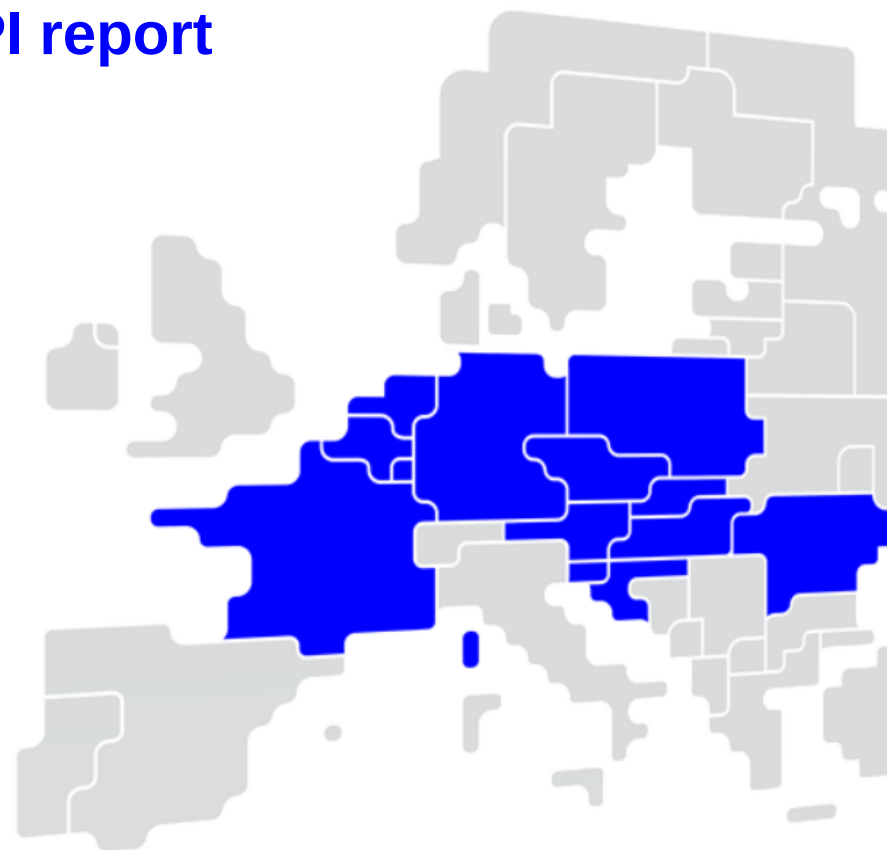




Core FB MC Operational KPI report

April 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

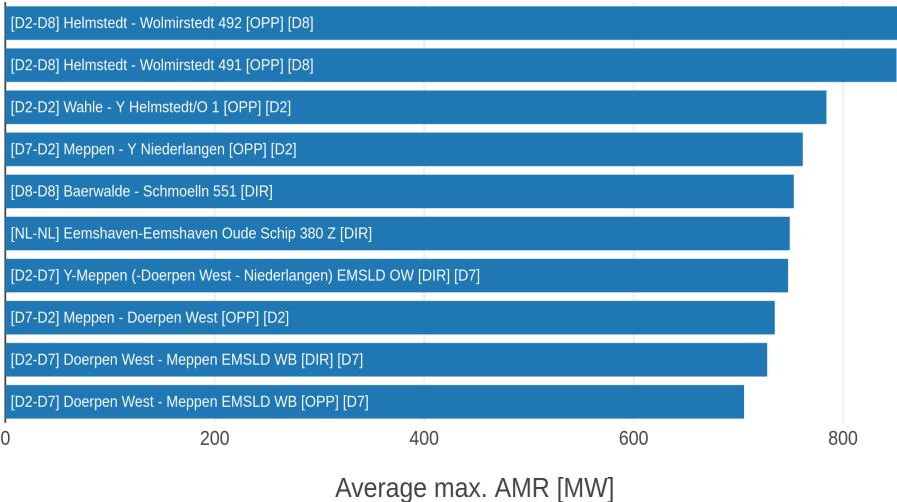
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

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-D8] Helmstedt - Wolmirstedt 492 [OPP] [D8]	851.88	34.16%	29.27%
[D2-D8] Helmstedt - Wolmirstedt 491 [OPP] [D8]	851.11	34.13%	29.24%
[D2-D2] Wahle - Y Helmstedt/O 1 [OPP] [D2]	784.18	32.57%	28.32%
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	761.56	38.55%	29.23%
[D8-D8] Baerwalde - Schmoelln 551 [DIR]	753.04	30.19%	6.58%
[NL-NL] Eemshaven-Eemshaven Oude Schip 380 Z [DIR]	749.13	27.03%	2.55%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	747.58	29.98%	20.15%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	734.82	37.19%	28.15%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	727.61	29.27%	19.31%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	705.50	28.38%	18.76%

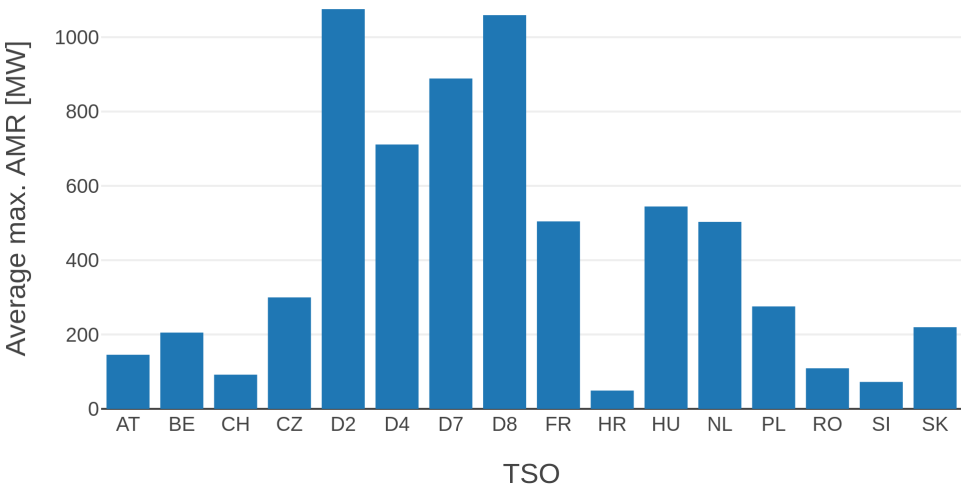


KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	145.71
BE	205.26
CH	92.00
CZ	299.80
D2	1075.52
D4	711.34
D7	888.91
D8	1059.16
FR	504.39
HR	49.20

TSO	Average maximum AMR per TSO
HU	544.68
NL	503.15
PL	275.58
RO	109.22
SI	72.41
SK	219.86



KPI 3: Share of MTUs with intervention per TSO



Total BDs
30

Total MTUs
719

MTUs without IVA
73

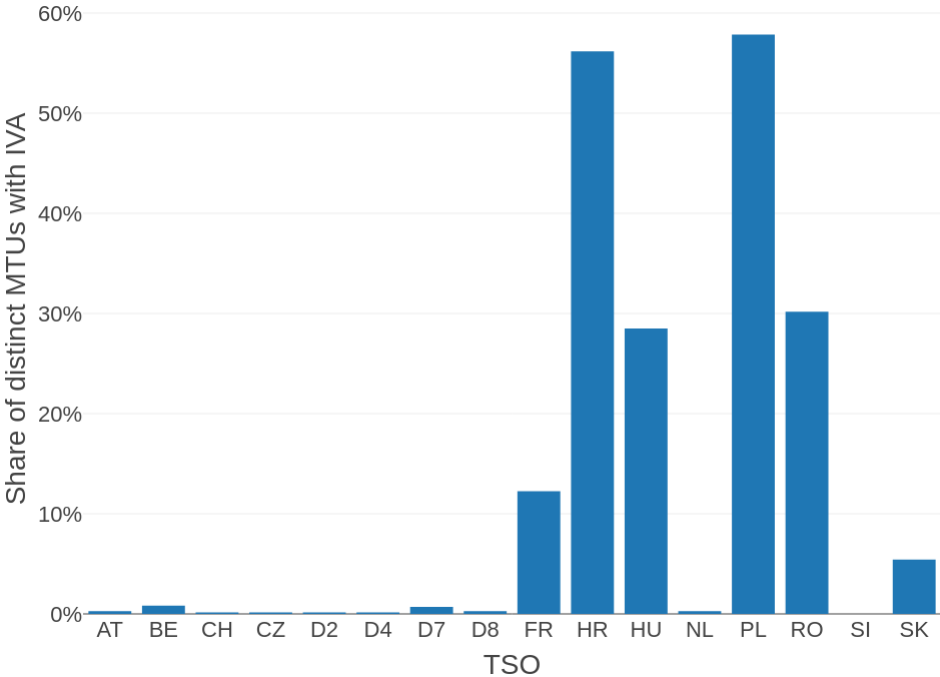
Share of distinct MTUs without IVA
10.15%

MTUs with IVA
646

Share of distinct MTUs with IVA
89.8%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.28%	2
BE	0.83%	6
CH	0.14%	1
CZ	0.14%	1
D2	0.14%	1
D4	0.14%	1
D7	0.70%	5
D8	0.28%	2
FR	12.24%	88
HR	56.19%	404

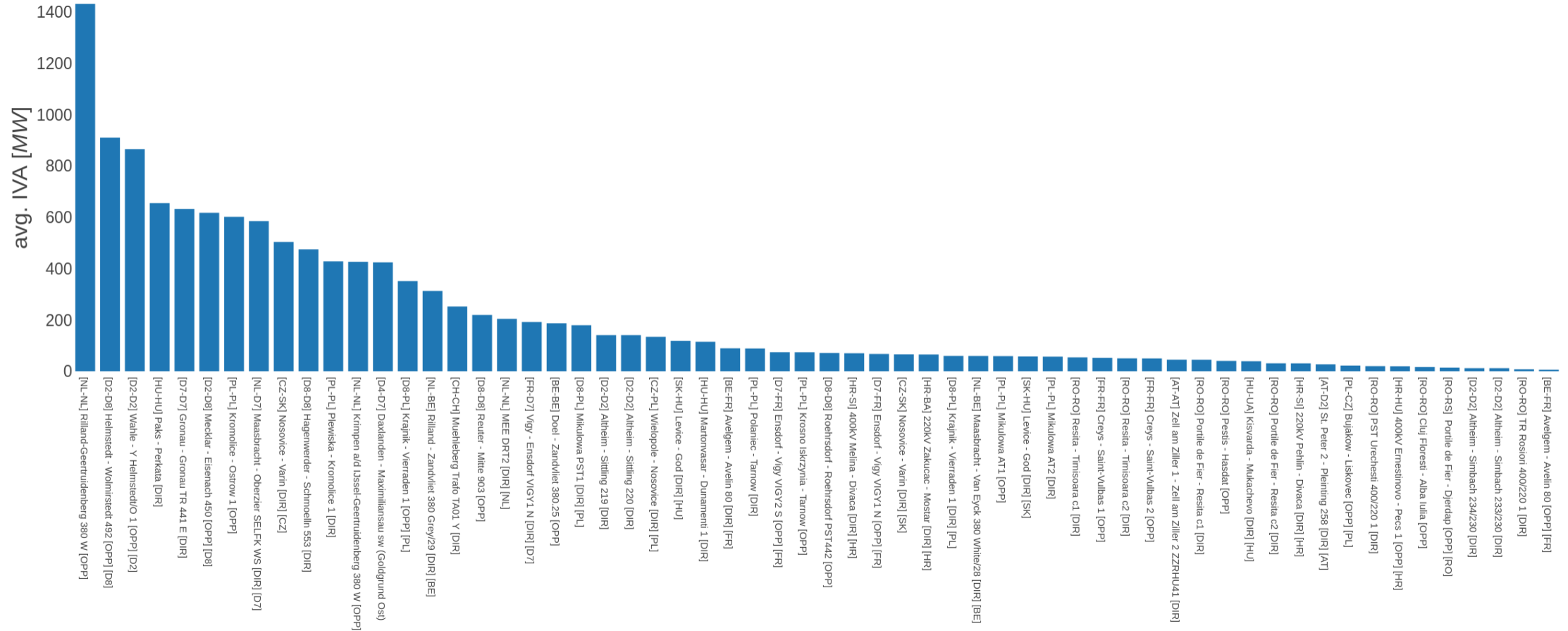
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
HU	28.51%	205
NL	0.28%	2
PL	57.86%	416
RO	30.18%	217
SI	0.00%	0
SK	5.42%	39



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



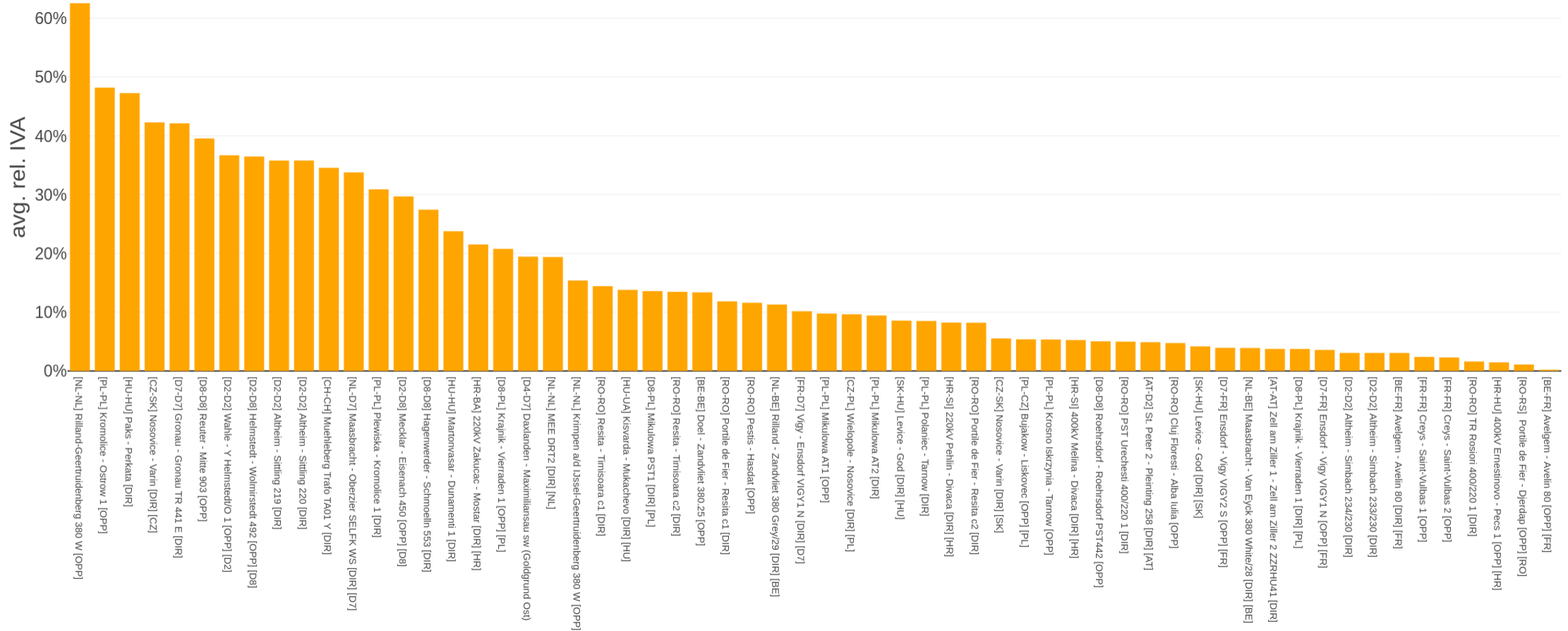
$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]$$



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



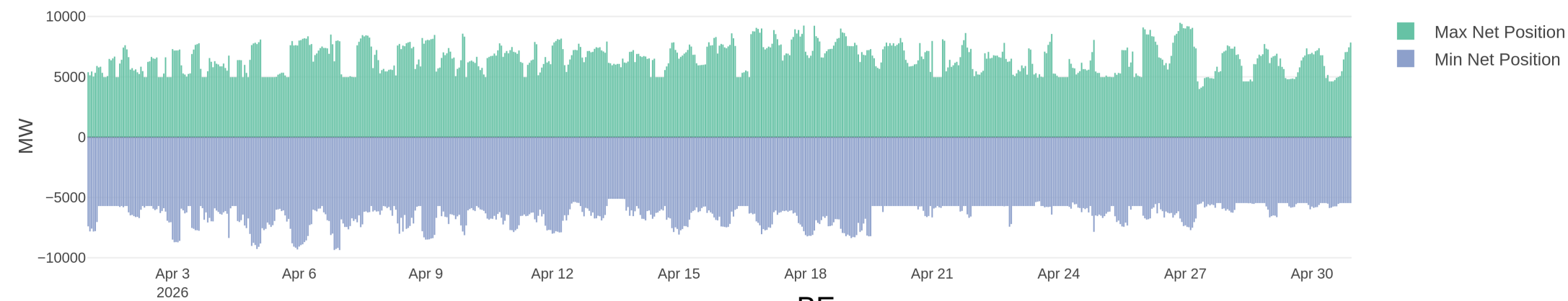
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{maxCNEC, MTU}[IVA_{CNEC, MTU} > 0]}$$



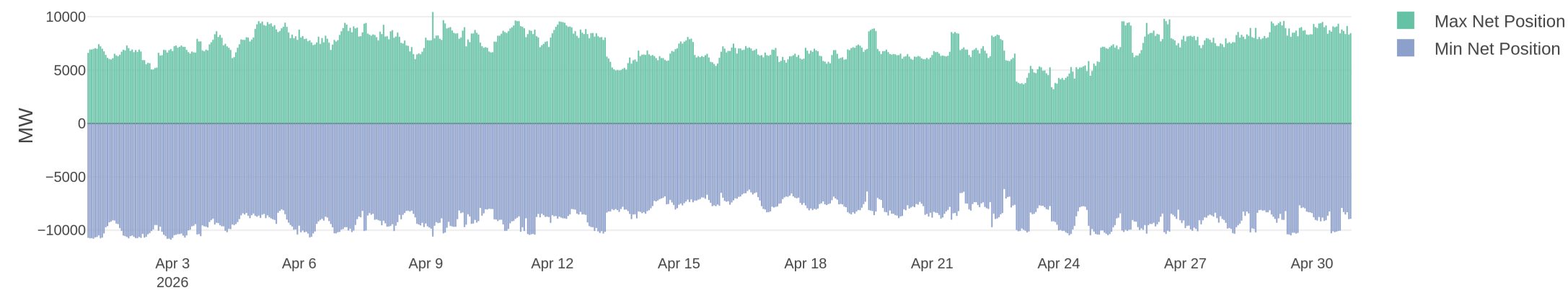
KPI 5: Min & max net positions per BZ hub



AT



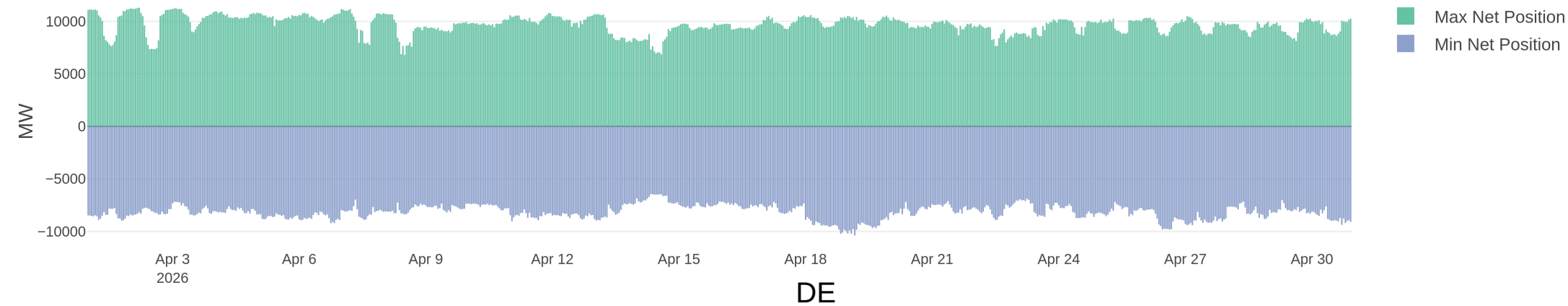
BE



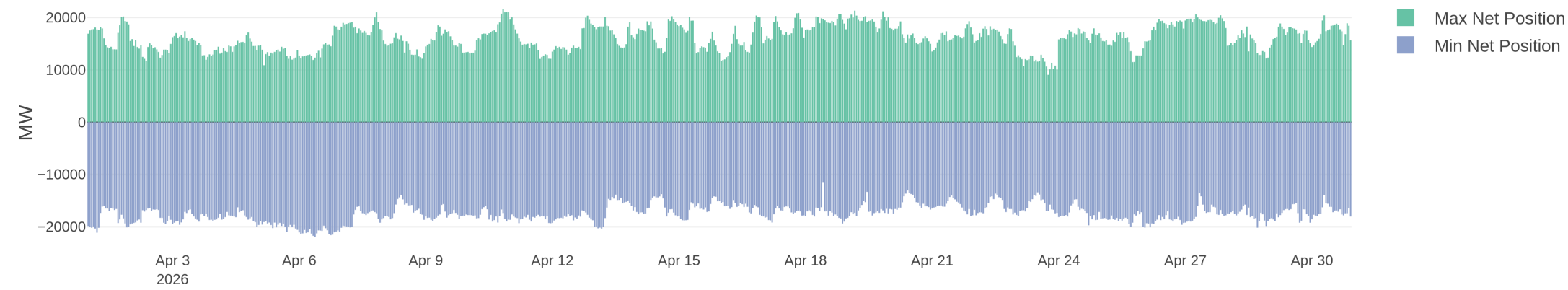
KPI 5: Min & max net positions per BZ hub



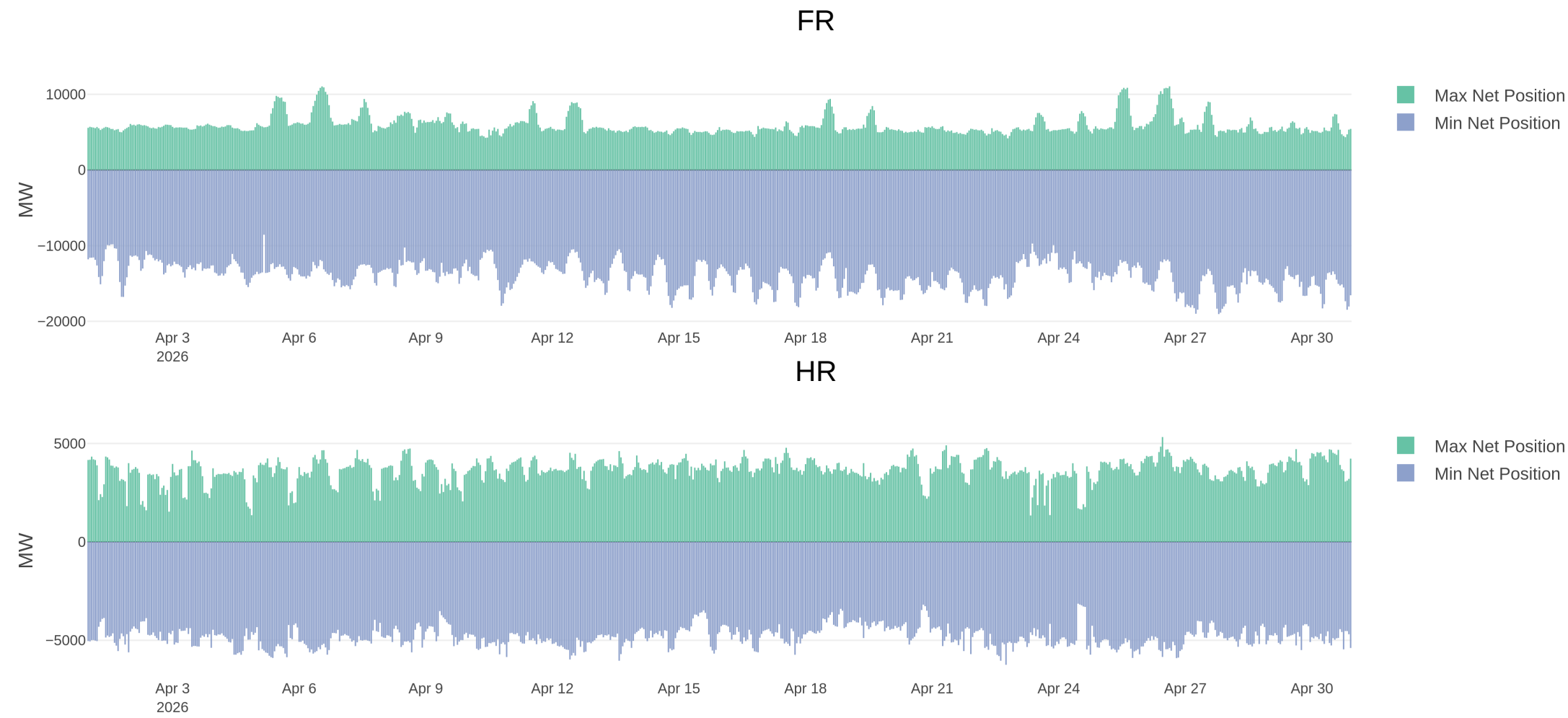
CZ



DE



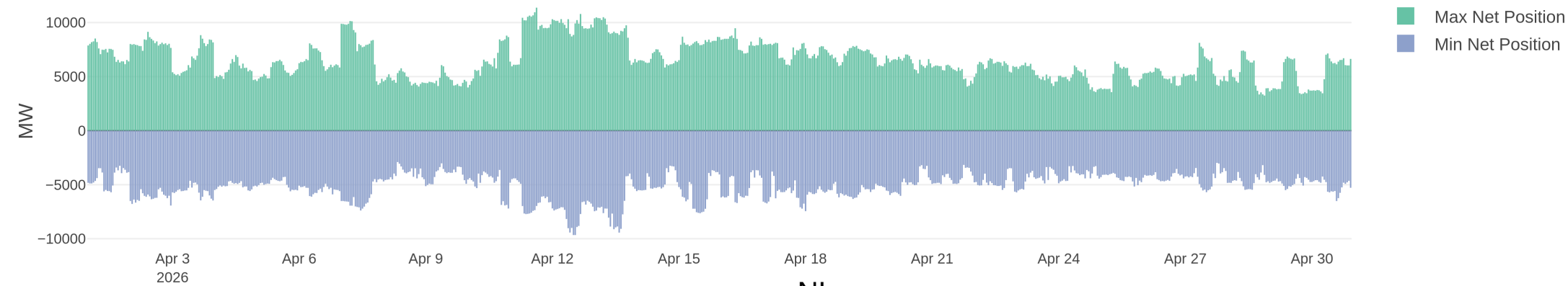
KPI 5: Min & max net positions per BZ hub



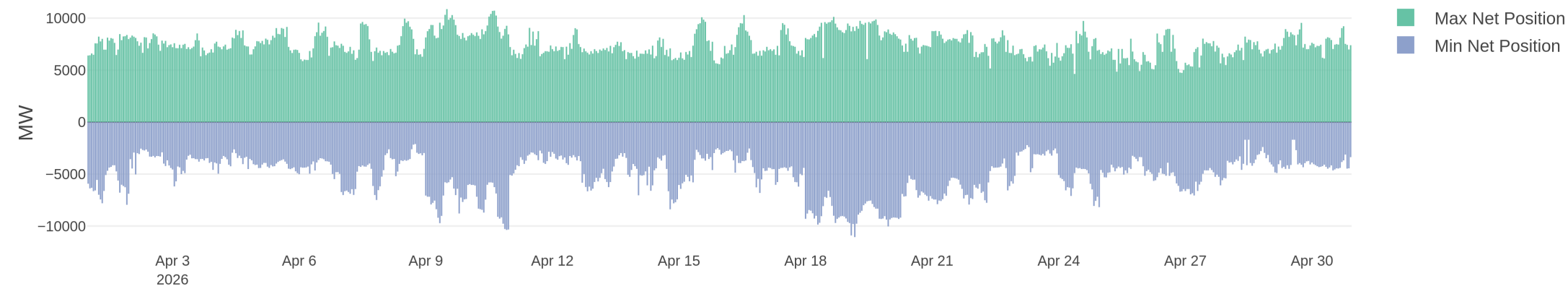
KPI 5: Min & max net positions per BZ hub



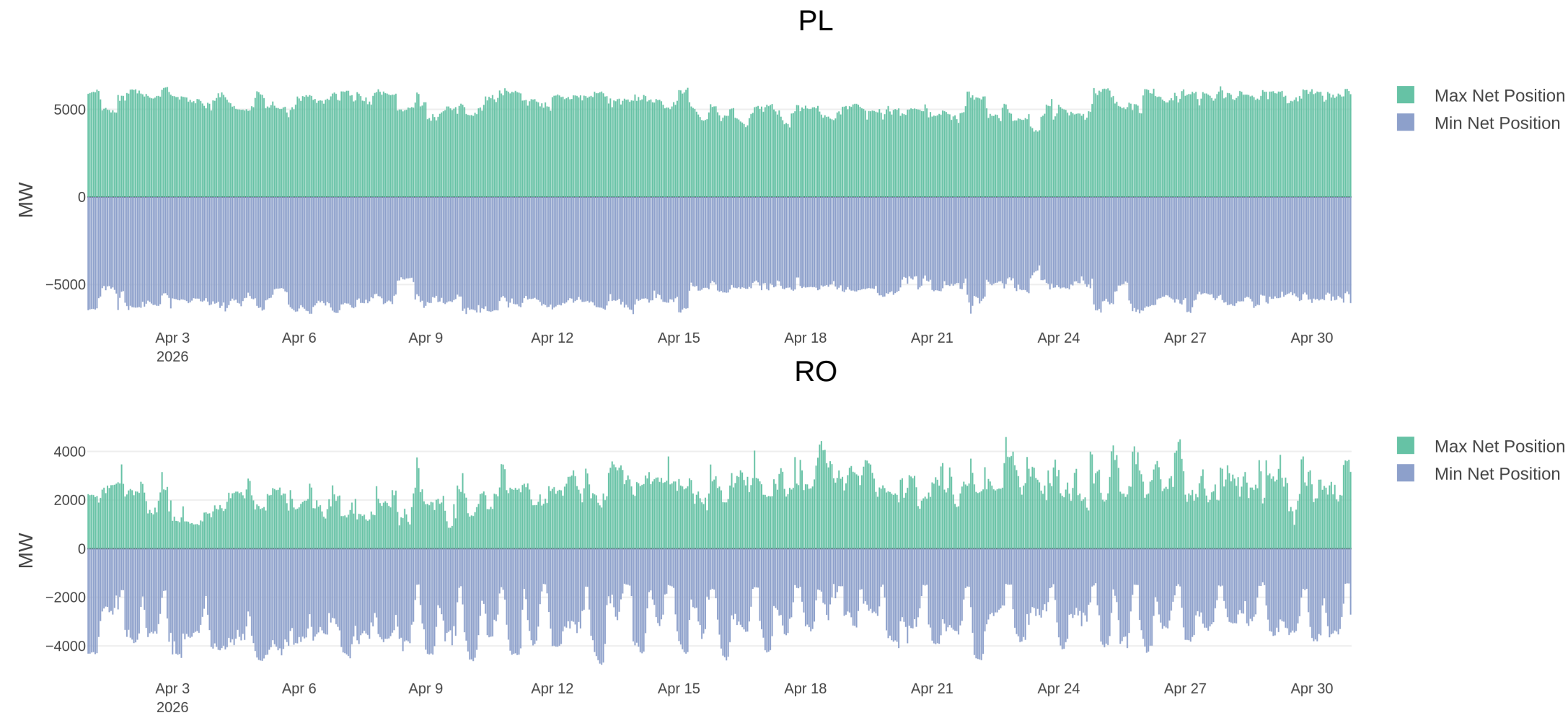
HU



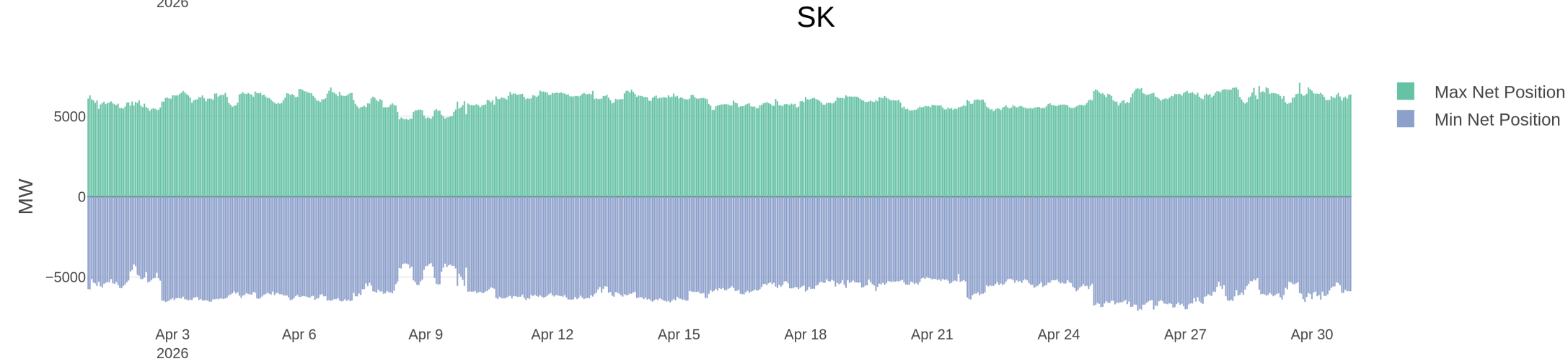
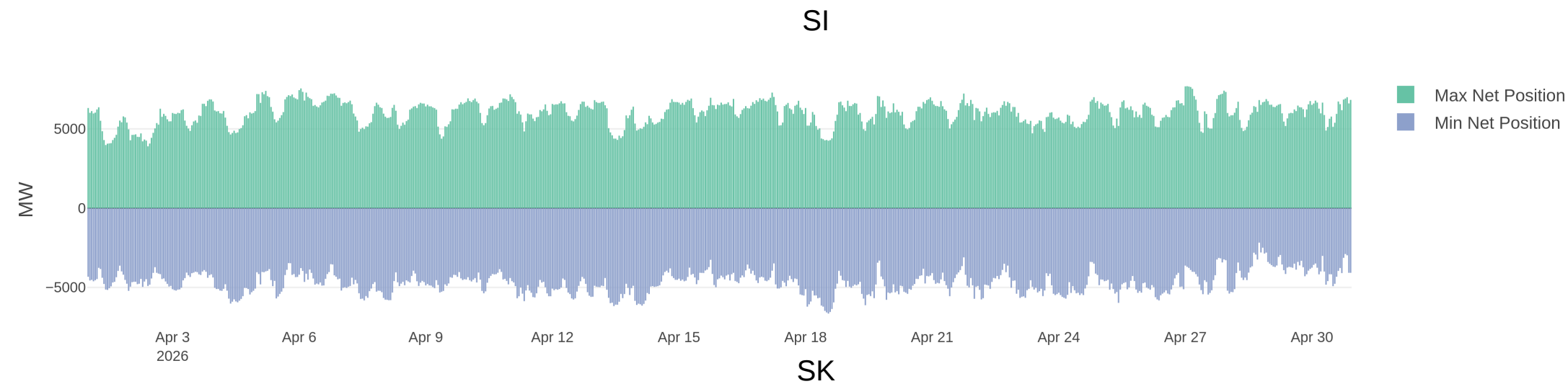
NL



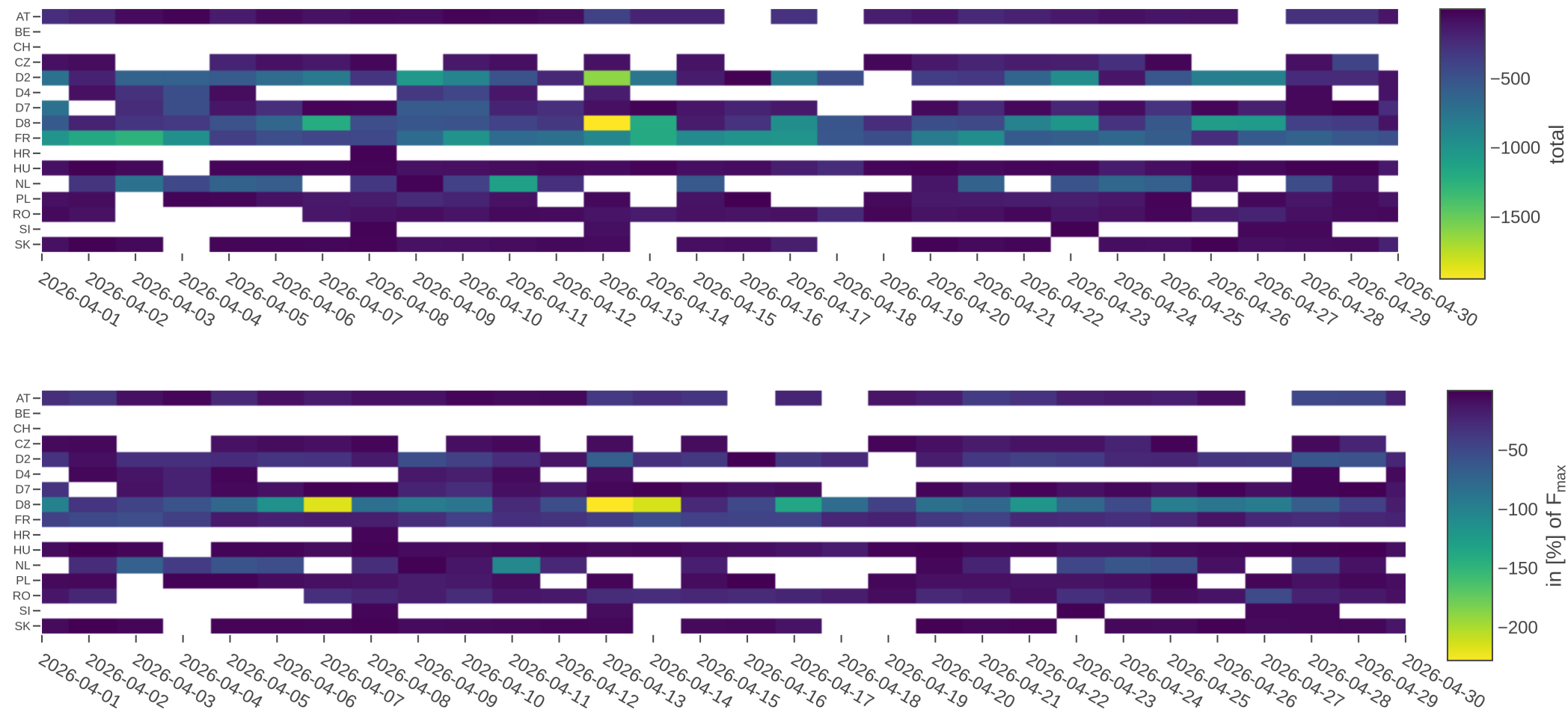
KPI 5: Min & max net positions per BZ hub



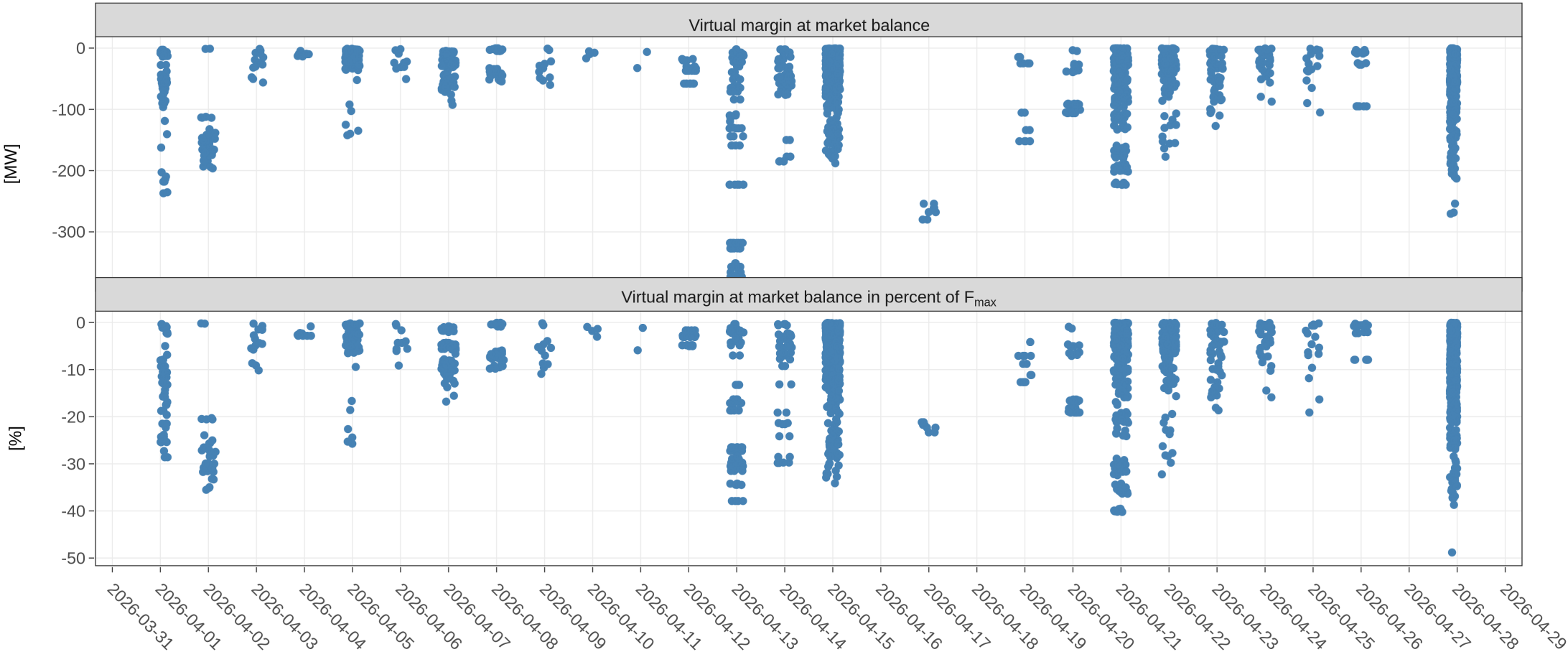
KPI 5: Min & max net positions per BZ hub



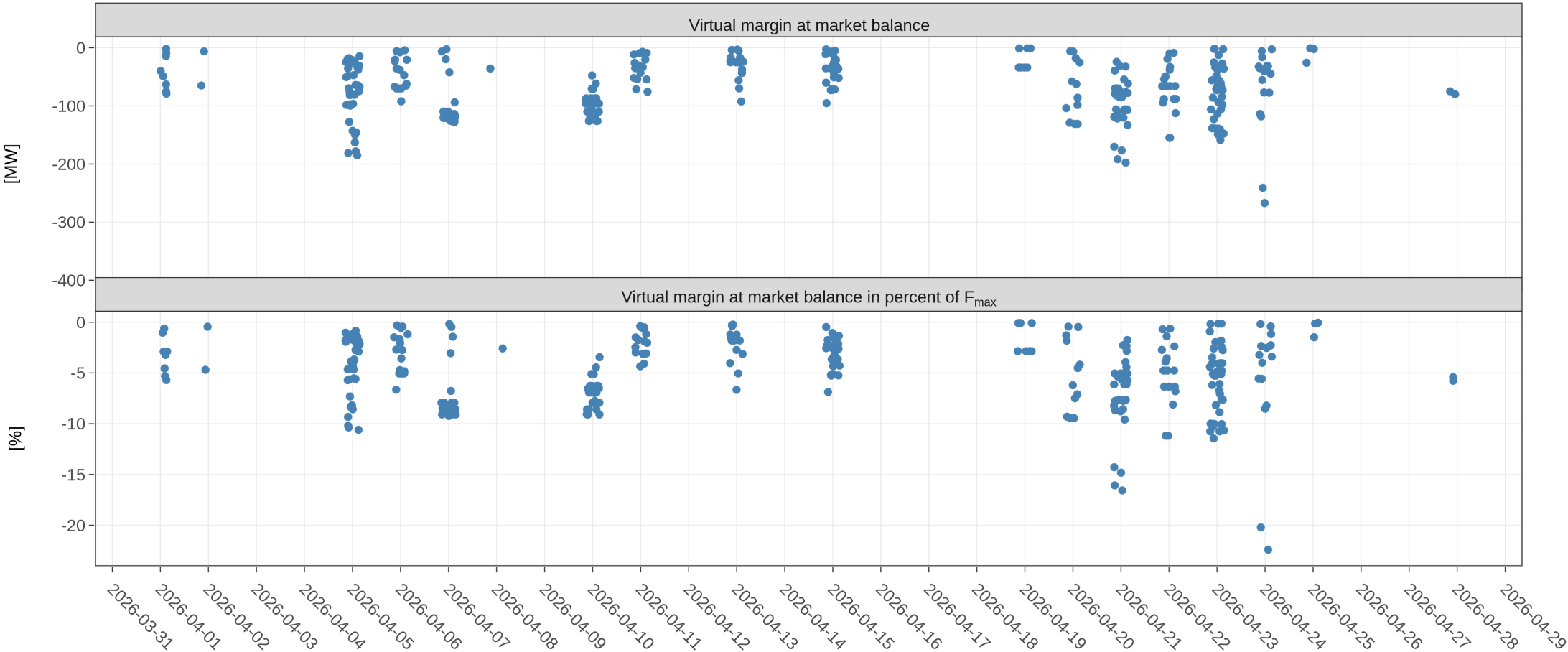
KPI 6a: Highest virtual margins at market balance for CORE TSOs



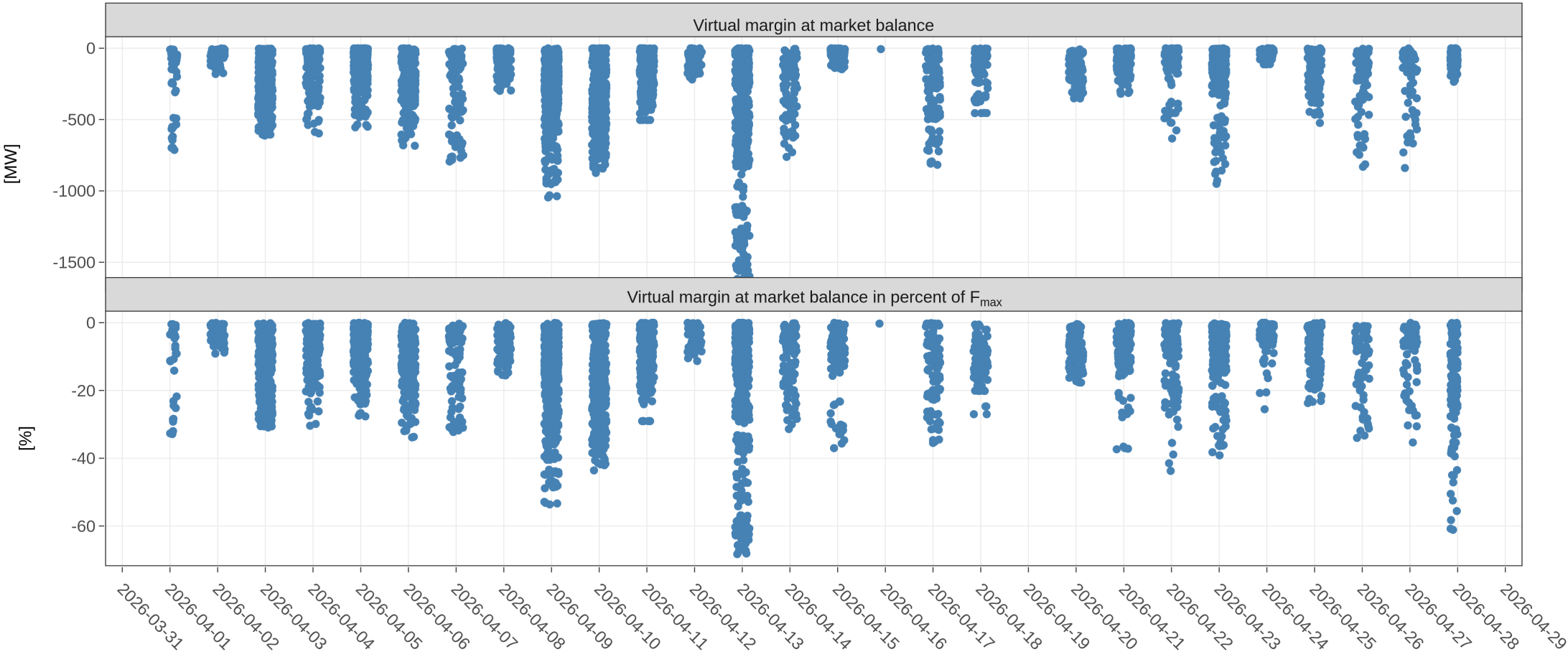
KPI 6b: Virtual margins at market balance AT



KPI 6b: Virtual margins at market balance CZ



KPI 6b: Virtual margins at market balance D2



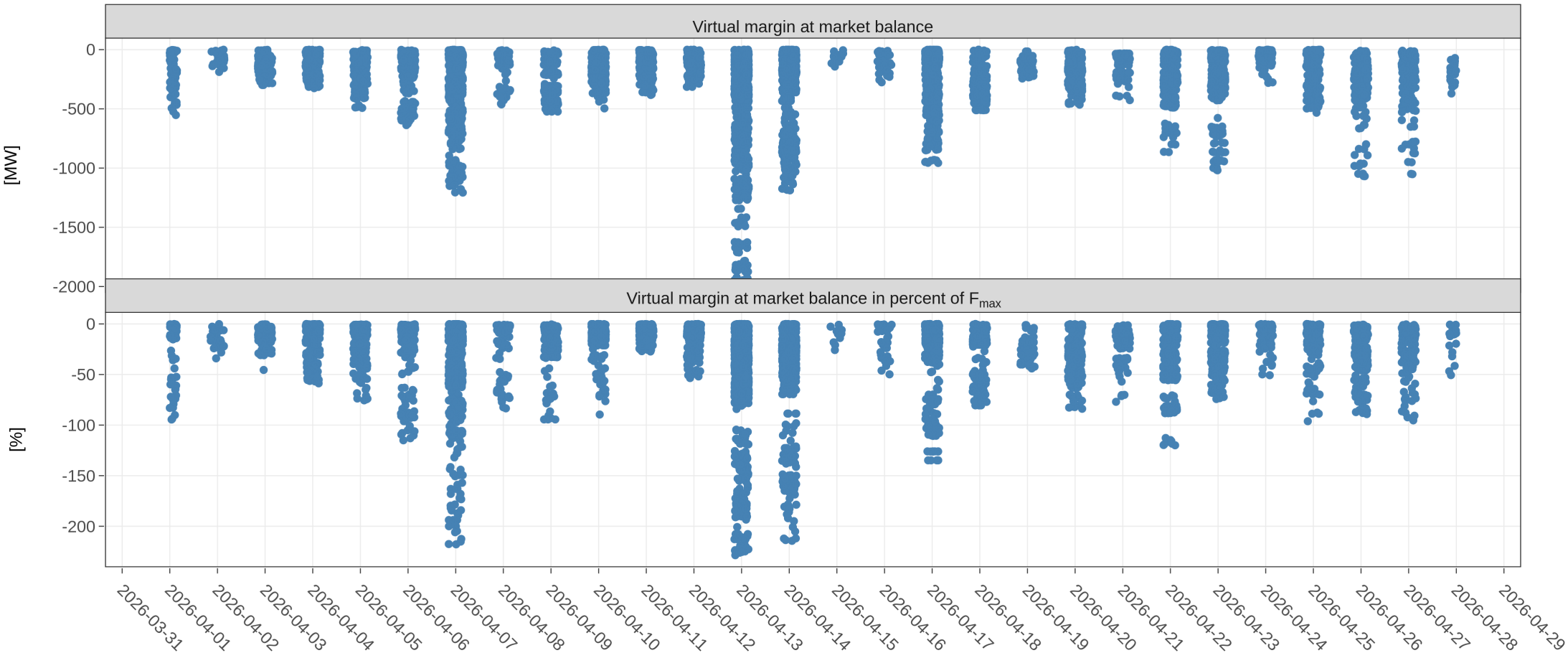
KPI 6b: Virtual margins at market balance D4



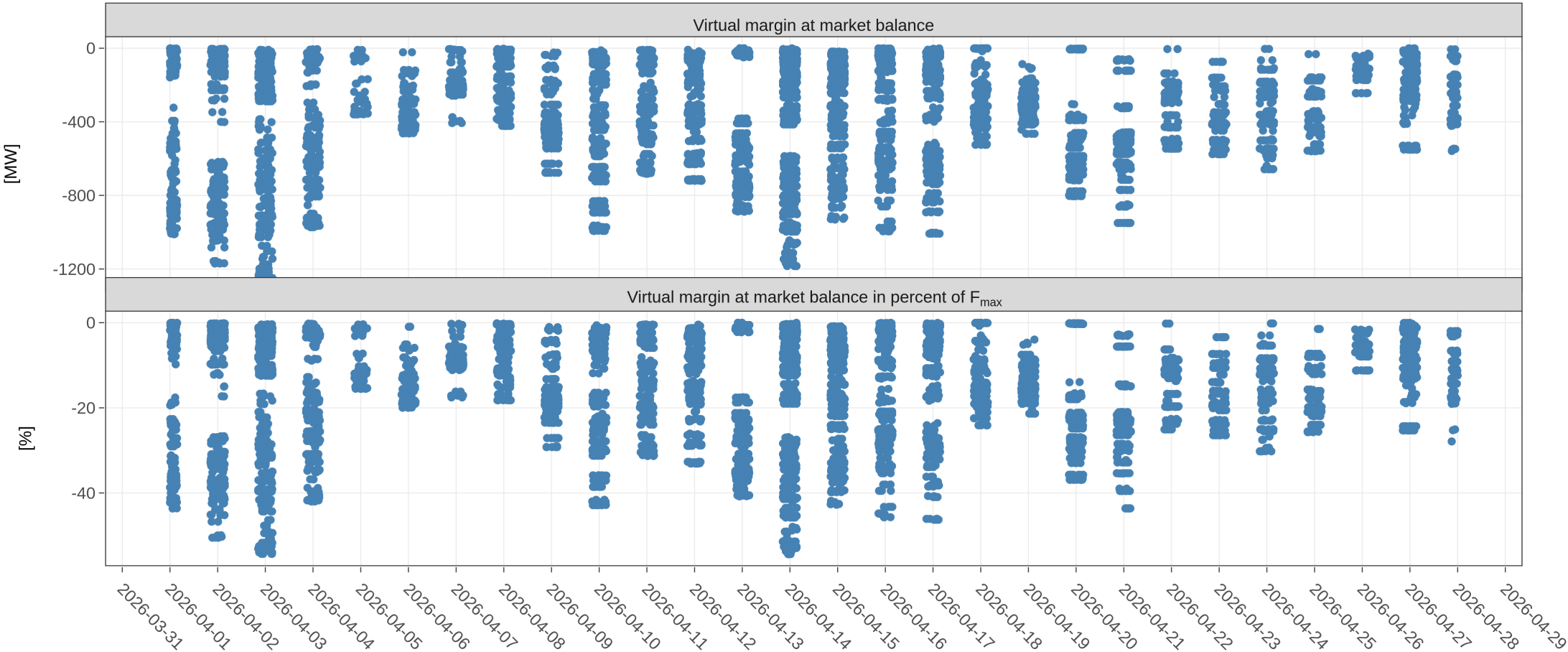
KPI 6b: Virtual margins at market balance D7



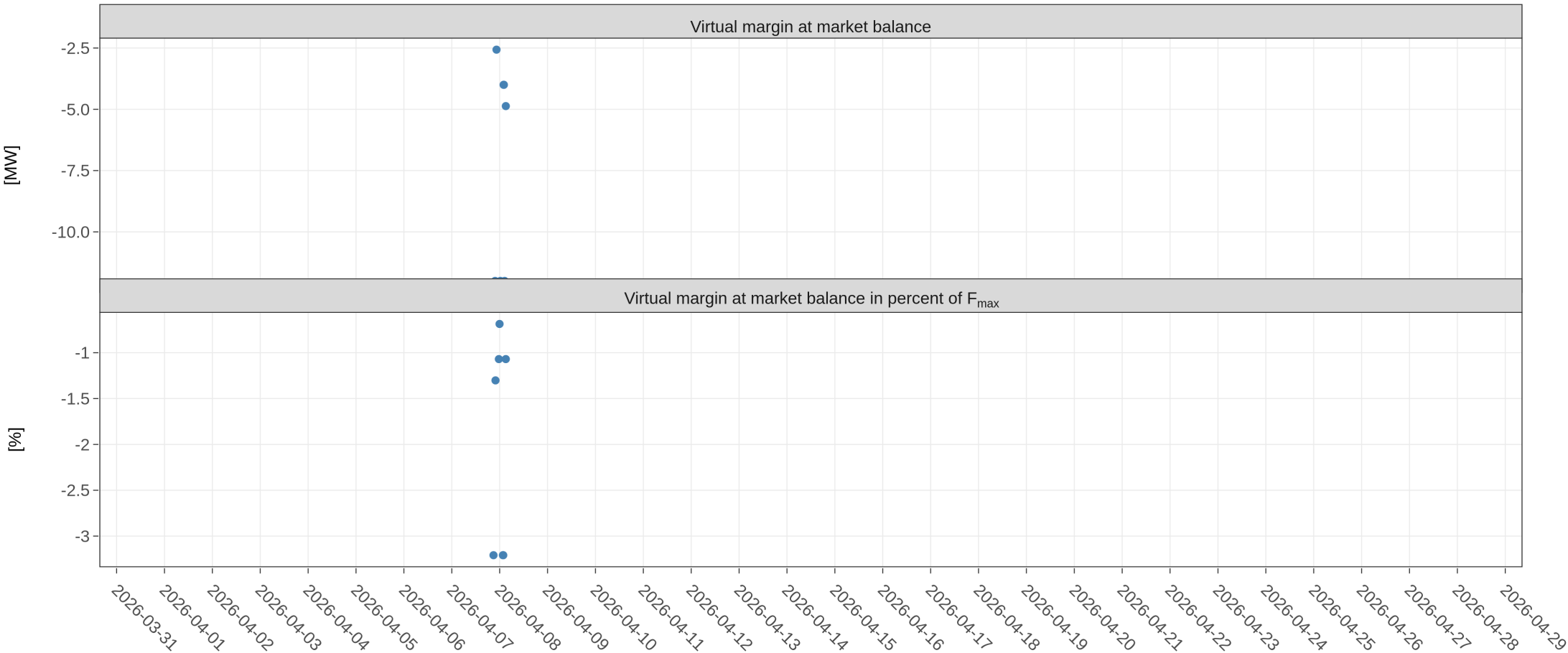
KPI 6b: Virtual margins at market balance D8



KPI 6b: Virtual margins at market balance FR



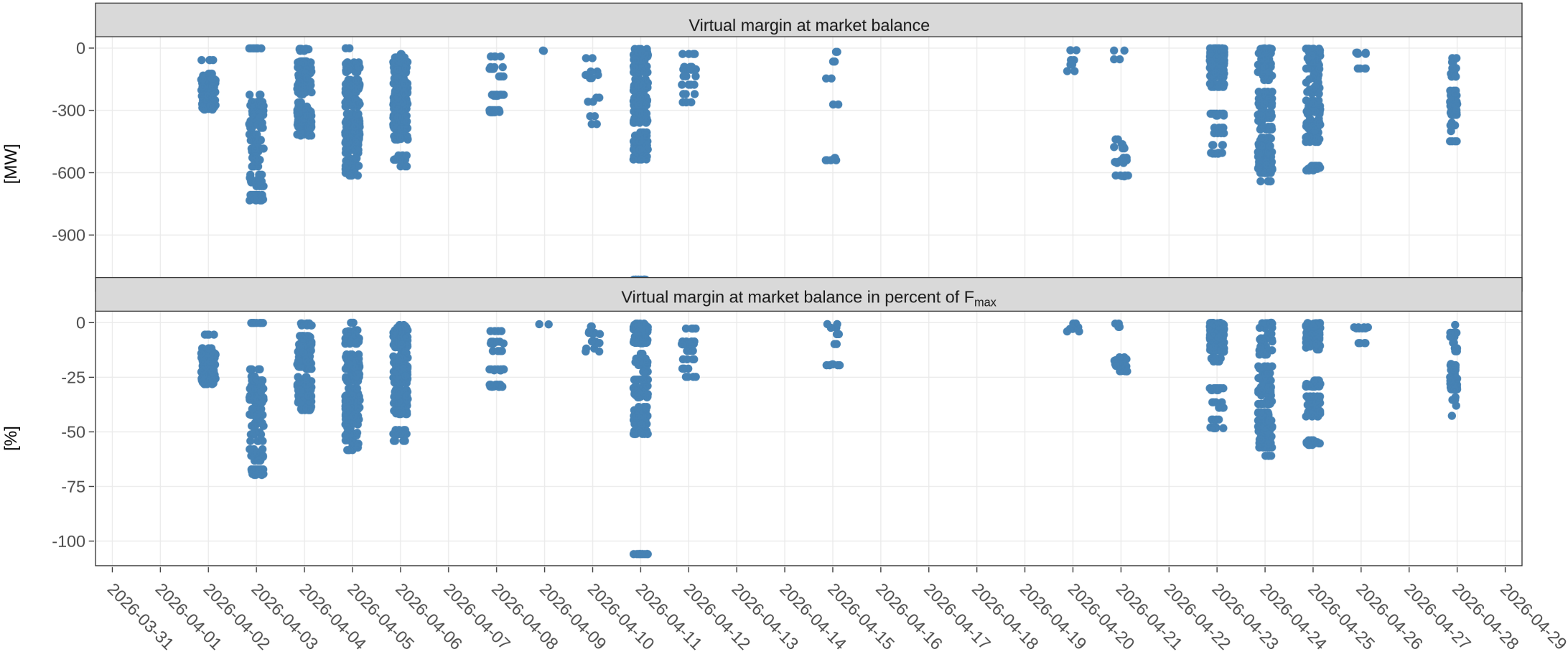
KPI 6b: Virtual margins at market balance HR



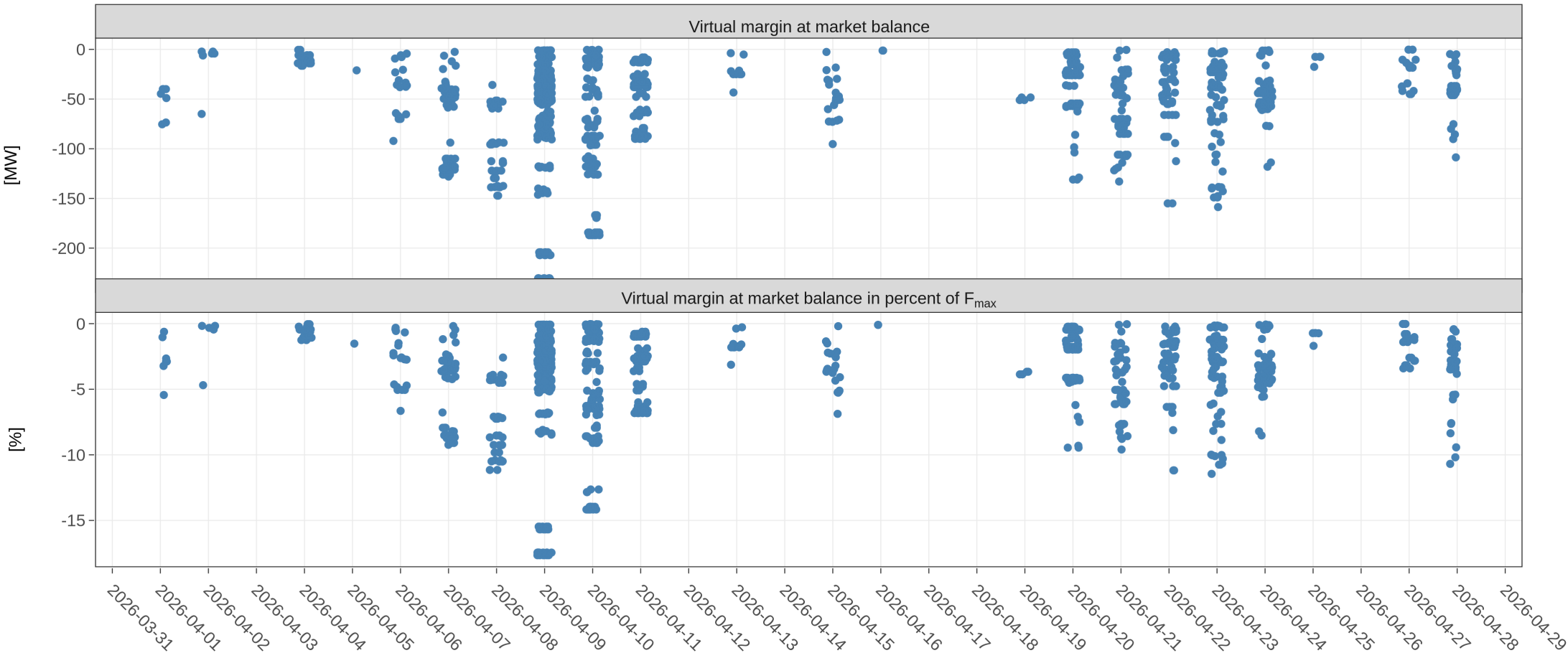
KPI 6b: Virtual margins at market balance HU



KPI 6b: Virtual margins at market balance NL



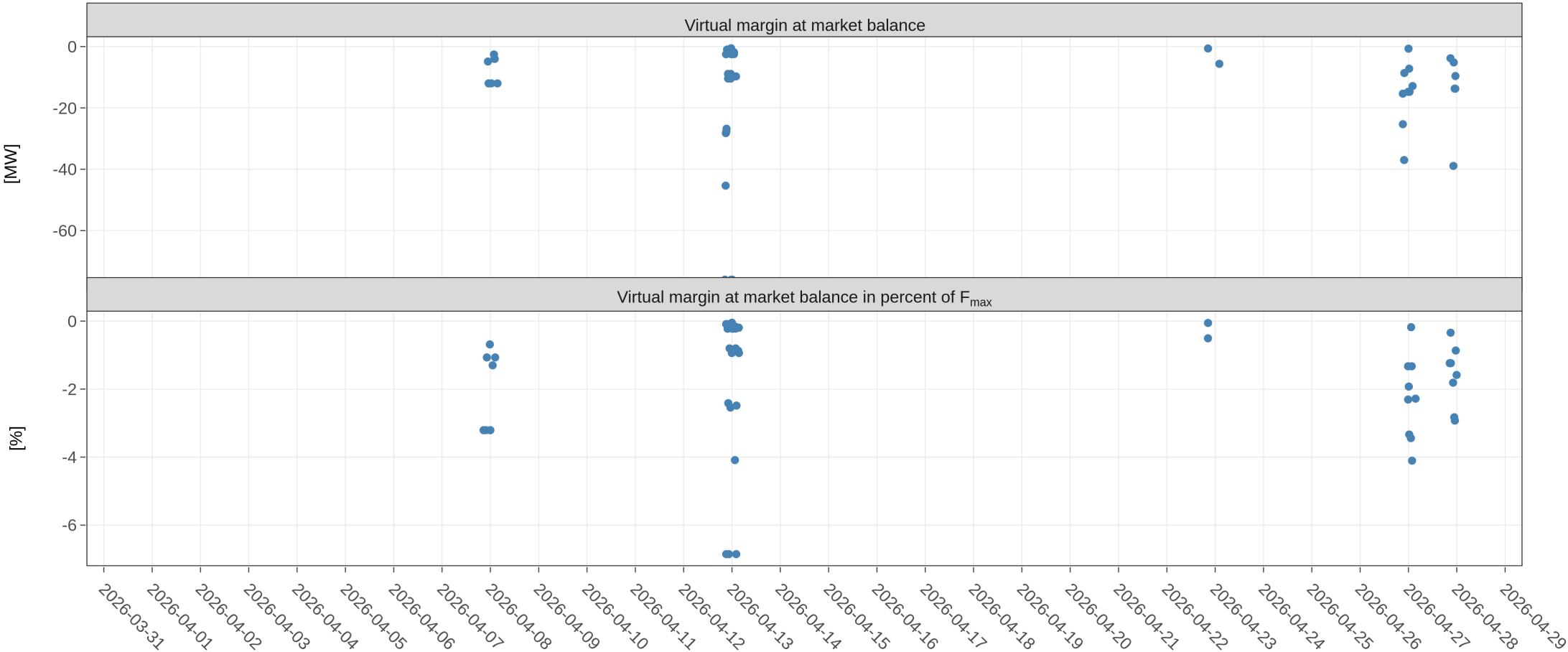
KPI 6b: Virtual margins at market balance PL



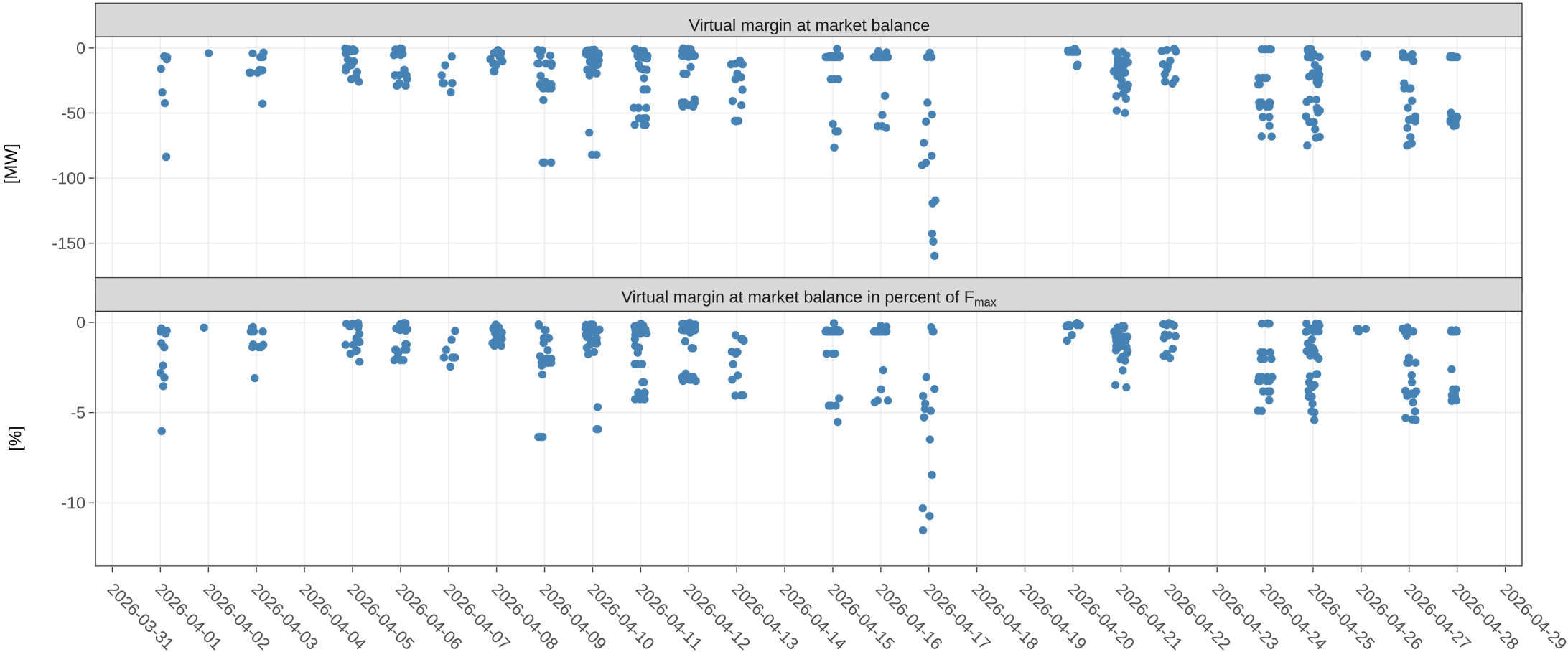
KPI 6b: Virtual margins at market balance RO



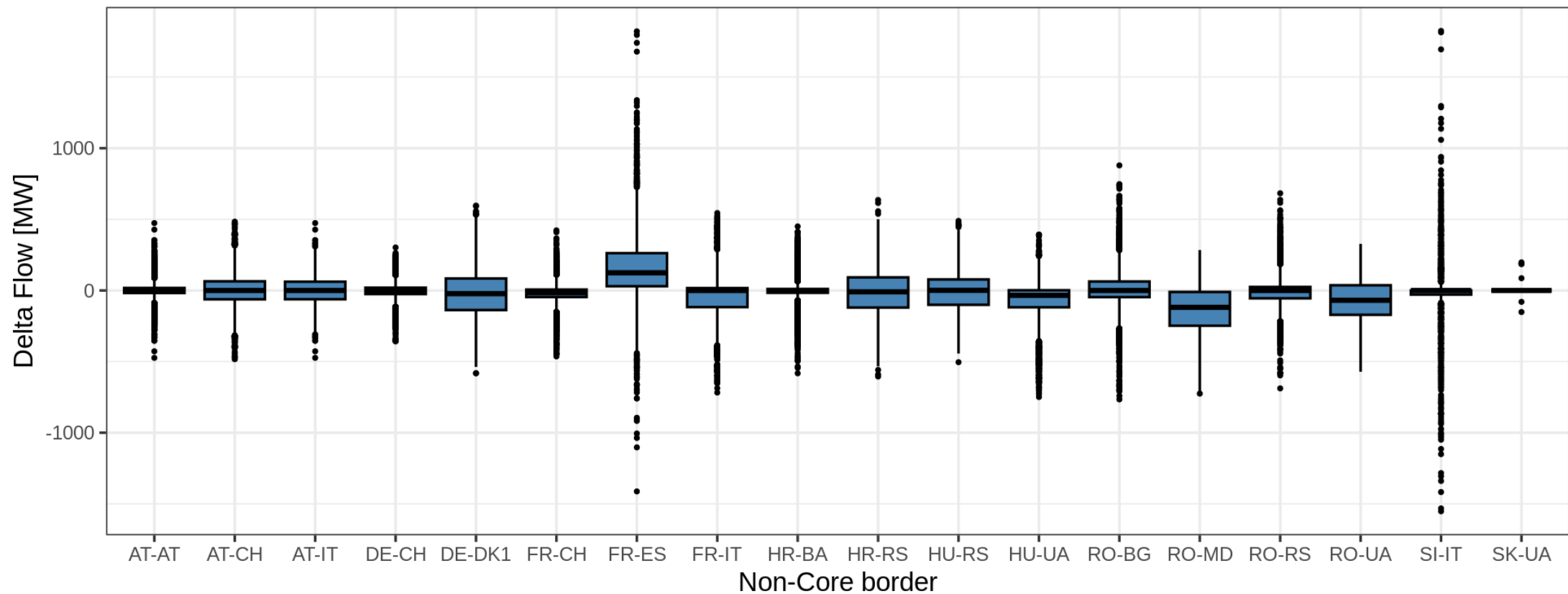
KPI 6b: Virtual margins at market balance SI



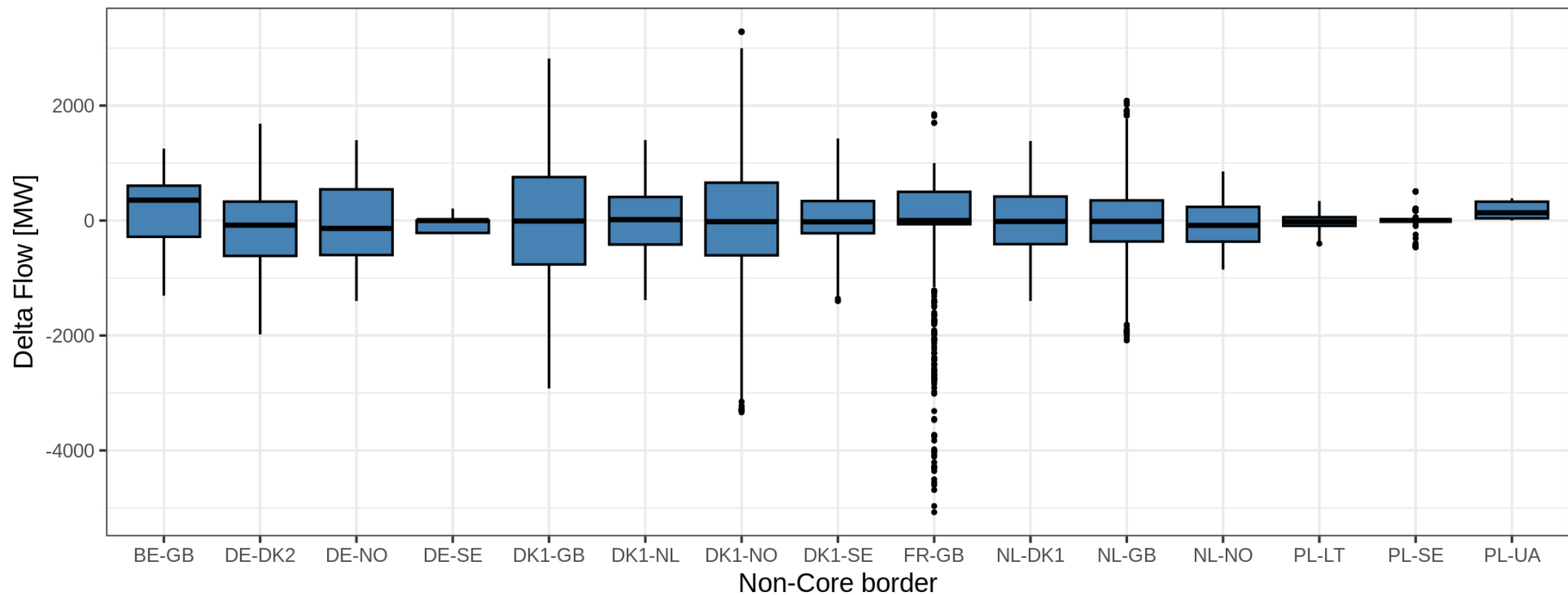
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



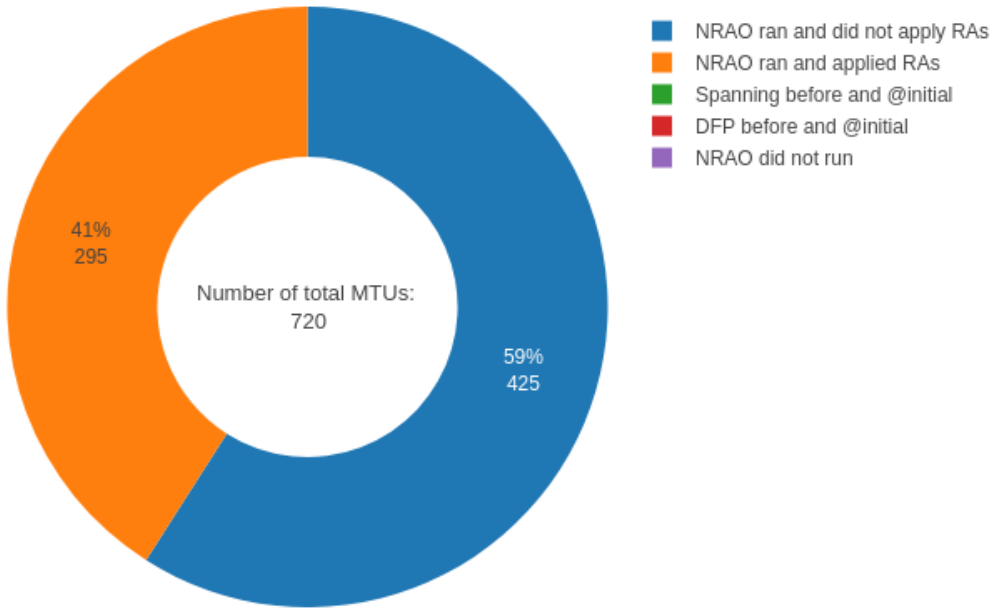
KPI 8: NRAO – Applied Remedial Action



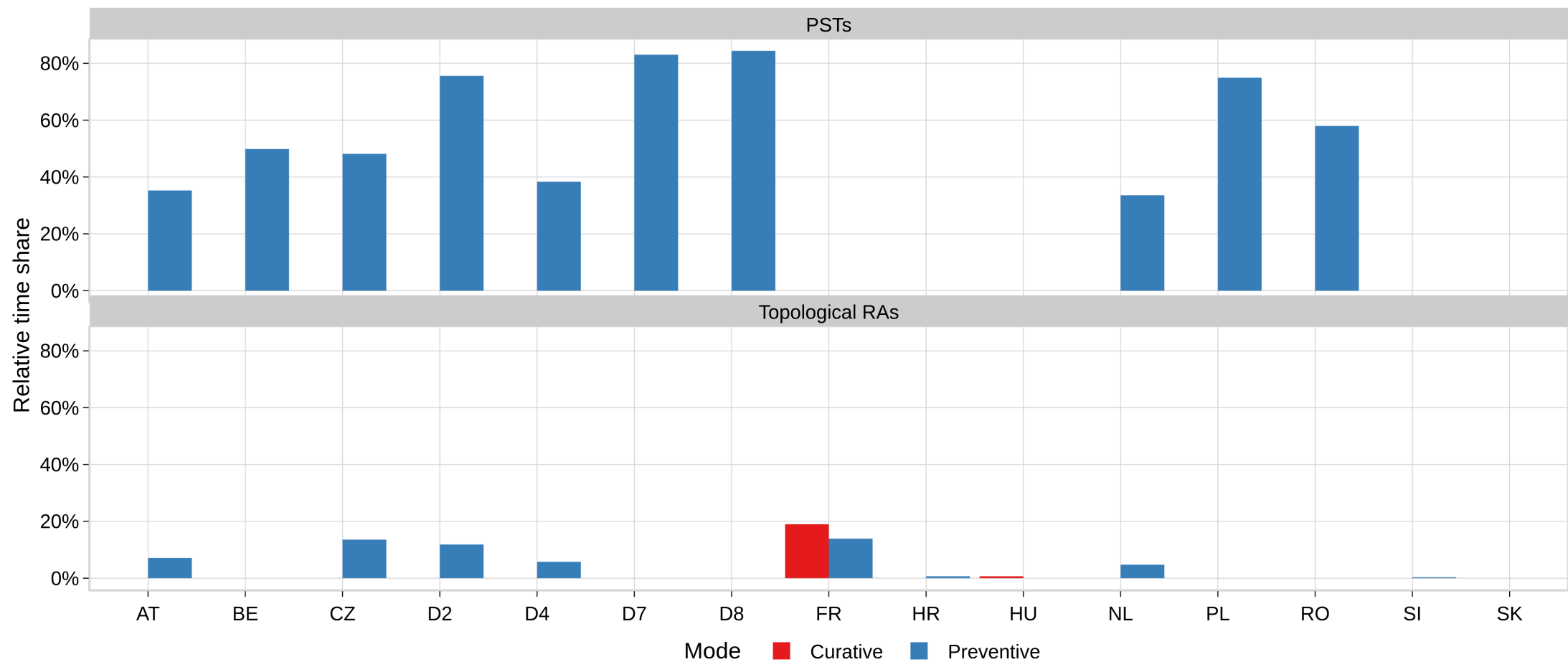
In the following plots, the relative time share relates to the hours labeled ‘NRAO Ran and Applied RAs’.

Total MTUs: 720 hours

Category	Hours (%)
NRAO ran and did not apply RAs	425 hours (59%)
NRAO ran and applied RAs	295 hours (41%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

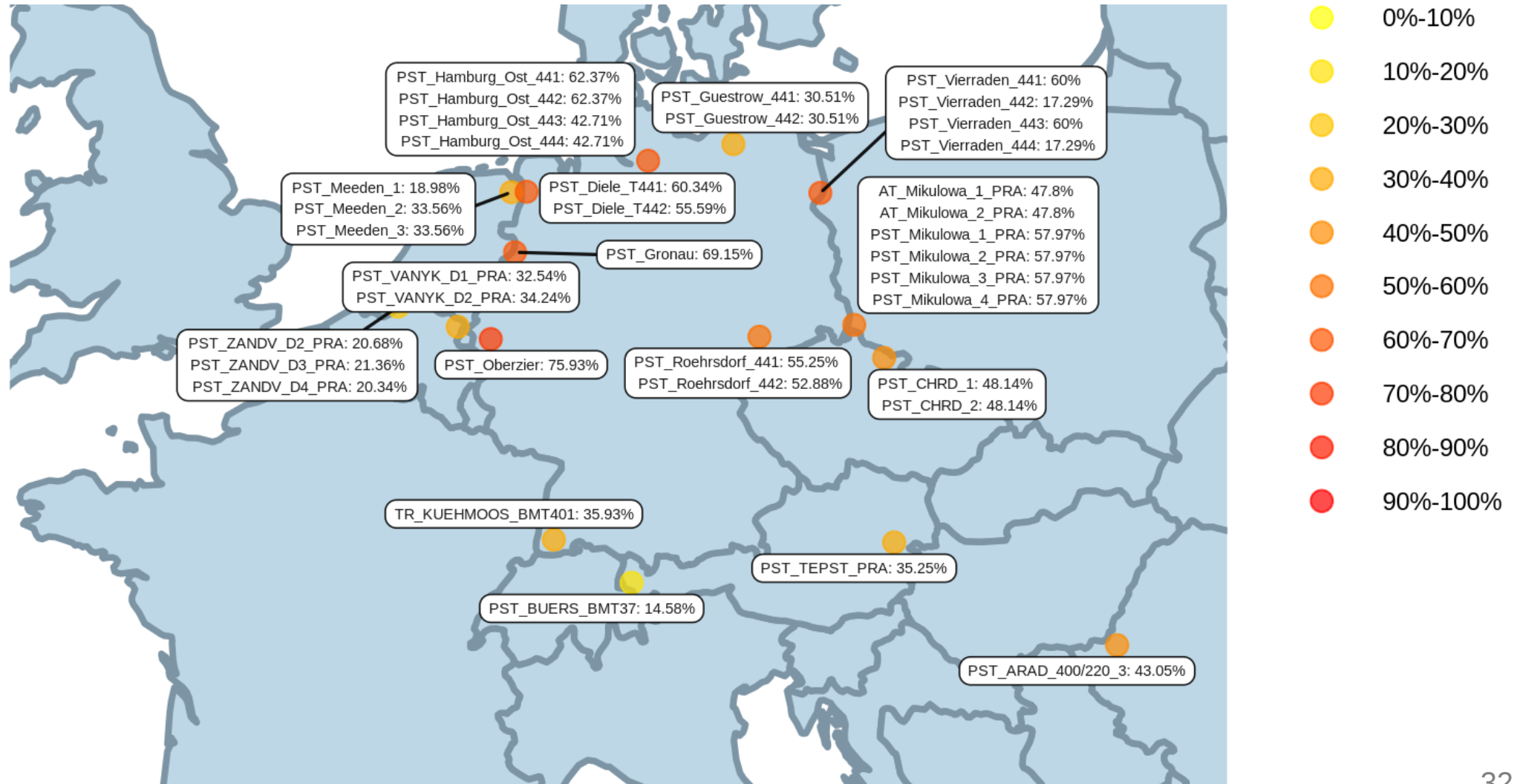


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



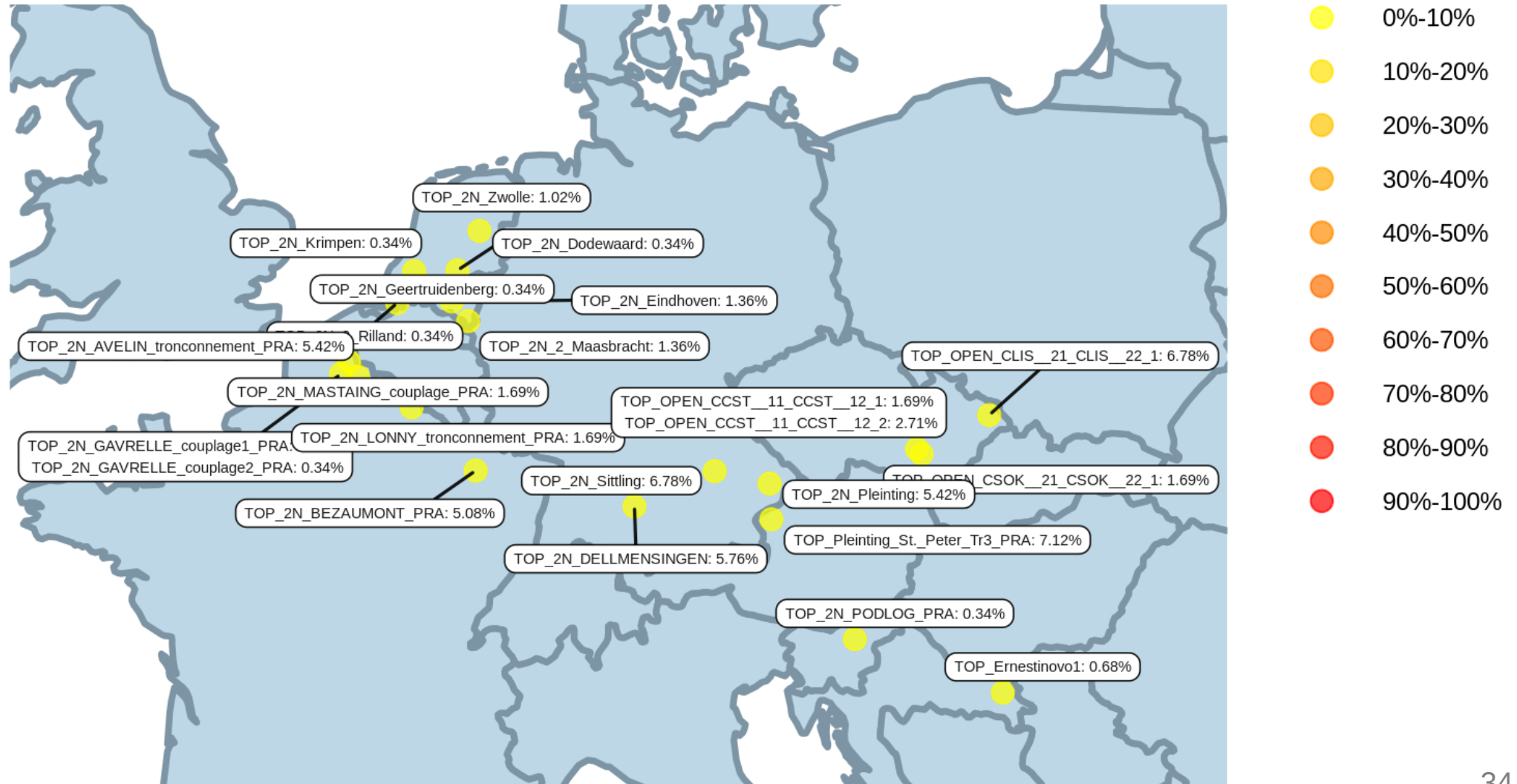
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



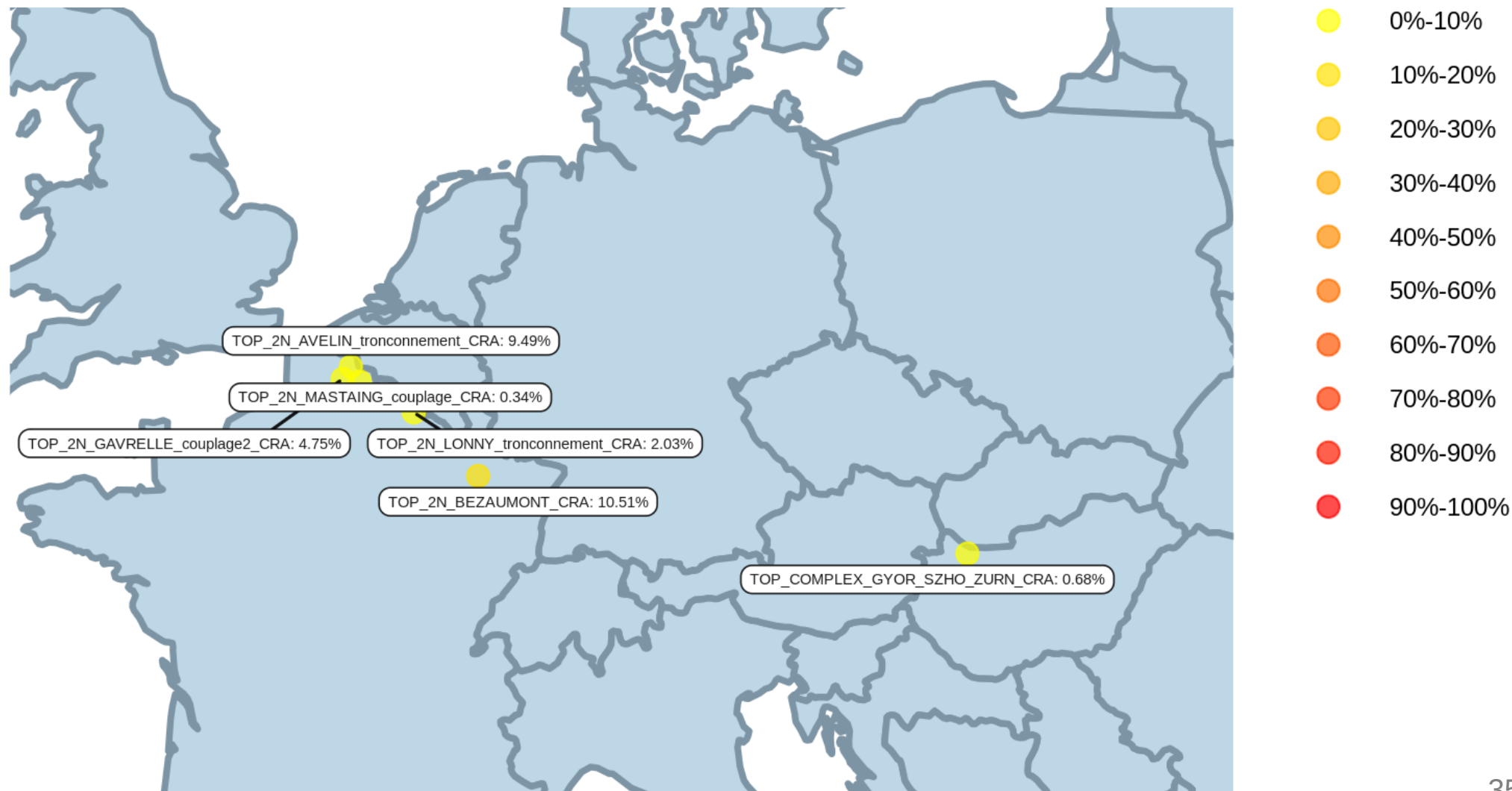
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

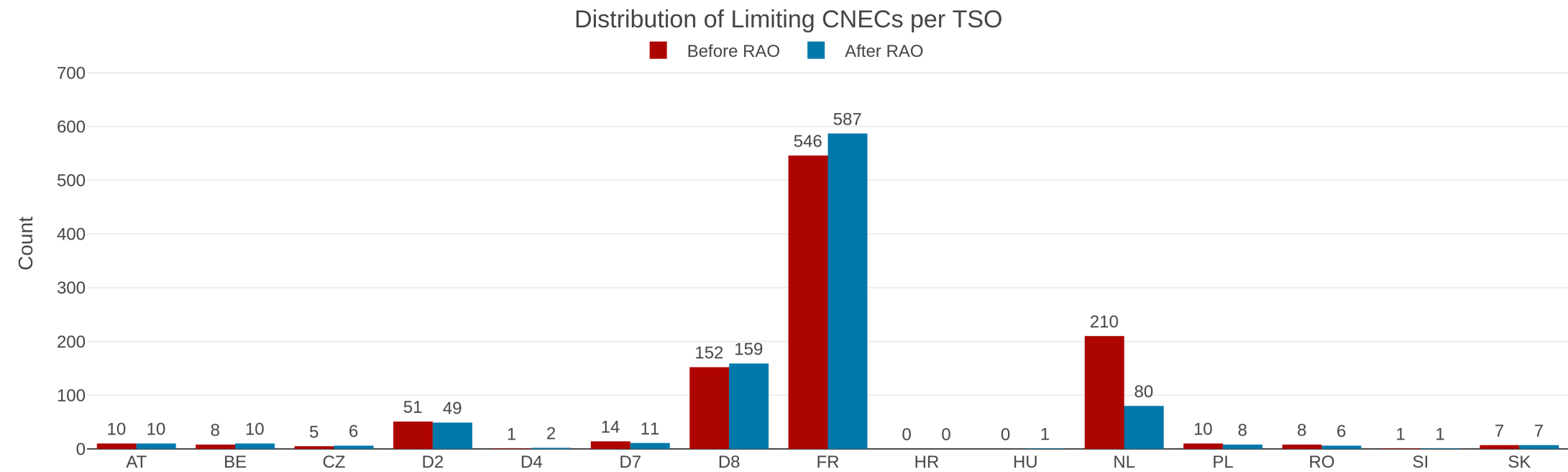
Relative Time Share of Applied Topological RAs in Curative Mode



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.

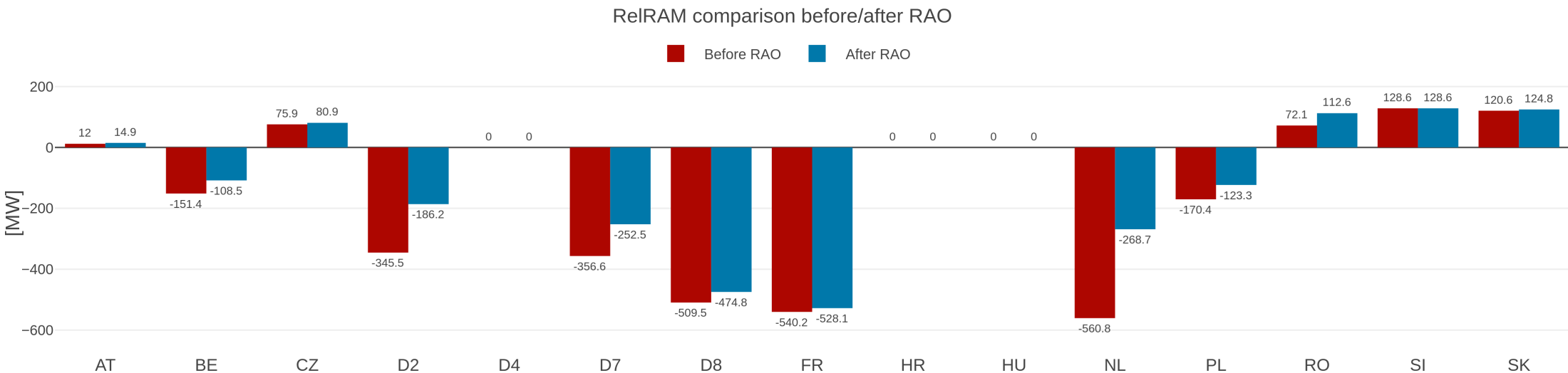
KPI 10: Average variation of relative RAM before and after NRAO



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
[CZ-SK] Nosovice - Varin [OPP] [CZ]	719	1418	99.10%	70.89%	135.91%	0.4388	1.6911
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	719	1594	72.64%	57.71%	94.95%	0.2833	1.3618
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	719	796	59.09%	24.60%	89.57%	0.2651	0.6086
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	719	1412	112.90%	78.61%	158.56%	0.2651	0.6086
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	716	1439	107.92%	85.03%	133.27%	0.2833	1.3618
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	712	1377	91.96%	29.89%	180.47%	0.1817	0.6193
[D8-PL] Mikulowa PST1 [DIR] [PL]	699	699	57.61%	19.85%	92.58%	0.3961	1.4224
[CZ-SK] Liskovec - P. Bystrica [OPP] [CZ]	698	698	103.60%	77.22%	137.45%	0.1158	0.4211
[SK-SK] V.Dur - Levice 1 [DIR]	695	695	47.65%	30.23%	64.44%	0.3001	1.1224
[CZ-SK] Nosovice - Varin [DIR] [CZ]	694	984	74.56%	30.03%	123.74%	0.4388	1.6911
[SK-SK] Gabčíkovo - P.Biskupice [DIR]	694	694	88.12%	69.55%	108.29%	0.3882	1.3421
[RO-RO] Resita - Timisoara c1 [DIR]	693	701	38.22%	20.32%	91.18%	0.1195	0.1801
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	693	1703	79.53%	18.42%	150.00%	0.1817	0.6193
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	691	1495	66.13%	20.07%	115.73%	0.1895	0.7252
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	691	691	66.25%	40.28%	95.47%	0.3195	1.392
[D8-D8] Reuter - Mitte 903 [OPP]	687	742	81.29%	20.22%	107.58%	0.1056	0.3971
[SK-HU] Levice - God [DIR] [HU]	686	686	57.69%	31.17%	77.85%	0.3805	1.258
[HU-UA] Kisvarda - Mukachevo [DIR] [HU]	678	950	55.93%	19.72%	94.37%	0.106	0.2568
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	675	1536	63.55%	19.90%	122.90%	0.278	1.115
[BE-BE] Doel - Zandvliet 380.25 [OPP]	661	661	91.74%	55.28%	138.23%	0.3378	0.7432

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]	410	410	1127.35	21.14%	19.97%	40.18%	0.1445
[SK-HU] Levice - God [DIR] [HU]	284	284	1103.04	53.11%	31.17%	71.72%	0.3738
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	240	262	890.92	79.27%	52.88%	108.15%	0.3466
[NL-NL] MEE DRT2 [DIR] [NL]	151	151	778.07	38.29%	19.96%	100.95%	0.42
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	94	94	1232.37	20.94%	19.97%	32.32%	0.1439
[CZ-SK] Nosovice - Varin [DIR] [SK]	85	85	454.91	66.49%	51.76%	86.83%	0.4164
[FR-D7] Vigy - Ensdorf VIGY1 N [DIR] [D7]	73	77	806.83	30.21%	19.90%	69.75%	0.2442
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	72	72	329.36	51.53%	30.95%	76.31%	0.423
[D8-PL] Mikulowa PST1 [DIR] [PL]	71	71	488.33	47.70%	19.85%	65.23%	0.3912
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	59	59	757.11	45.75%	20.07%	101.63%	0.1526
[RO-RO] Resita - Timisoara c1 [DIR]	58	58	3316.39	36.05%	20.59%	72.19%	0.1176
[HU-UA] Kisvarda - Mukachevo [DIR] [HU]	56	58	6897.64	39.15%	19.72%	66.20%	0.1031
[CZ-PL] Nosovice - Wielopole [OPP] [CZ]	52	52	556.83	67.40%	54.76%	81.96%	0.4233
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	51	52	526.43	71.56%	29.89%	106.33%	0.1713
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	37	37	461.83	62.04%	49.82%	87.26%	0.2951
[HU-HU] Martonvasar - Dunamenti 1 [DIR]	35	35	2712.49	37.81%	25.26%	50.72%	0.0898
[D8-D8] Reuter - Mitte 903 [OPP]	33	33	1497.05	70.22%	58.12%	88.81%	0.1
[D2-D2] Altheim - Simbach 233/230 [DIR]	32	32	537.33	59.61%	34.16%	84.65%	0.1127
[AT-AT] Zell am Ziller 1 - Zell am Ziller 2 ZZRHU41 [DIR]	29	29	1004.25	31.42%	19.83%	54.92%	0.1821
[BE-FR] Avelgem - Avelin 80 [OPP] [FR]	28	28	458.67	62.85%	46.32%	81.00%	0.3753

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	391
AC < 0 MW	57
AC = 0 MW	314
AC > 0 MW	20

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-1475.4	6986.86
Min.	-8186.0	0.00
Max.	0.0	21064.00

