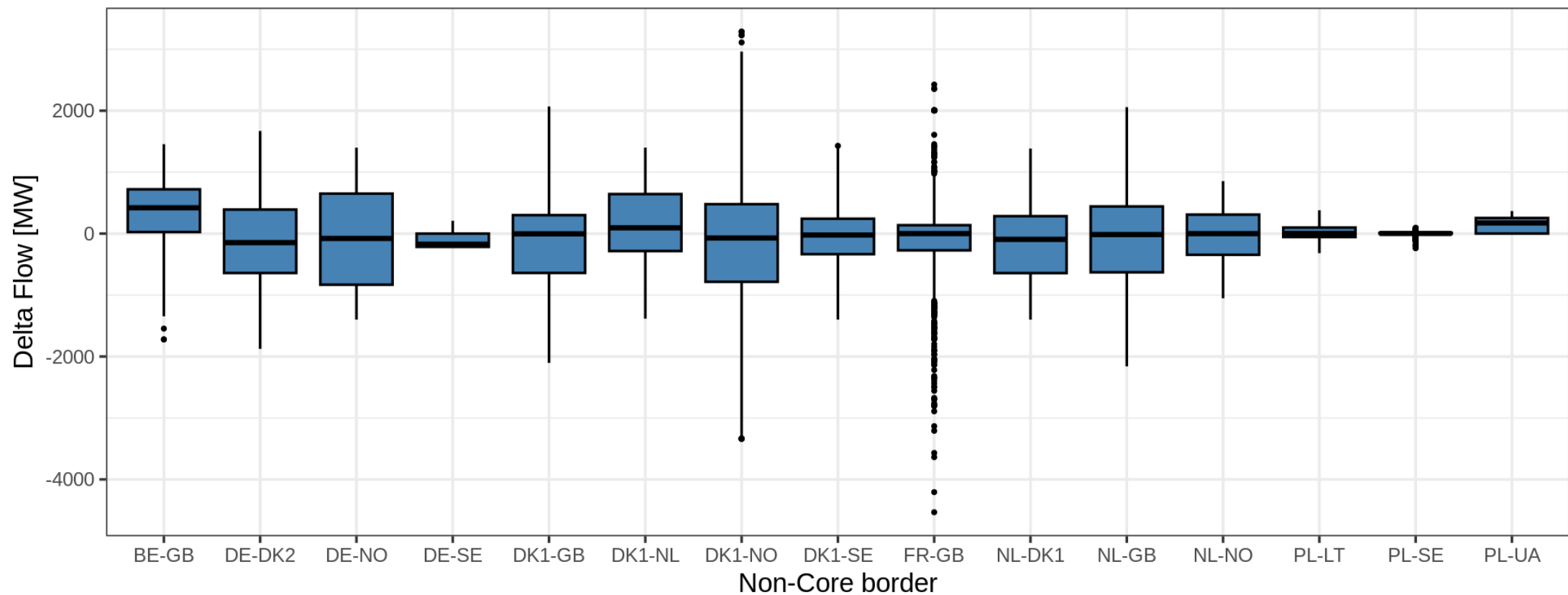
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



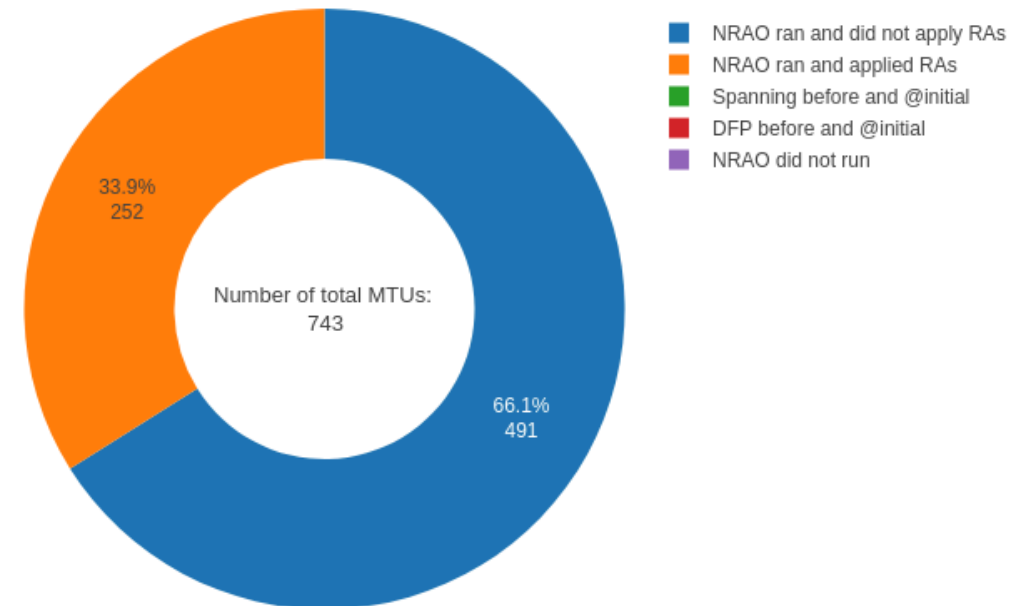
KPI 8: NRAO – Applied Remedial Action



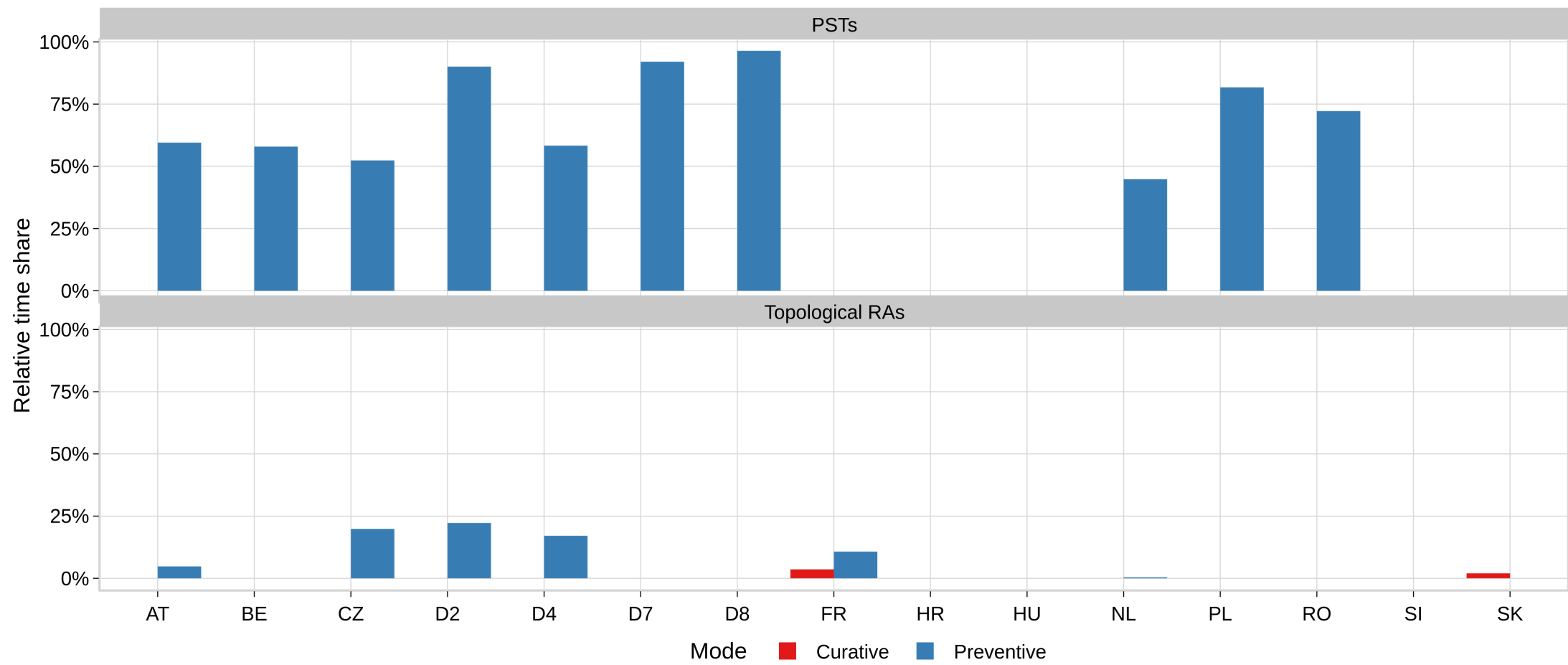
In the following plots, the relative time share relates to the hours labeled 'NRAO Ran and Applied RAs'.

Total MTUs: 743 hours

Category	Hours (%)
NRAO ran and did not apply RAs	491 hours (66.1%)
NRAO ran and applied RAs	252 hours (33.9%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

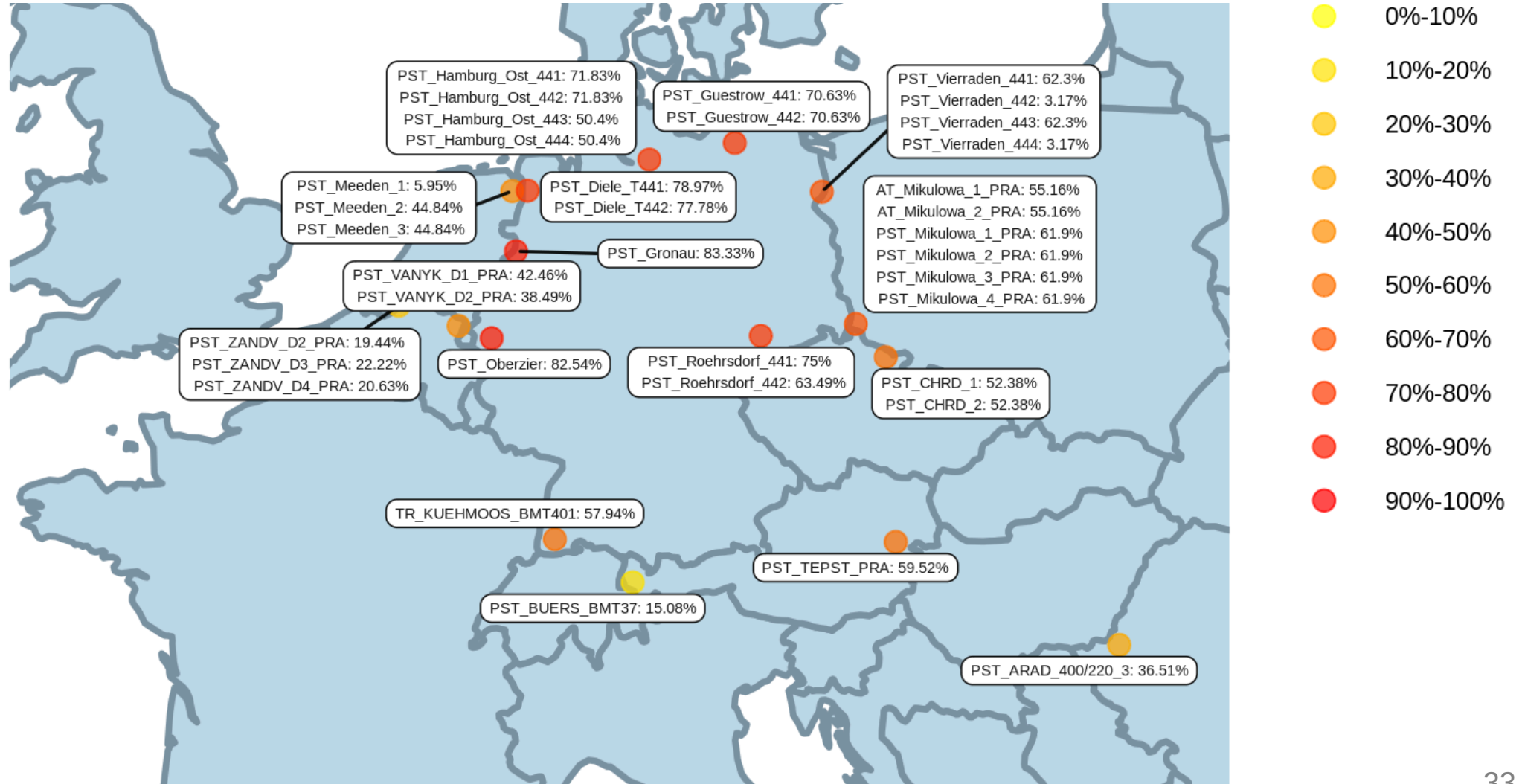


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



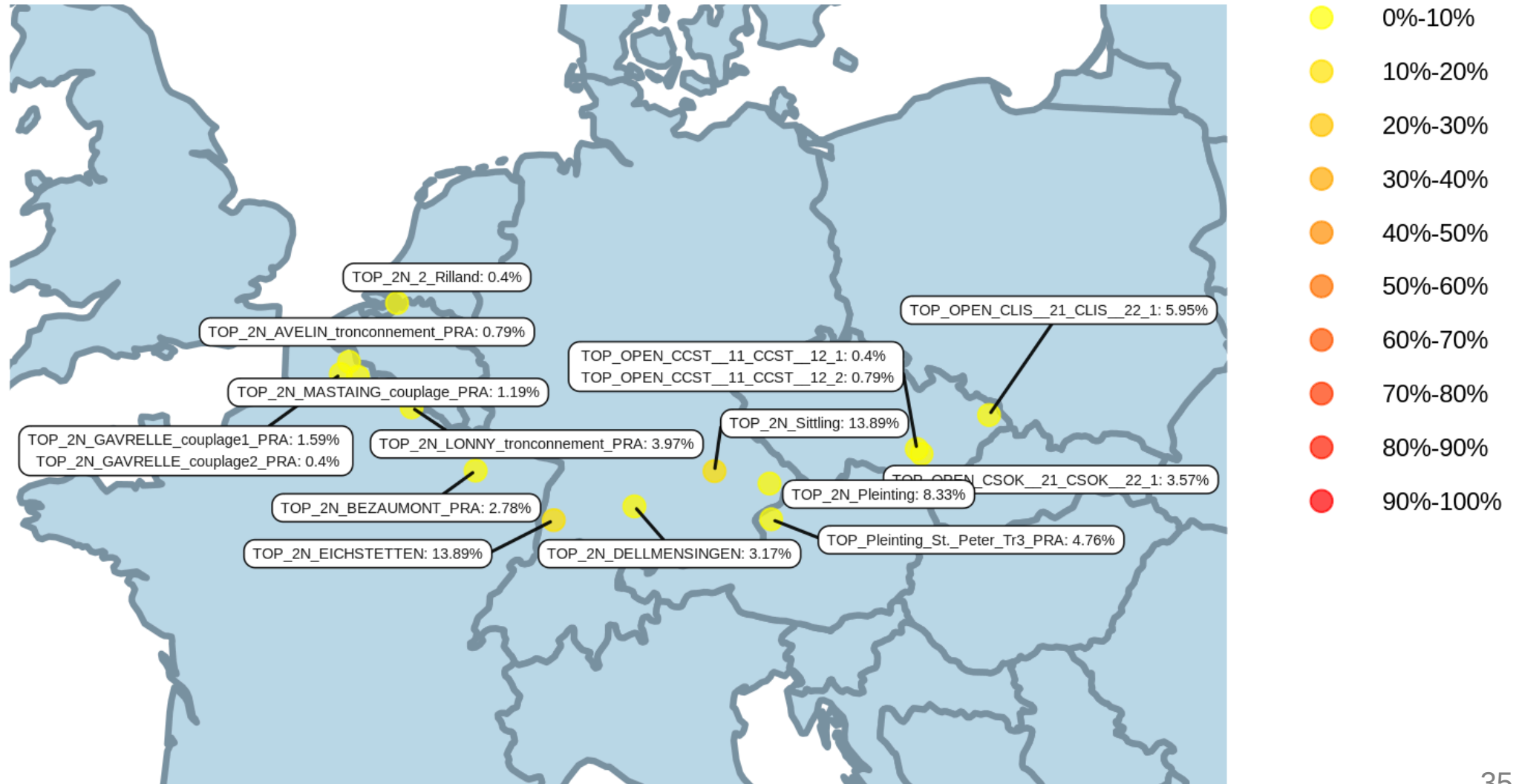
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



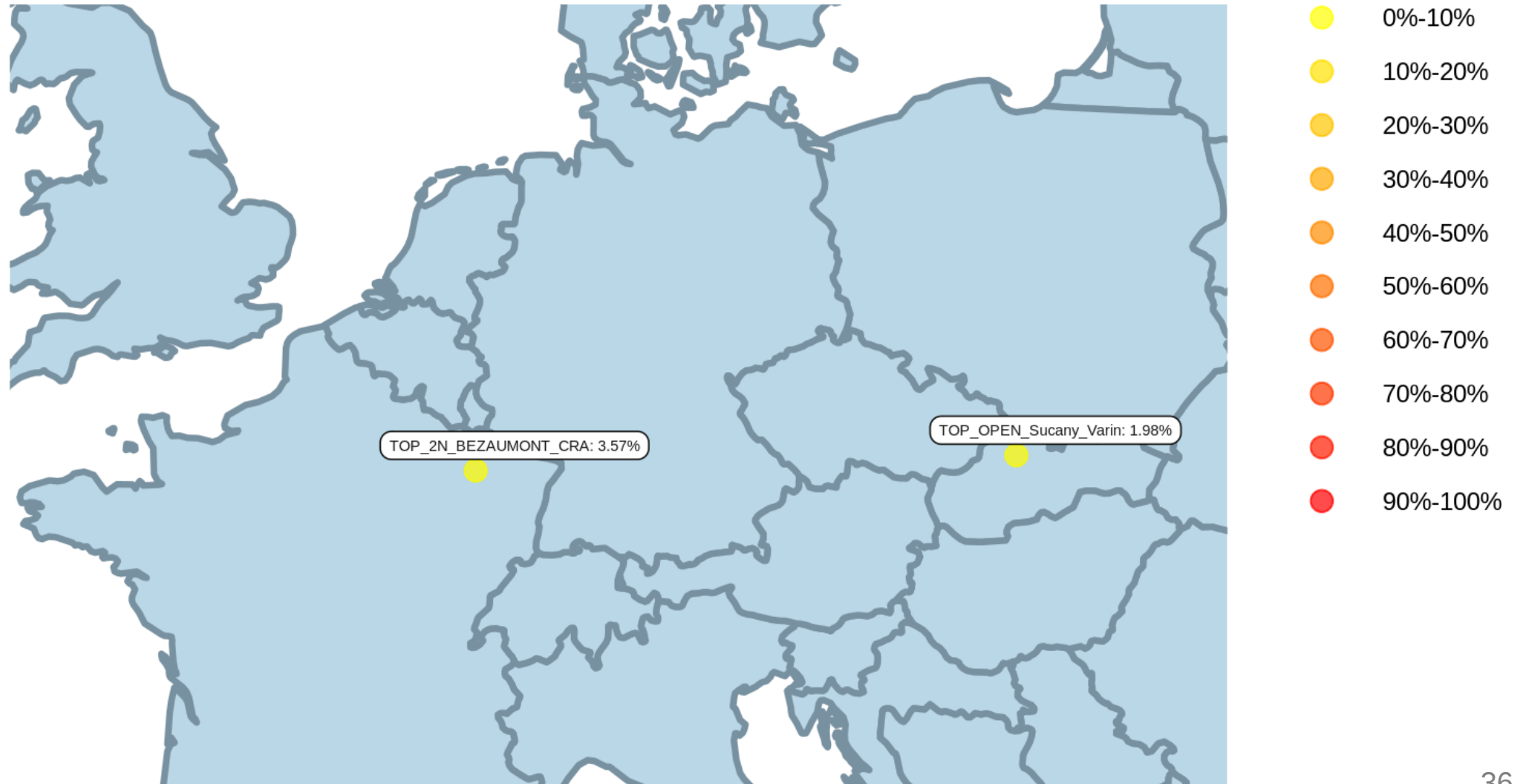
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

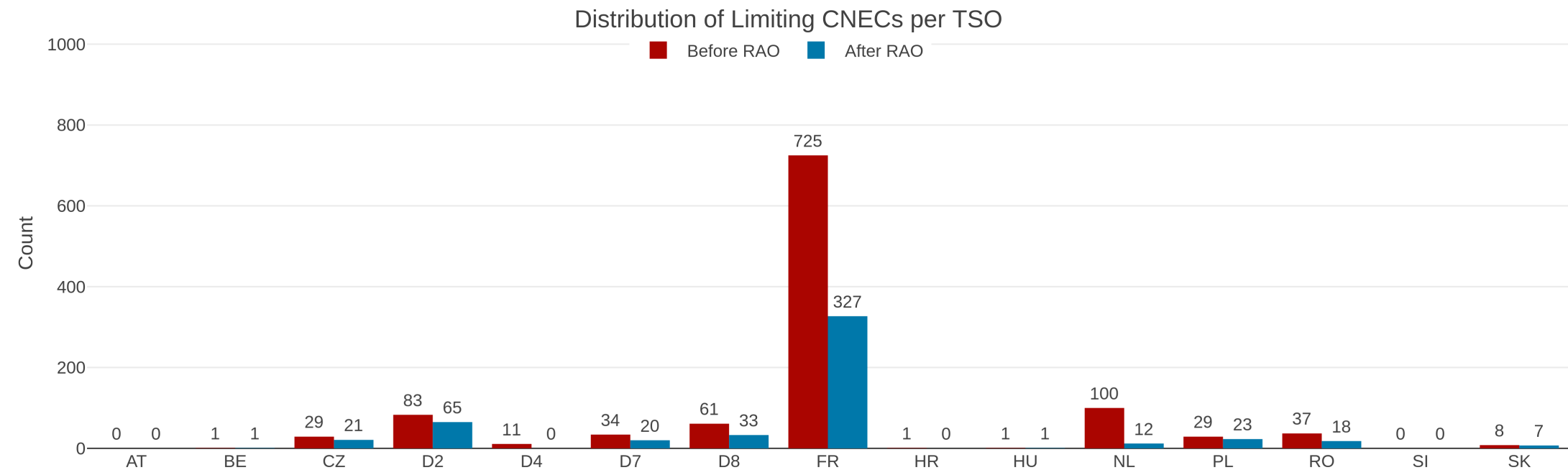
Relative Time Share of Applied Topological RAs in Curative Mode



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

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

RelRAM comparison before/after RAO



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
[CZ-SK] Nosovice - Varin [OPP] [CZ]	743	1479	101.89%	73.59%	137.16%	0.4582	1.7651
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	743	1719	59.99%	19.77%	86.58%	0.4886	1.6855
[SK-SK] Gabčíkovo - P.Biskupice [DIR]	743	743	82.23%	67.80%	103.77%	0.3327	1.2072
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	743	1506	76.37%	56.36%	95.76%	0.2058	1.125
[CZ-SK] Nosovice - Varin [DIR] [CZ]	743	1444	75.83%	19.41%	112.63%	0.4582	1.7651
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	742	742	70.87%	43.81%	95.41%	0.3002	1.229
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	741	1461	104.53%	84.22%	138.32%	0.2058	1.125
[D8-PL] Mikulowa PST1 [DIR] [PL]	741	741	57.33%	19.77%	92.35%	0.4221	1.4557
[RO-RS] Portile de Fier - Djerdap [OPP] [RO]	740	799	50.52%	20.36%	129.01%	0.3815	0.547
[SK-HU] Gabčíkovo - Gyor [DIR] [HU]	739	1267	85.95%	66.02%	105.34%	0.2624	1.0851
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	736	877	76.92%	37.90%	106.05%	0.3162	1.0216
[SI-HU] Cirkovce - Heviz [OPP] [HU]	735	735	76.40%	53.17%	95.60%	0.2737	1.163
[NL-NL] MEE DRT2 [DIR] [NL]	732	732	65.34%	19.96%	160.84%	0.4163	0.9371
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	732	1761	39.89%	19.80%	123.90%	0.2457	0.9946
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	727	1333	105.00%	74.60%	186.63%	0.3615	0.8204
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	727	727	67.91%	48.40%	112.10%	0.3029	1.2813
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	724	725	65.78%	3.74%	103.21%	0.3615	0.8204
[SK-HU] Gabčíkovo - Gyor [OPP] [HU]	715	1222	93.17%	74.60%	120.13%	0.2624	1.0851
[CZ-SK] Liskovec - P. Bystrica [OPP] [CZ]	697	697	110.18%	80.31%	141.85%	0.1349	0.4635
[CZ-SK] Liskovec - P. Bystrica [DIR] [CZ]	696	696	71.33%	52.00%	99.38%	0.1349	0.4635

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 2 [OPP]	470	470	1373.97	20.79%	19.98%	32.24%	0.1464
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	190	192	631.57	46.27%	19.77%	72.29%	0.4886
[NL-NL] MEE DRT2 [DIR] [NL]	174	174	425.33	38.94%	19.96%	111.98%	0.3346
[RO-RO] Resita - Timisoara c1 [DIR]	149	153	2610.37	29.13%	20.59%	58.02%	0.1153
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	137	137	1060.49	20.43%	19.98%	33.36%	0.1471
[D8-PL] Mikulowa PST1 [DIR] [PL]	113	113	834.57	40.56%	19.77%	65.91%	0.4209
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	111	113	652.38	81.35%	55.90%	105.15%	0.3465
[HU-HU] Martonvasar - Dunamenti 1 [DIR]	93	93	3482.37	44.20%	29.40%	83.23%	0.1319
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	74	74	459.93	64.29%	53.24%	92.95%	0.3029
[SK-HU] Levice - God [DIR] [HU]	61	61	644.87	43.92%	33.48%	62.34%	0.2644
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	57	59	1007.27	75.67%	45.39%	115.24%	0.1687
[AT-AT] Zell am Ziller 1 - Zell am Ziller 2 ZZRHU41 [DIR]	57	57	1150.79	23.85%	19.75%	50.42%	0.1766
[D2-D2] Altheim - Simbach 233/230 [DIR]	44	44	912.53	75.22%	44.66%	106.89%	0.1122
[CZ-SK] Nosovice - Varin [DIR] [CZ]	44	47	525.47	59.67%	19.41%	77.68%	0.4413
[D8-D8] Reuter - Mitte 903 [OPP]	32	32	1812.5	71.19%	22.38%	80.14%	0.0937
[RO-RO] Paroseni - Targu Jiu Nord [OPP]	31	31	1422.16	27.29%	20.46%	43.23%	0.0922
[HU-HU] Paks - Perkata [DIR]	29	29	717.59	24.01%	17.53%	30.52%	0.2219
[FR-D7] Vigy - Ensdorf VIGY2 S [DIR] [D7]	27	27	806.21	26.11%	19.90%	45.17%	0.2241
[BE-BE] Achene - Gramme 380.10 [DIR]	25	25	181.66	86.03%	69.26%	99.18%	0.3466
[NL-D7] Maasbracht - Oberzier SELFK WS [OPP] [D7]	25	25	34.79	84.24%	70.33%	97.61%	0.2405

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	483
AC < 0 MW	70
AC = 0 MW	353
AC > 0 MW	60

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-1594.78	5639.97
Min.	-9939.00	0.00
Max.	0.00	15005.00

