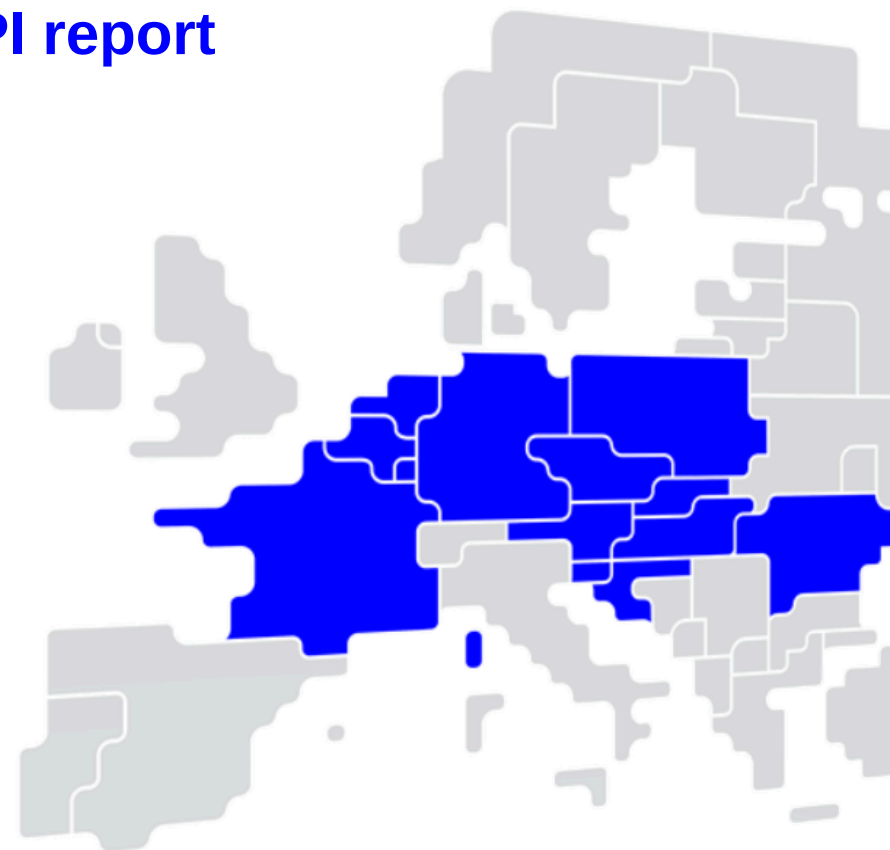




Core FB MC Operational KPI report

June 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

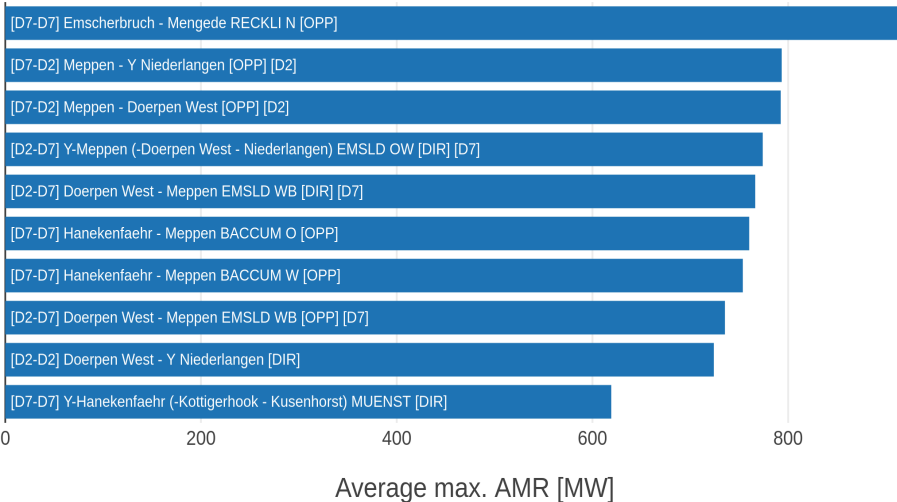
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
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Market Impact Assessment

- 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)
[D7-D7] Emscherbruch - Mengede RECKLI N [OPP]	911.57	42.95%	35.61%
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	793.40	41.39%	35.53%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	792.43	41.26%	32.50%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	774.01	31.03%	23.53%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	766.33	30.73%	21.51%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	760.22	34.64%	26.70%
[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	753.66	34.33%	24.75%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	735.40	29.49%	20.64%
[D2-D2] Doerpen West - Y Niederlangen [DIR]	724.06	37.75%	30.83%
[D7-D7] Y-Hanekenfaehr (-Kottigerhook - Kusenhorst) MUENST [DIR]	619.24	28.78%	5.04%

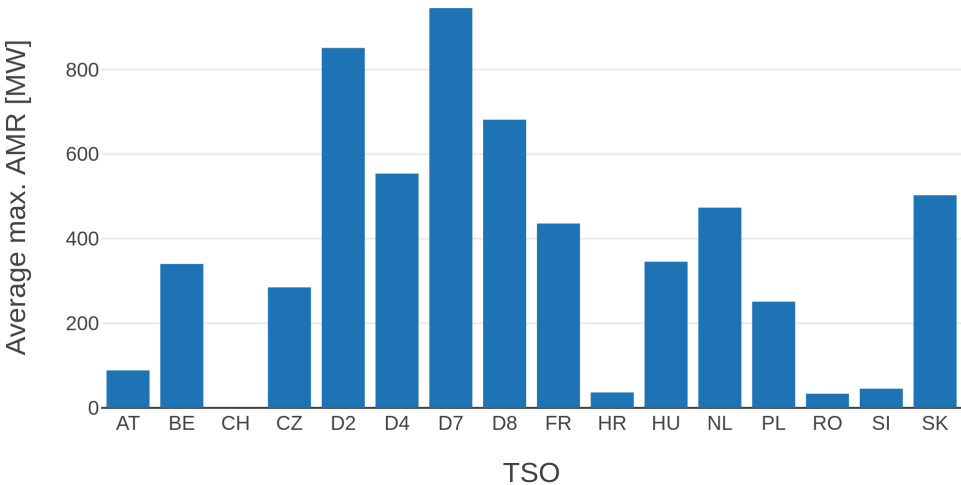


KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	88.42
BE	340.38
CH	0.00
CZ	284.76
D2	851.22
D4	554.09
D7	945.27
D8	681.42
FR	435.98
HR	36.39

TSO	Average maximum AMR per TSO
HU	345.67
NL	473.58
PL	251.02
RO	33.34
SI	45.28
SK	502.96



KPI 3: Share of MTUs with intervention per TSO



Total BDs
10

Total MTUs
240

MTUs without IVA
15

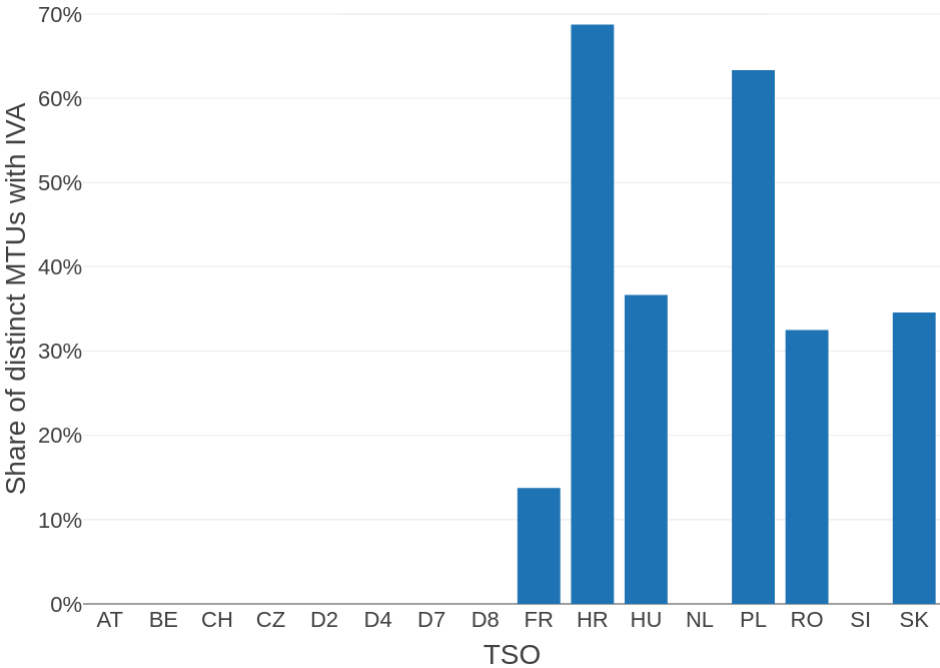
Share of distinct MTUs without IVA
6.25%

MTUs with IVA
225

Share of distinct MTUs with IVA
93.8%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
SI	0.00%	0
CZ	0.00%	0
AT	0.00%	0
D7	0.00%	0
D8	0.00%	0
D2	0.00%	0
PL	63.33%	152
D4	0.00%	0
SK	34.58%	83
HU	36.67%	88

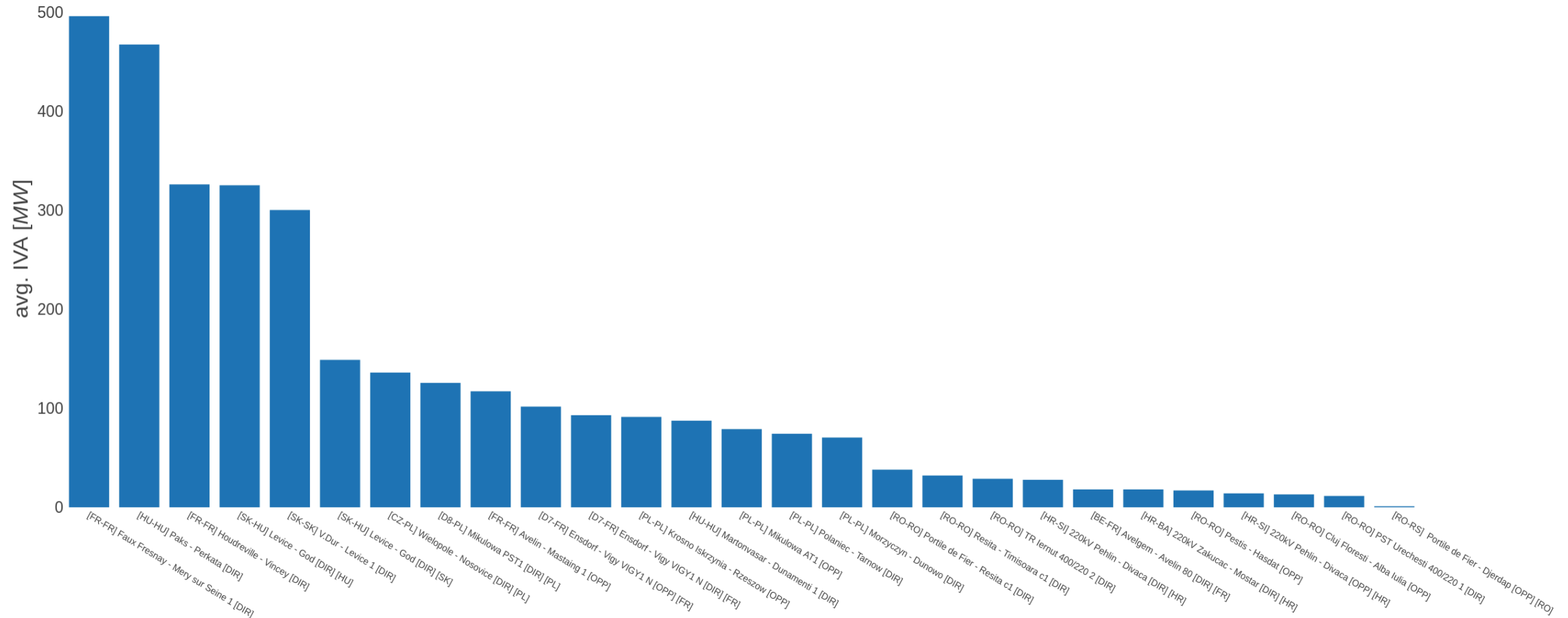
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
BE	0.00%	0
NL	0.00%	0
CH	0.00%	0
FR	13.75%	33
RO	32.50%	78
HR	68.75%	165



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



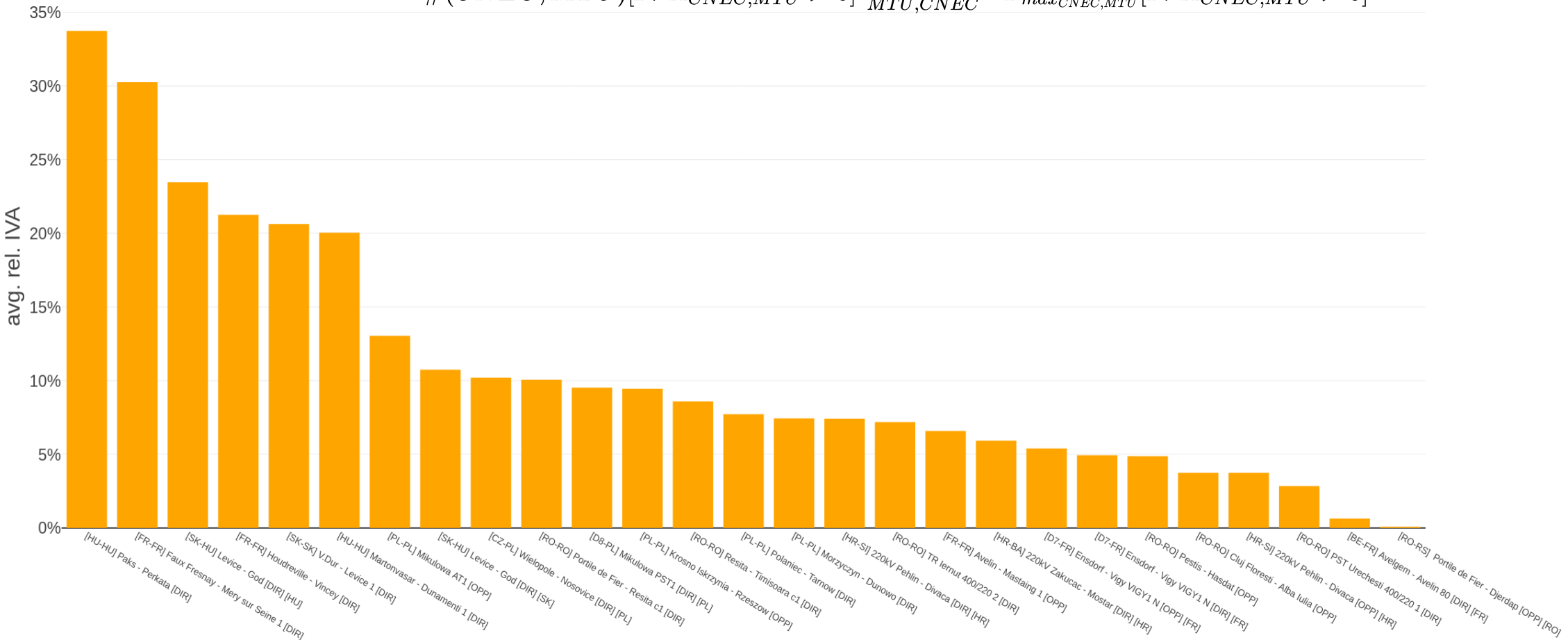
$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]$$



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



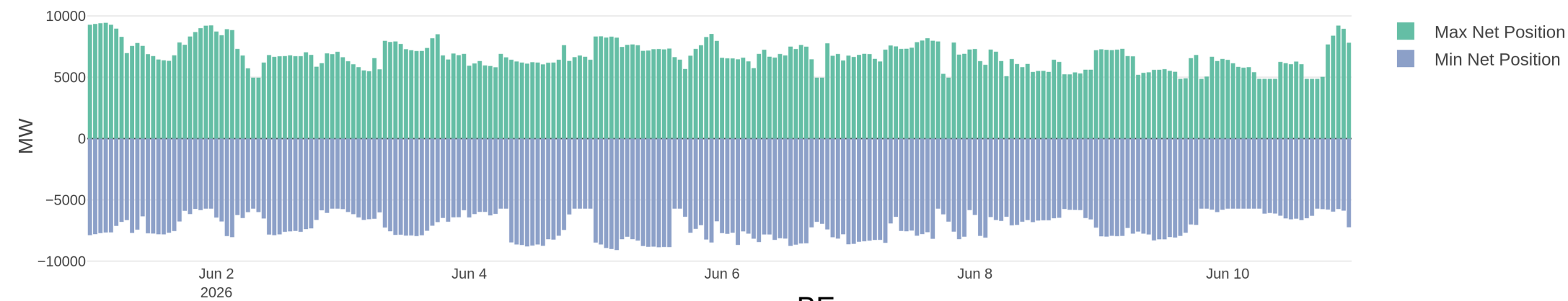
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{maxCNEC, MTU}[IVA_{CNEC, MTU} > 0]}$$



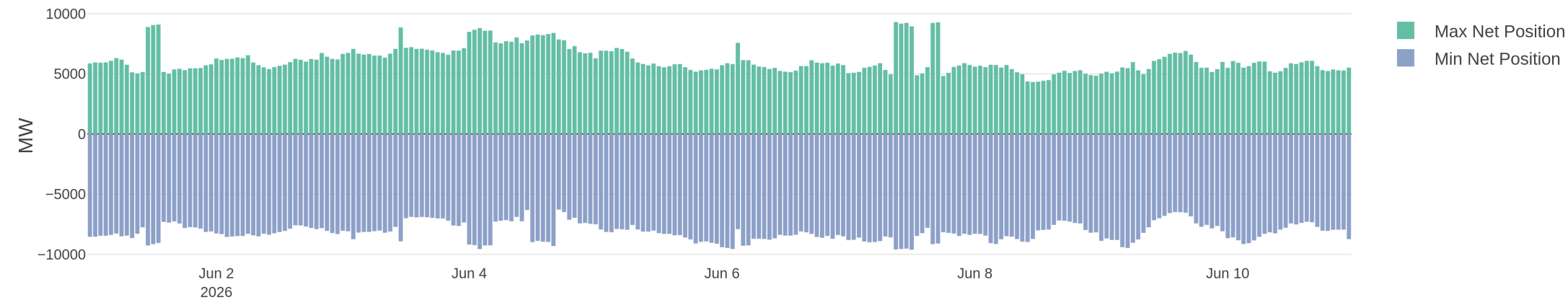
KPI 5: Min & max net positions per BZ hub



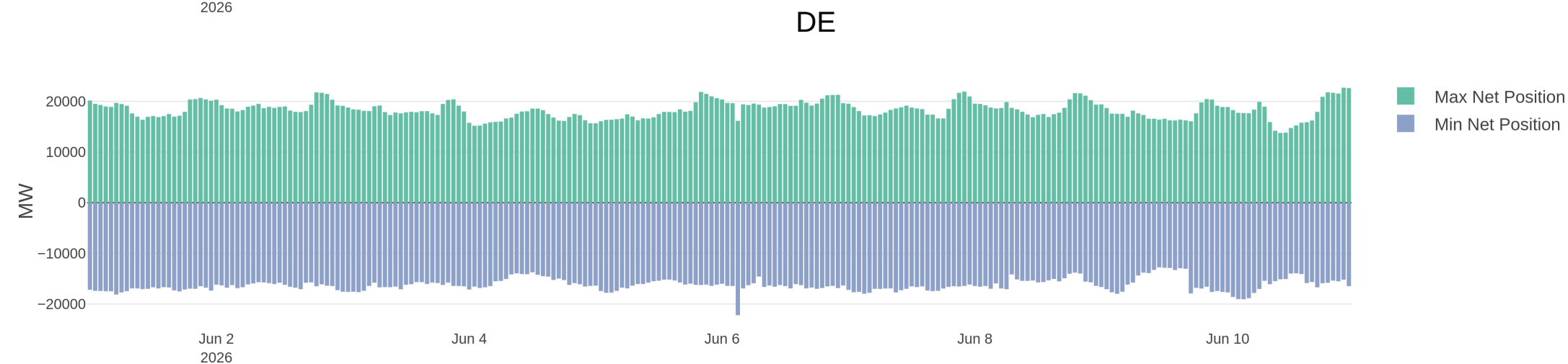
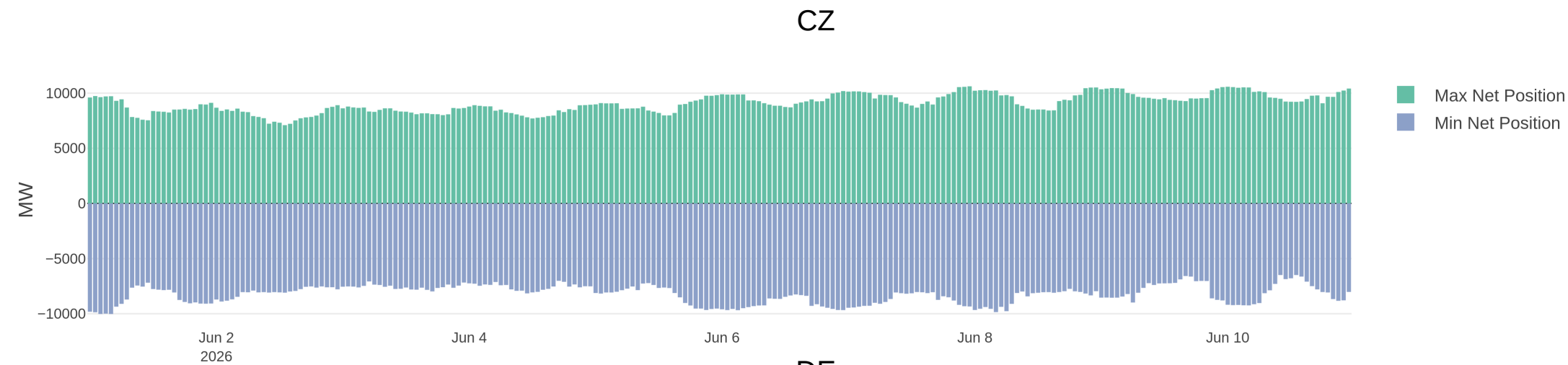
AT



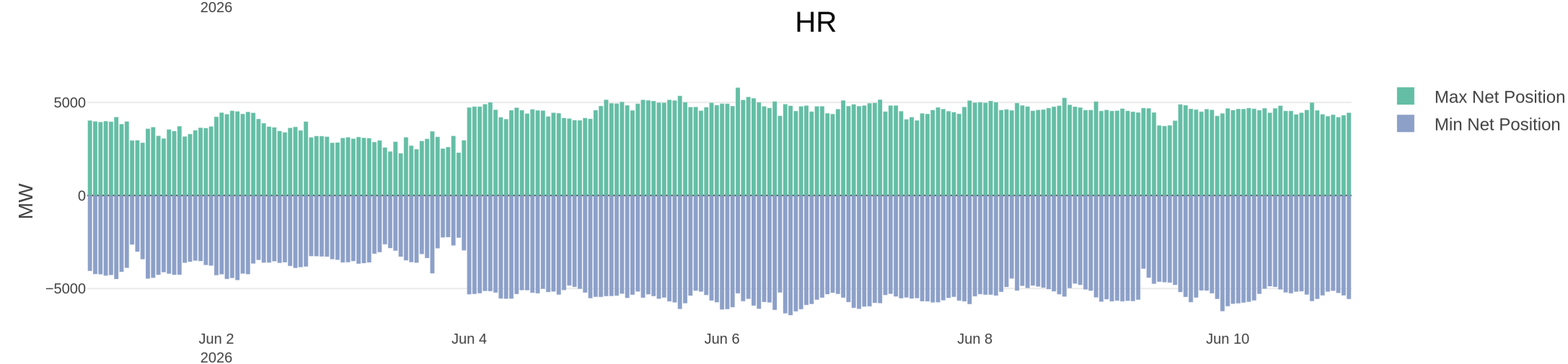
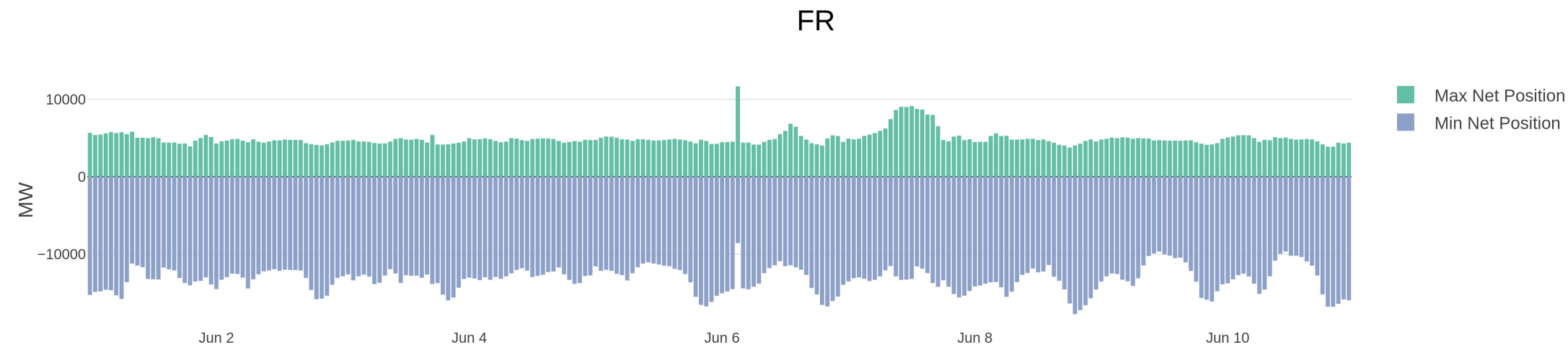
BE



KPI 5: Min & max net positions per BZ hub



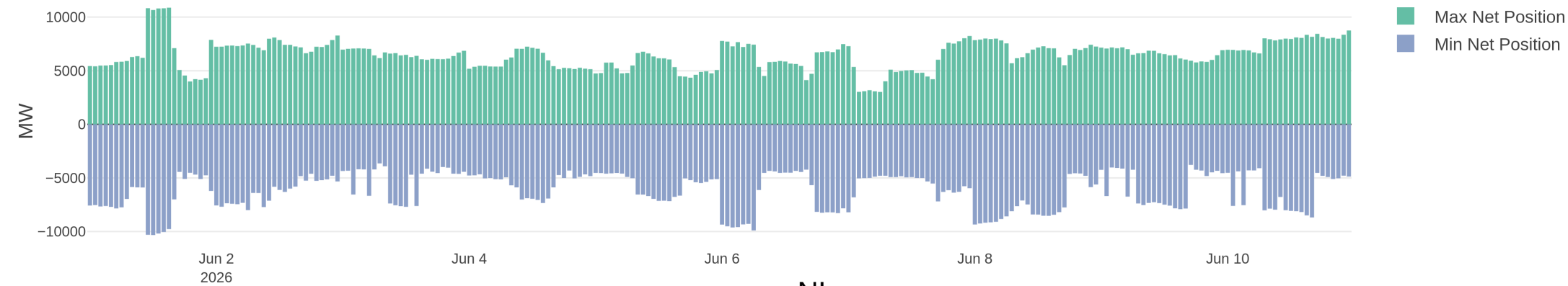
KPI 5: Min & max net positions per BZ hub



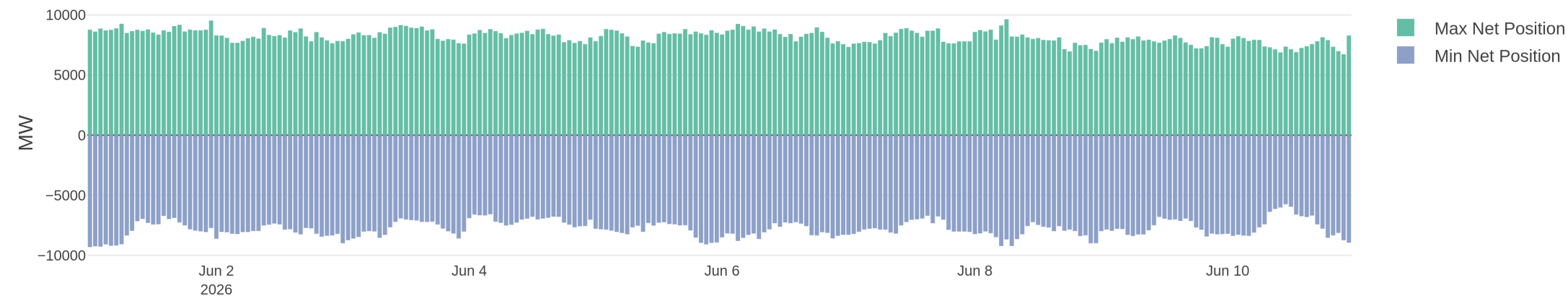
KPI 5: Min & max net positions per BZ hub



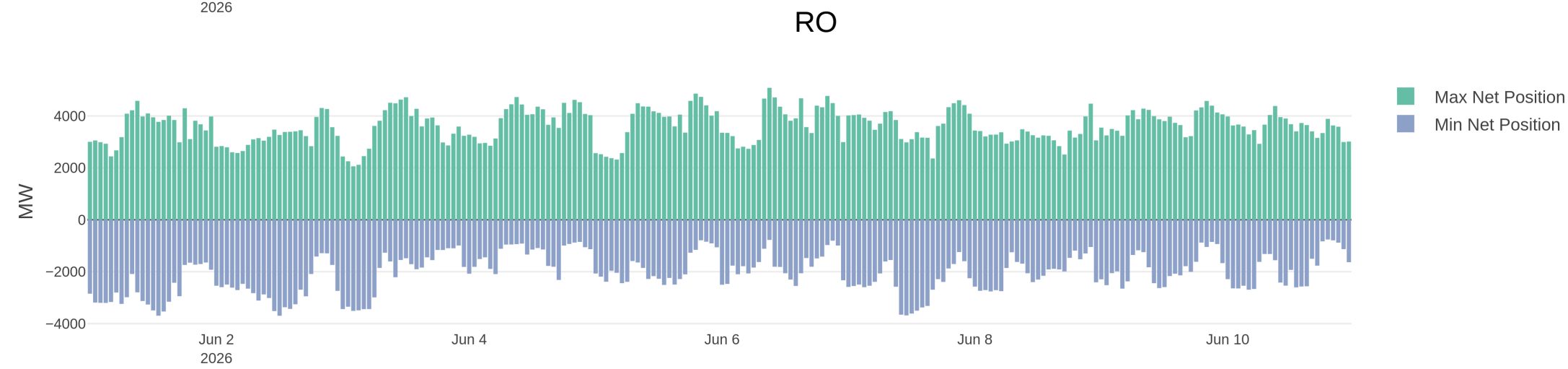
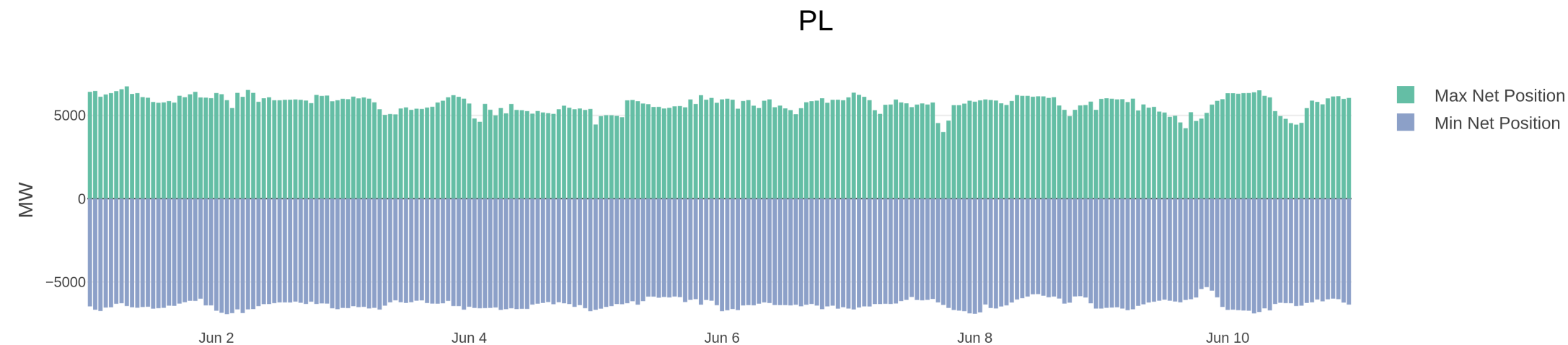
HU



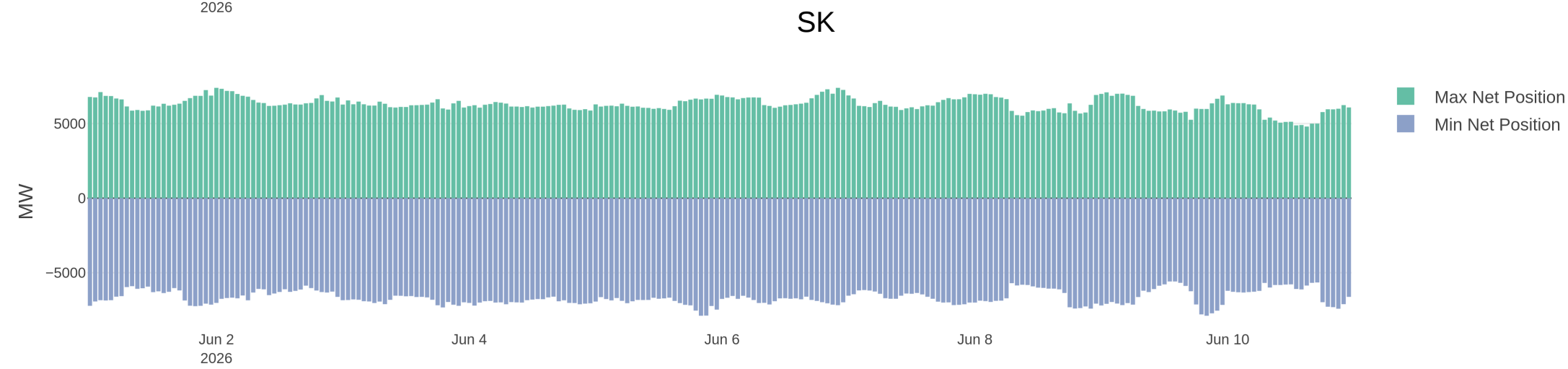
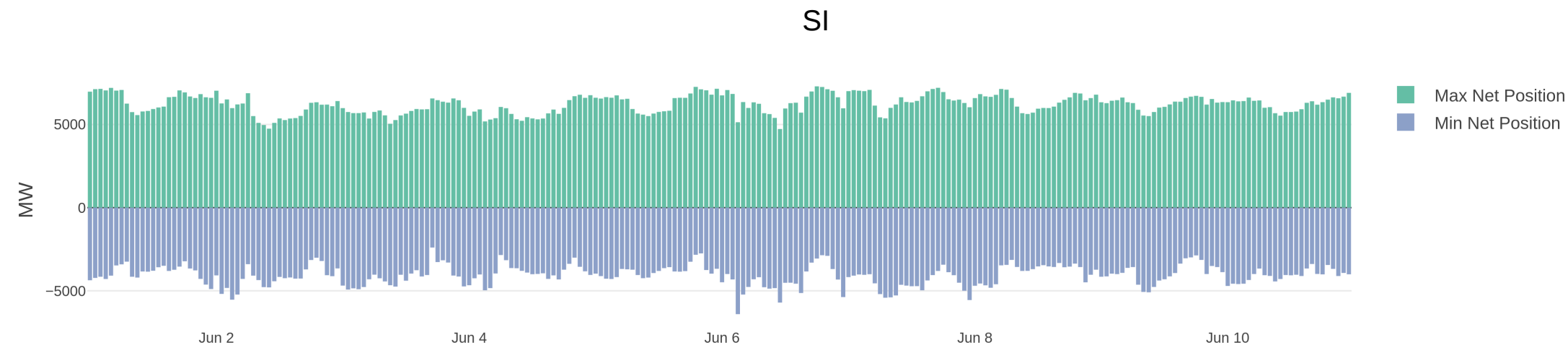
NL



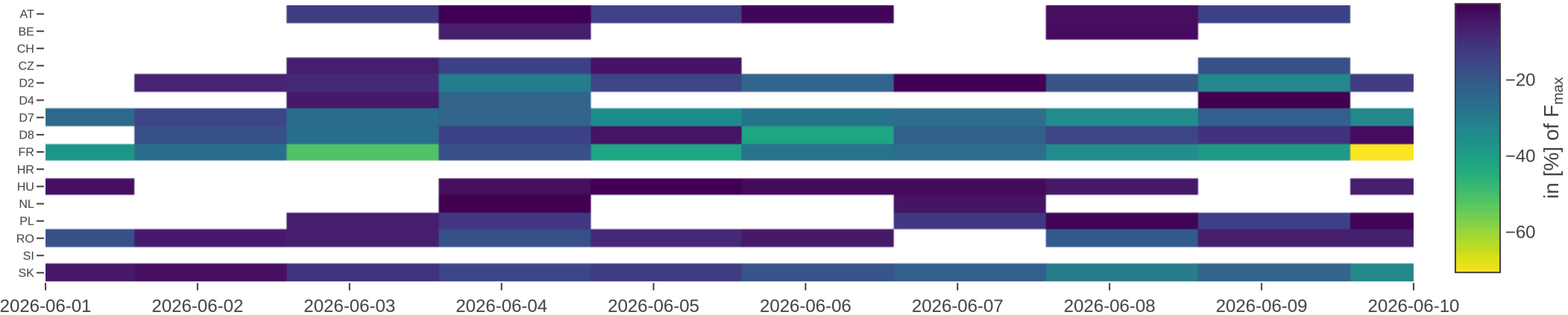
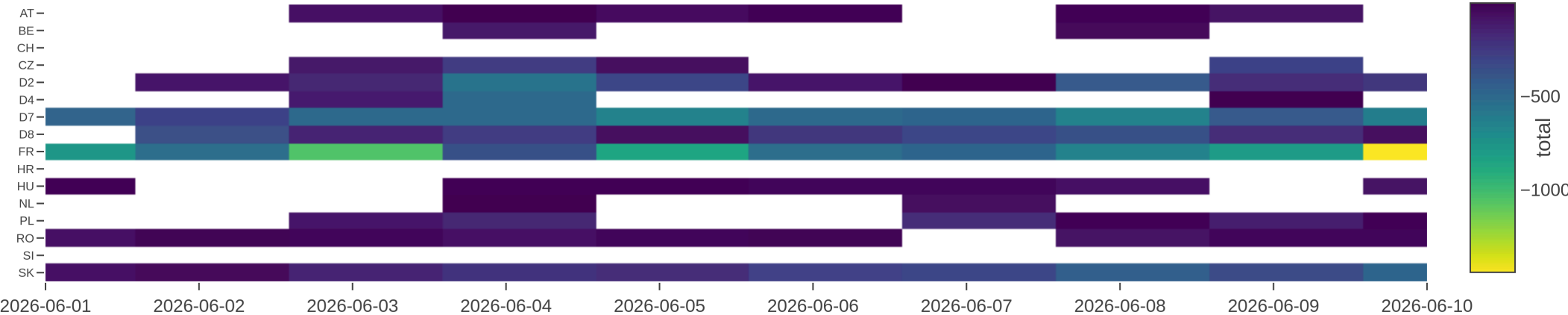
KPI 5: Min & max net positions per BZ hub



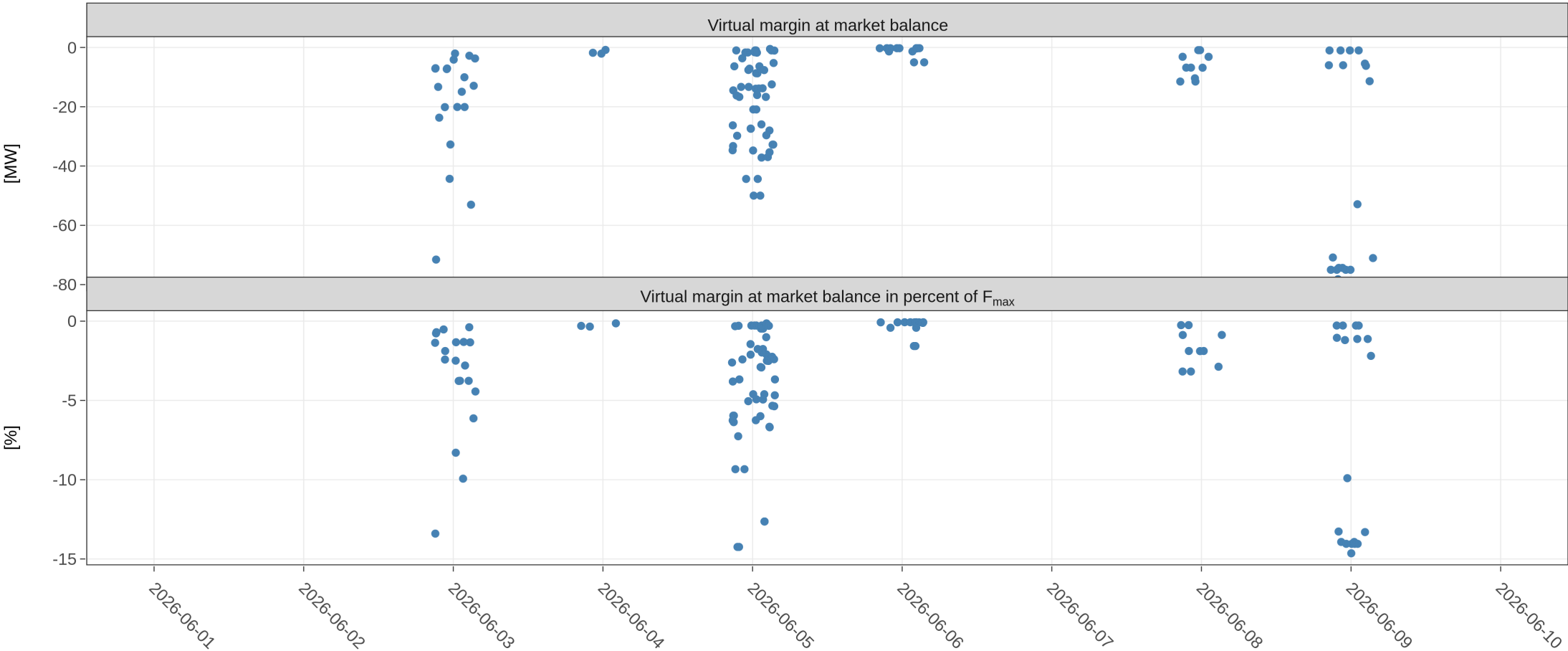
KPI 5: Min & max net positions per BZ hub



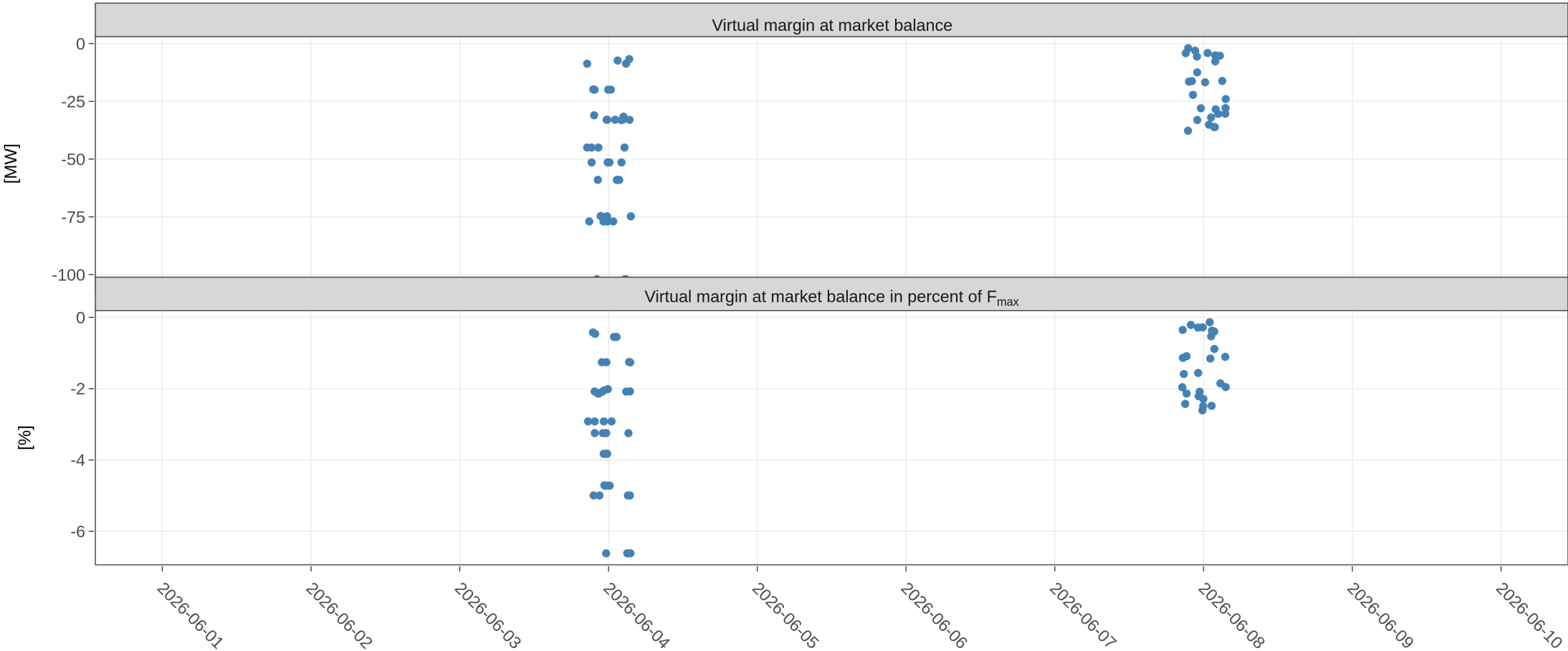
KPI 6a: Highest virtual margins at market balance for CORE TSOs



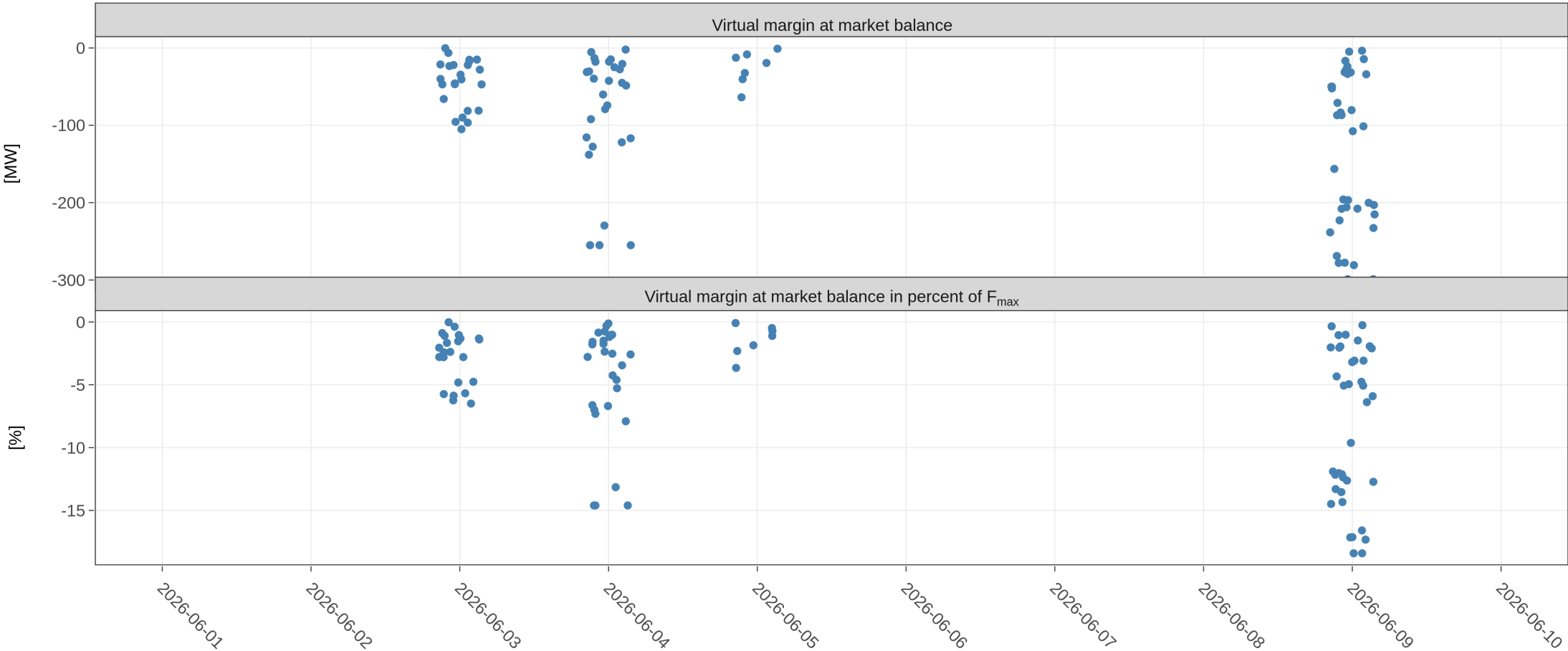
KPI 6b: Virtual margins at market balance AT



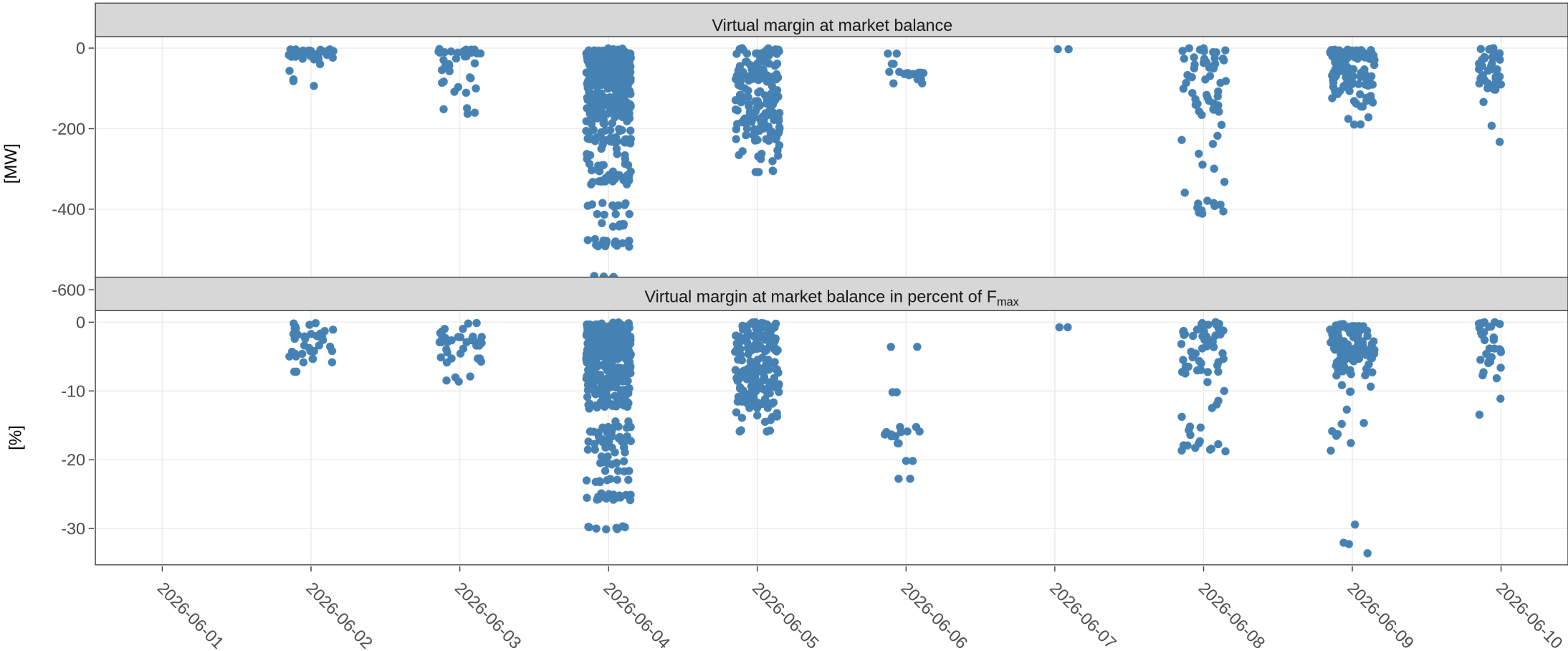
KPI 6b: Virtual margins at market balance BE



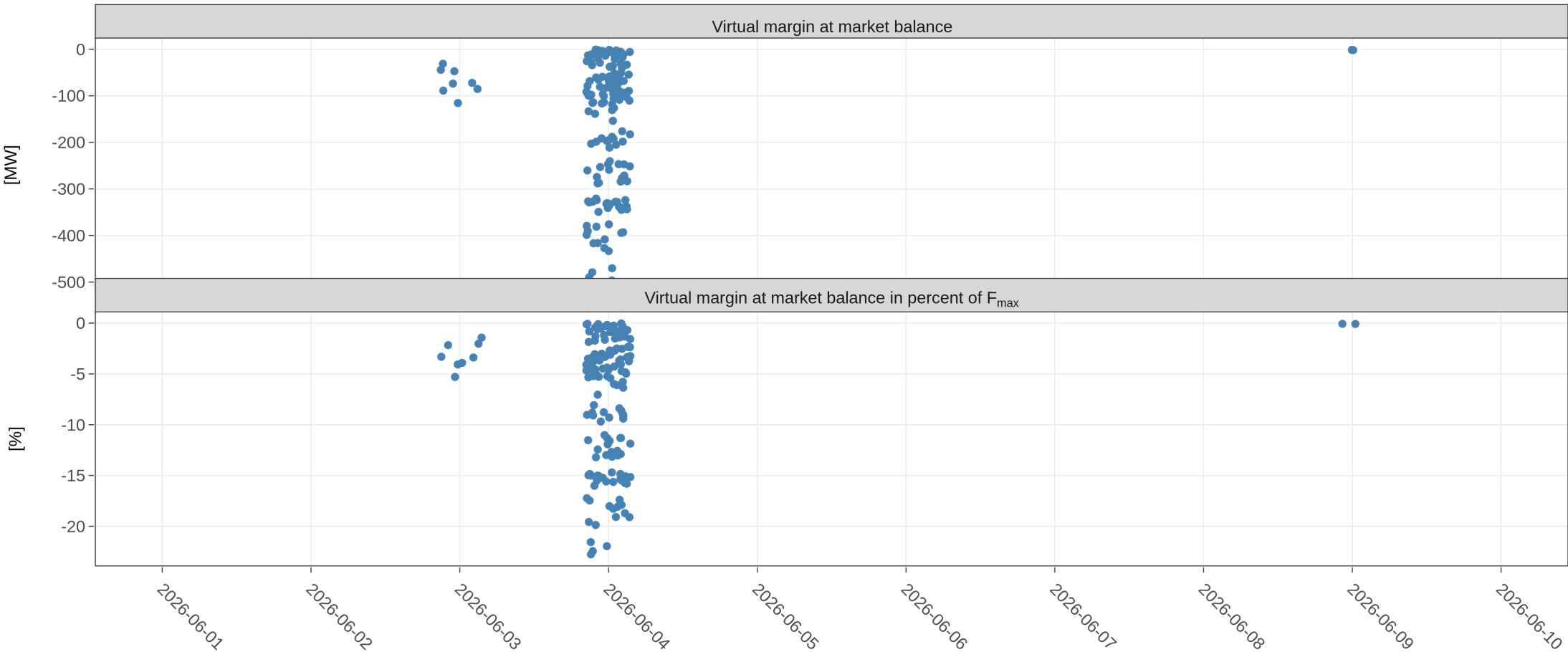
KPI 6b: Virtual margins at market balance CZ



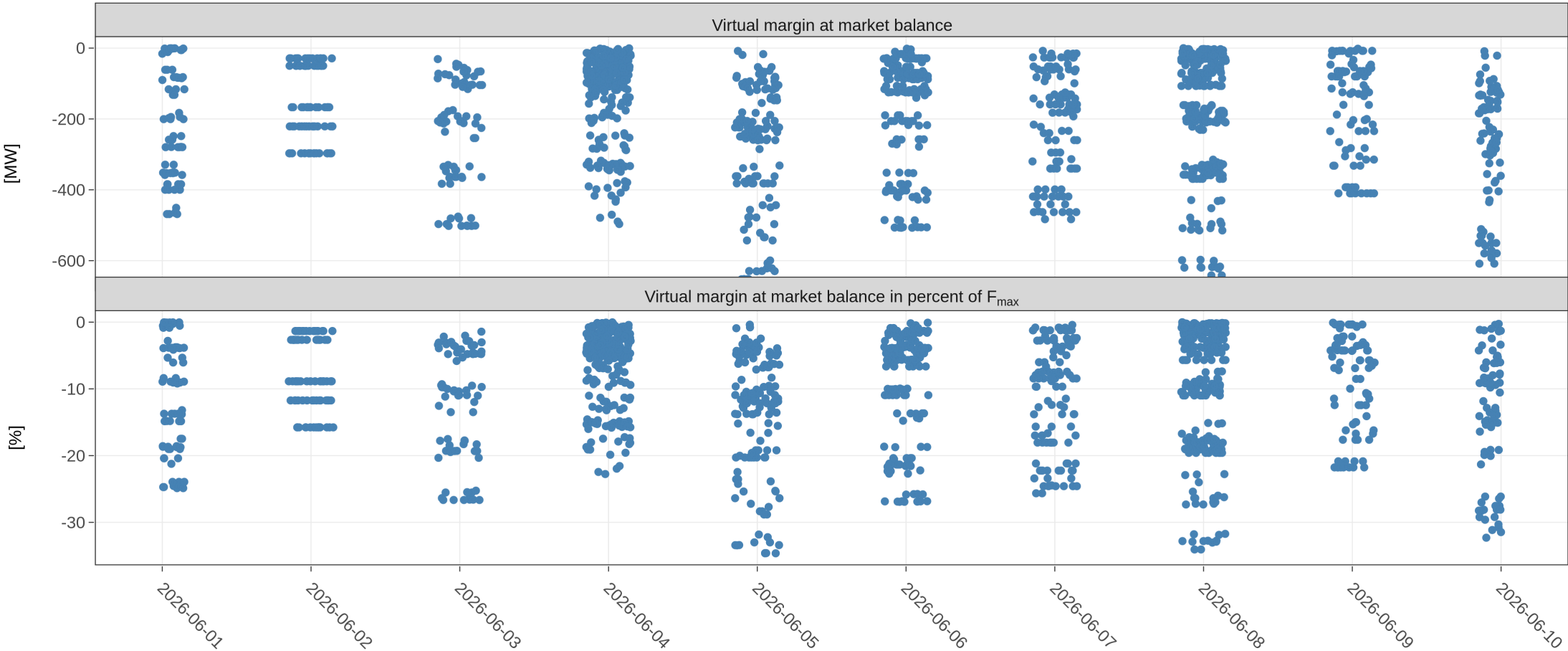
KPI 6b: Virtual margins at market balance D2



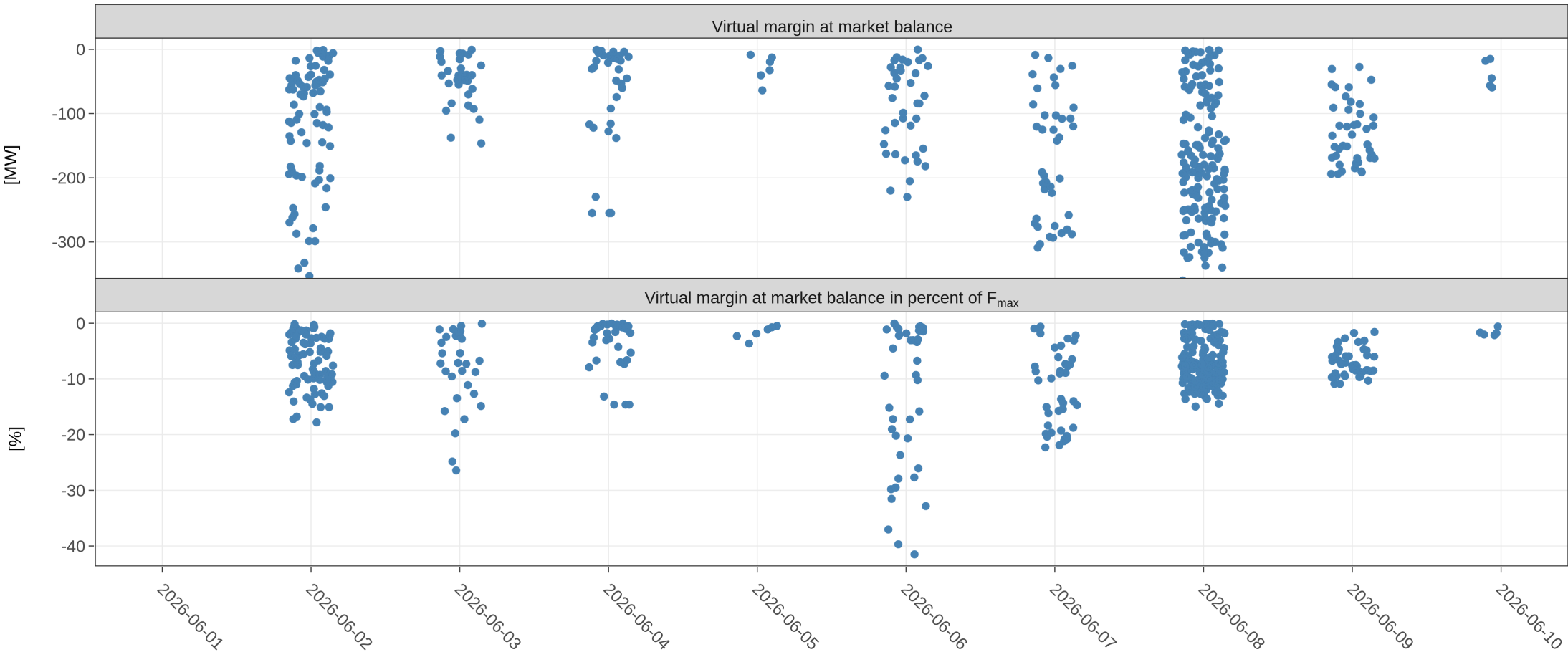
KPI 6b: Virtual margins at market balance D4



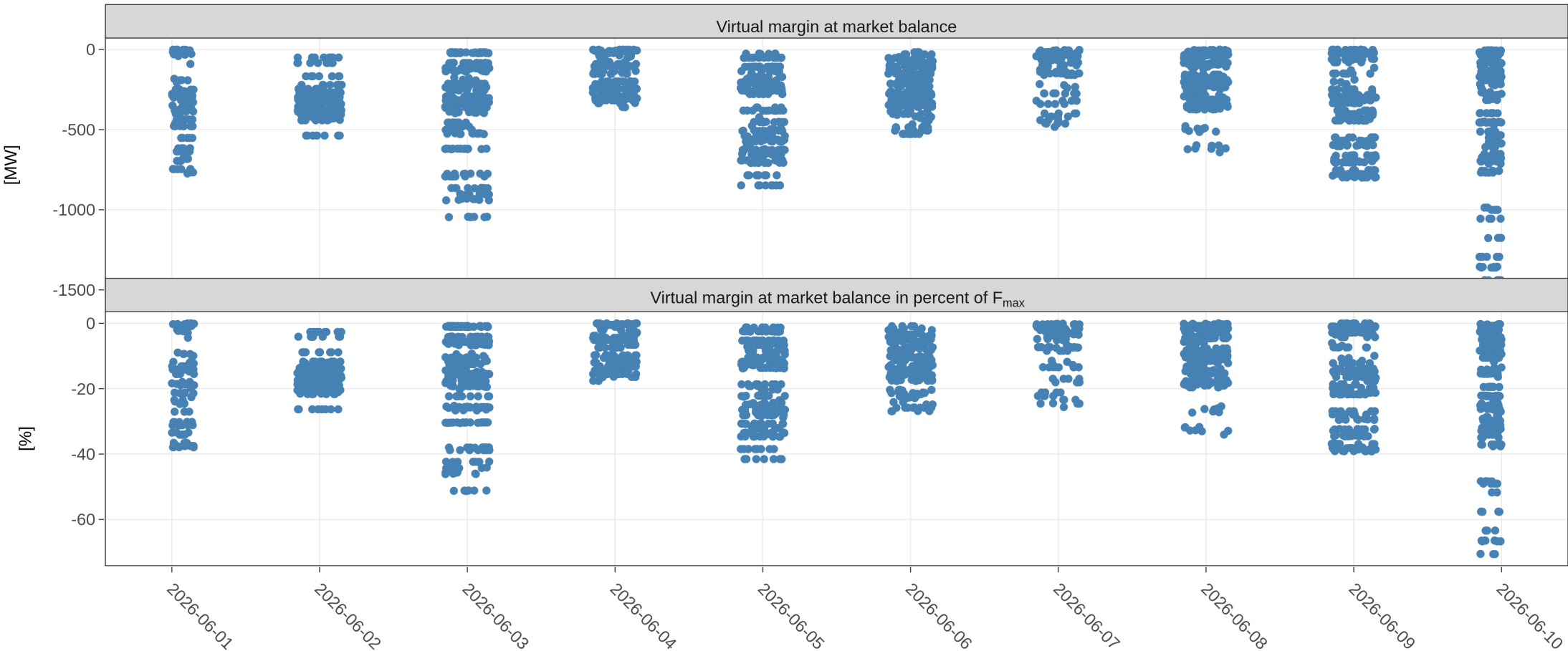
KPI 6b: Virtual margins at market balance D7



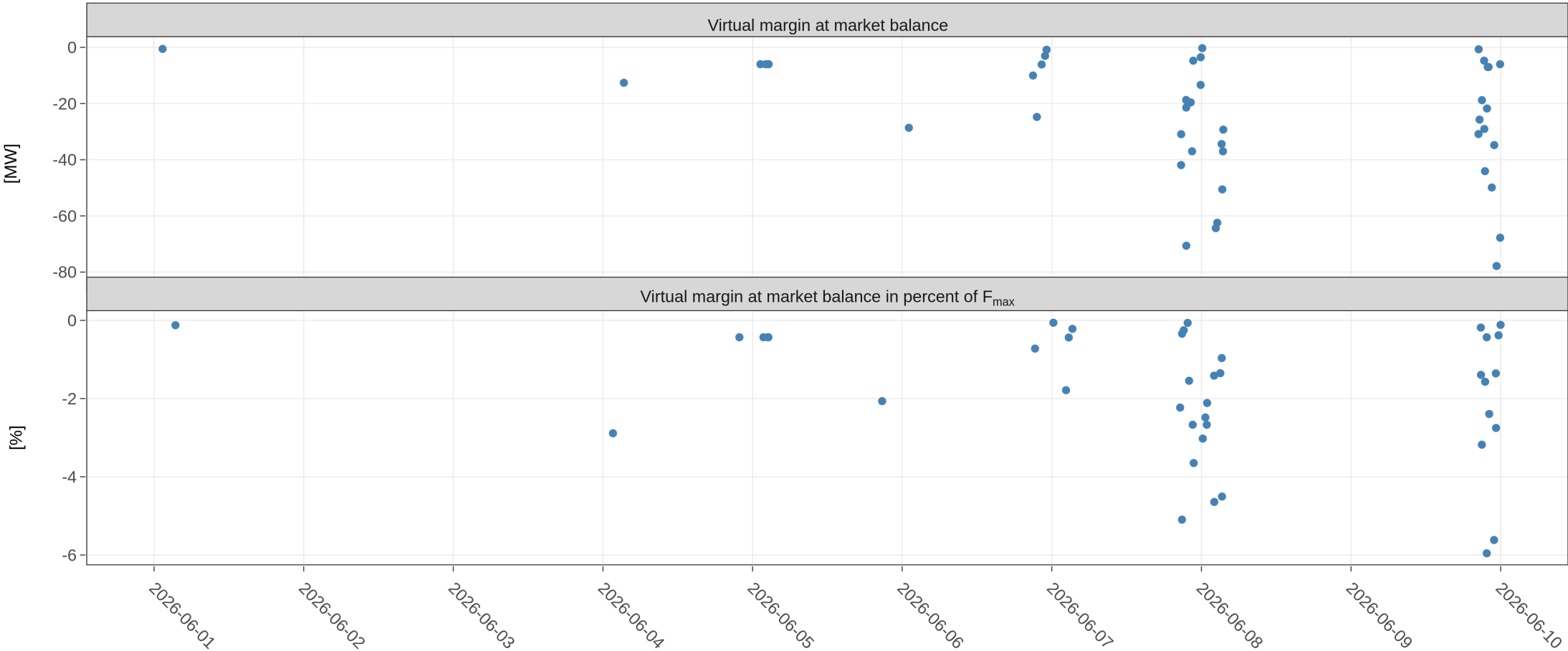
KPI 6b: Virtual margins at market balance D8



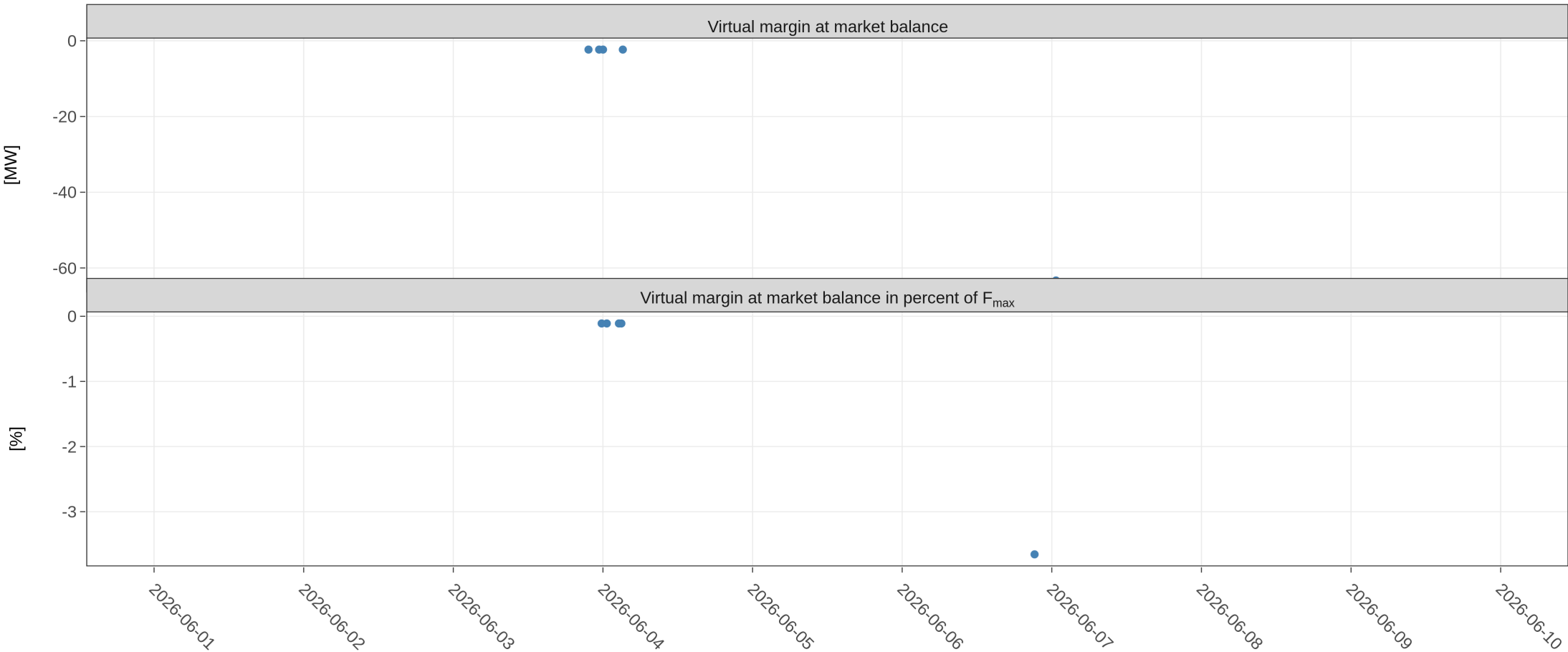
KPI 6b: Virtual margins at market balance FR



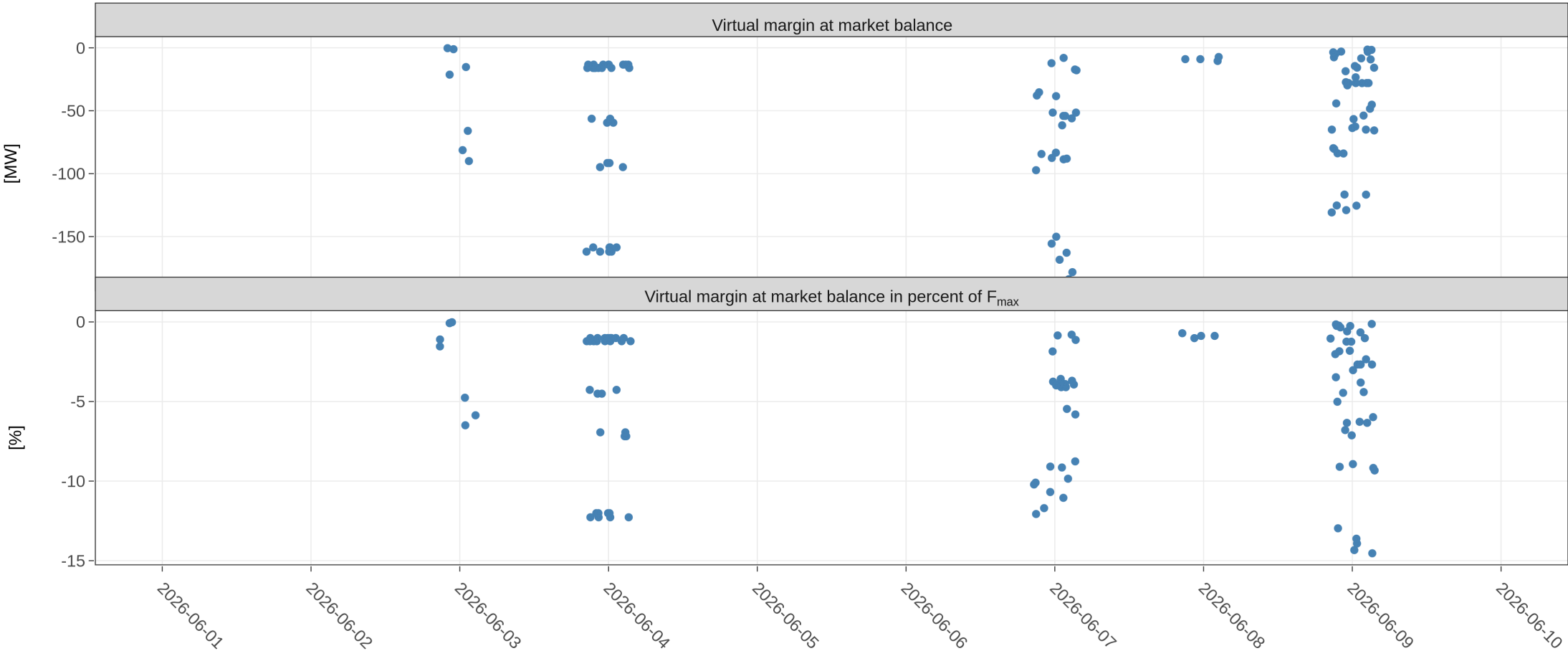
KPI 6b: Virtual margins at market balance HU



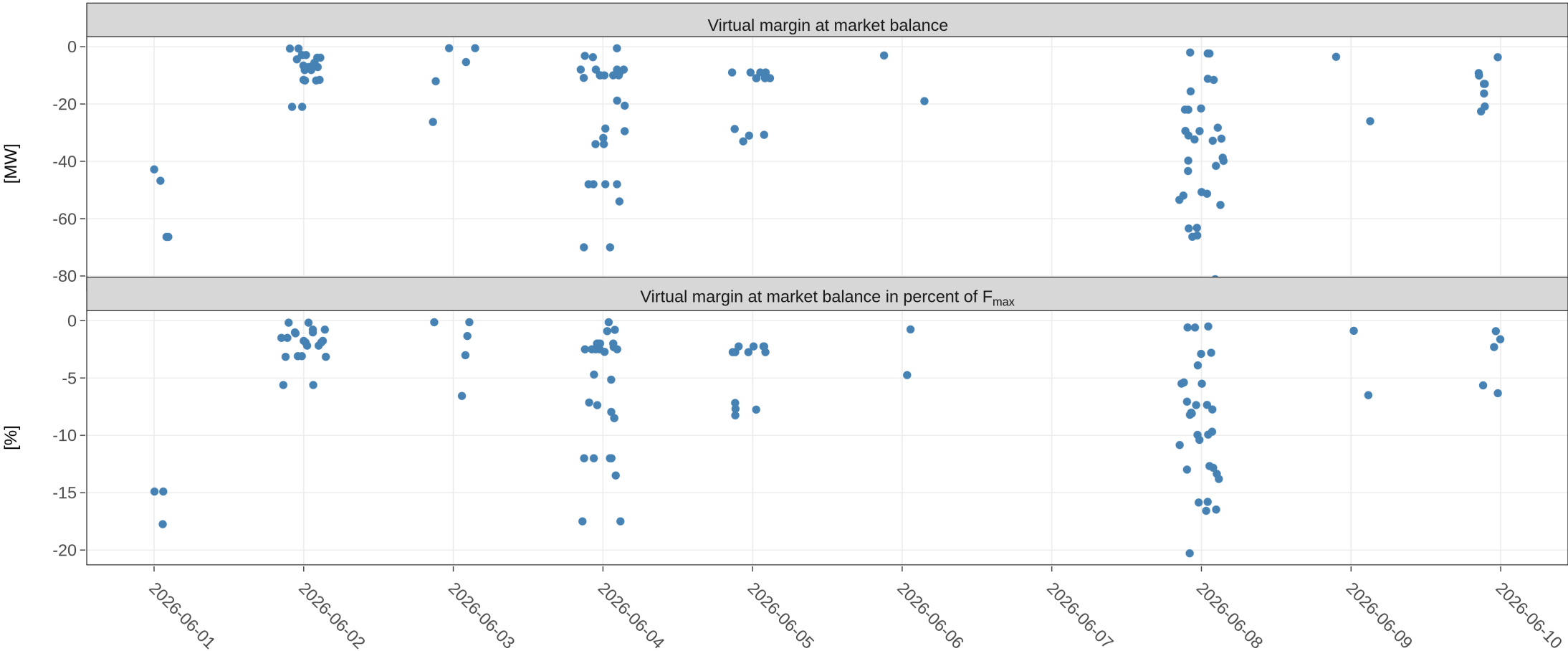
KPI 6b: Virtual margins at market balance NL



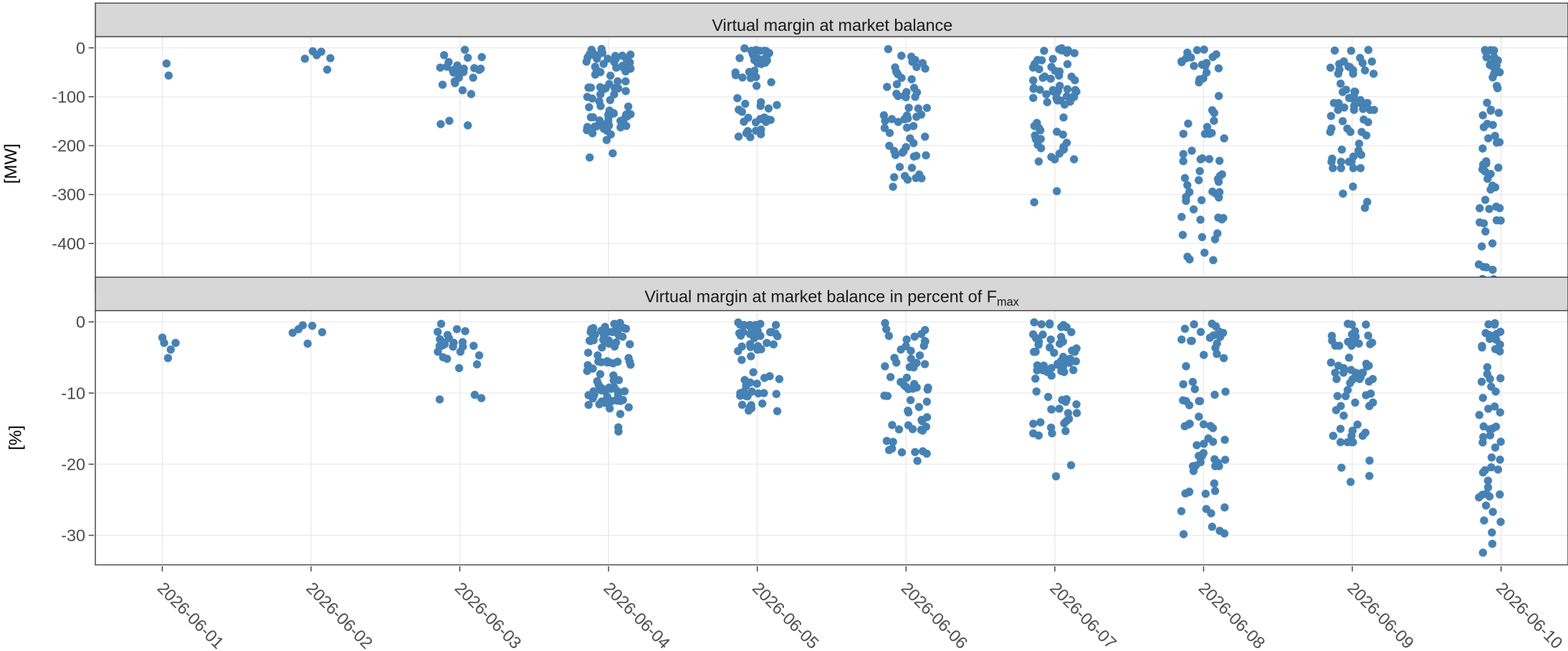
KPI 6b: Virtual margins at market balance PL



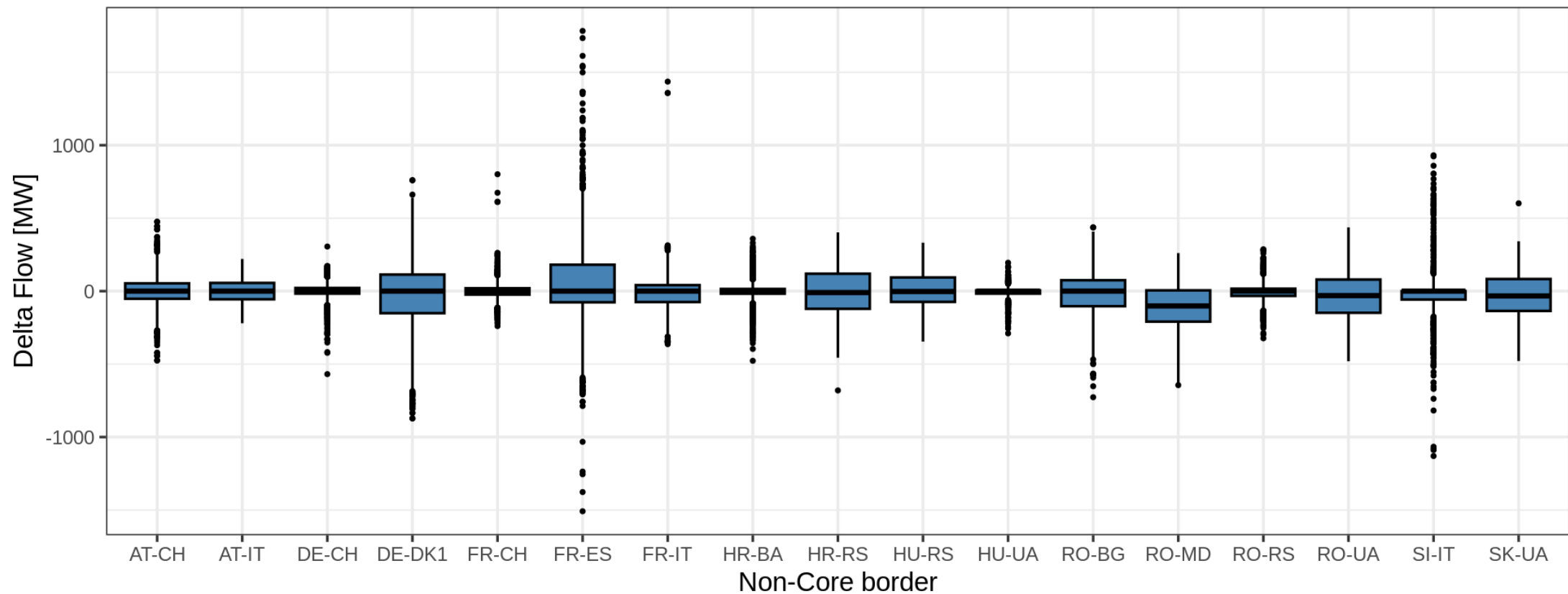
KPI 6b: Virtual margins at market balance RO



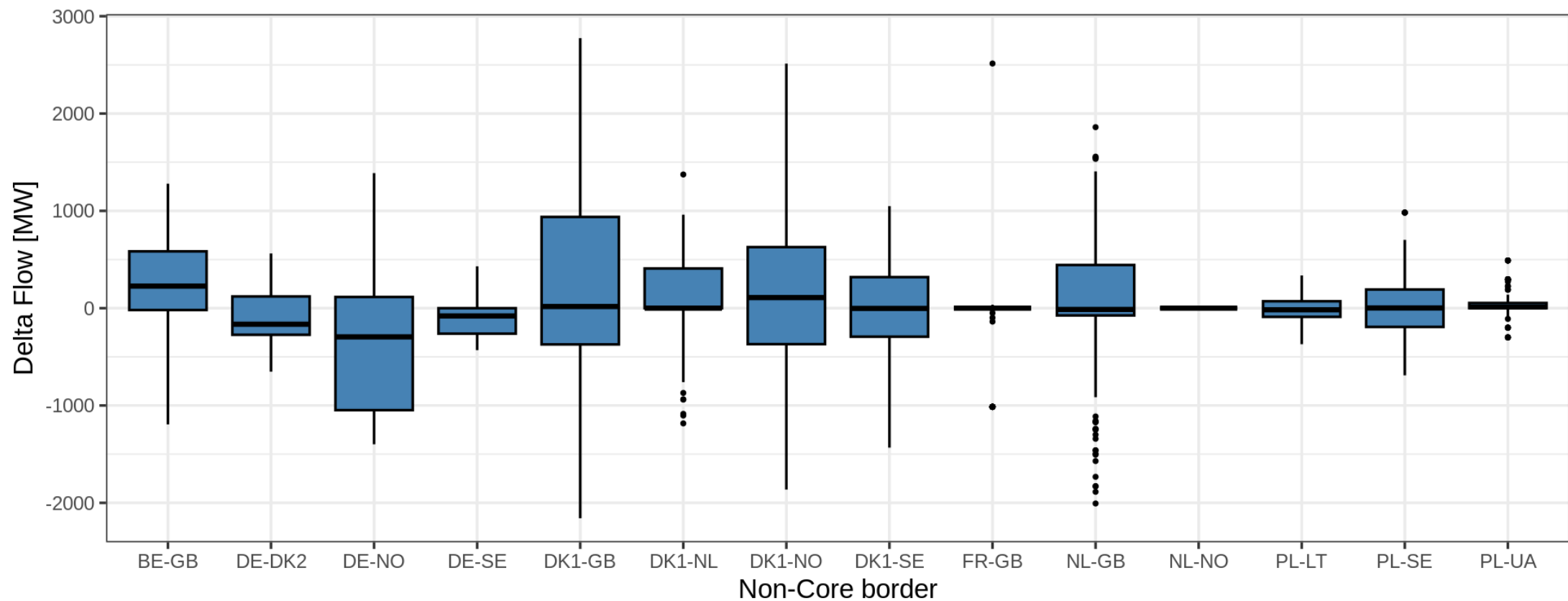
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



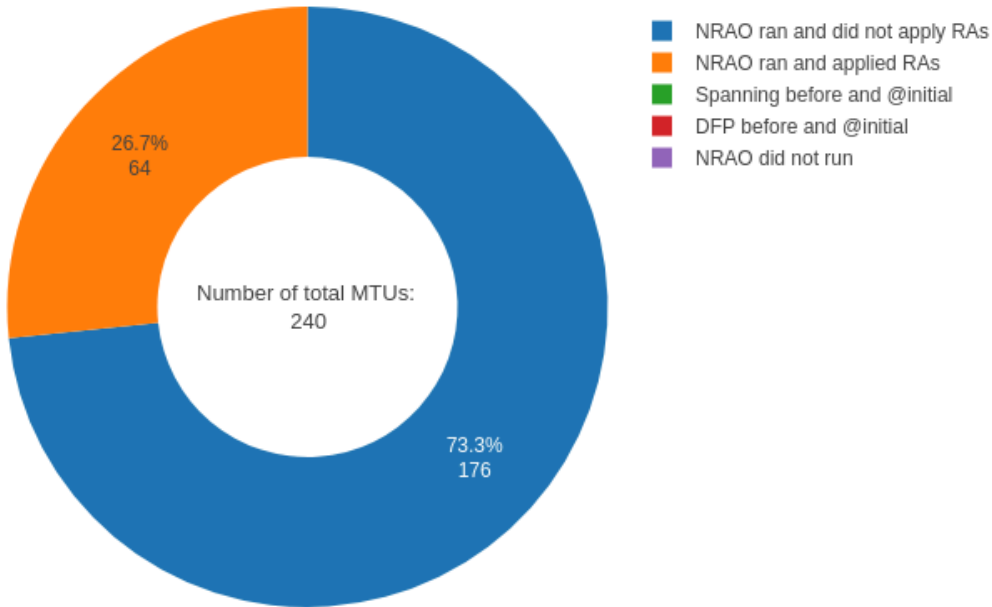
KPI 8: NRAO – Applied Remedial Action



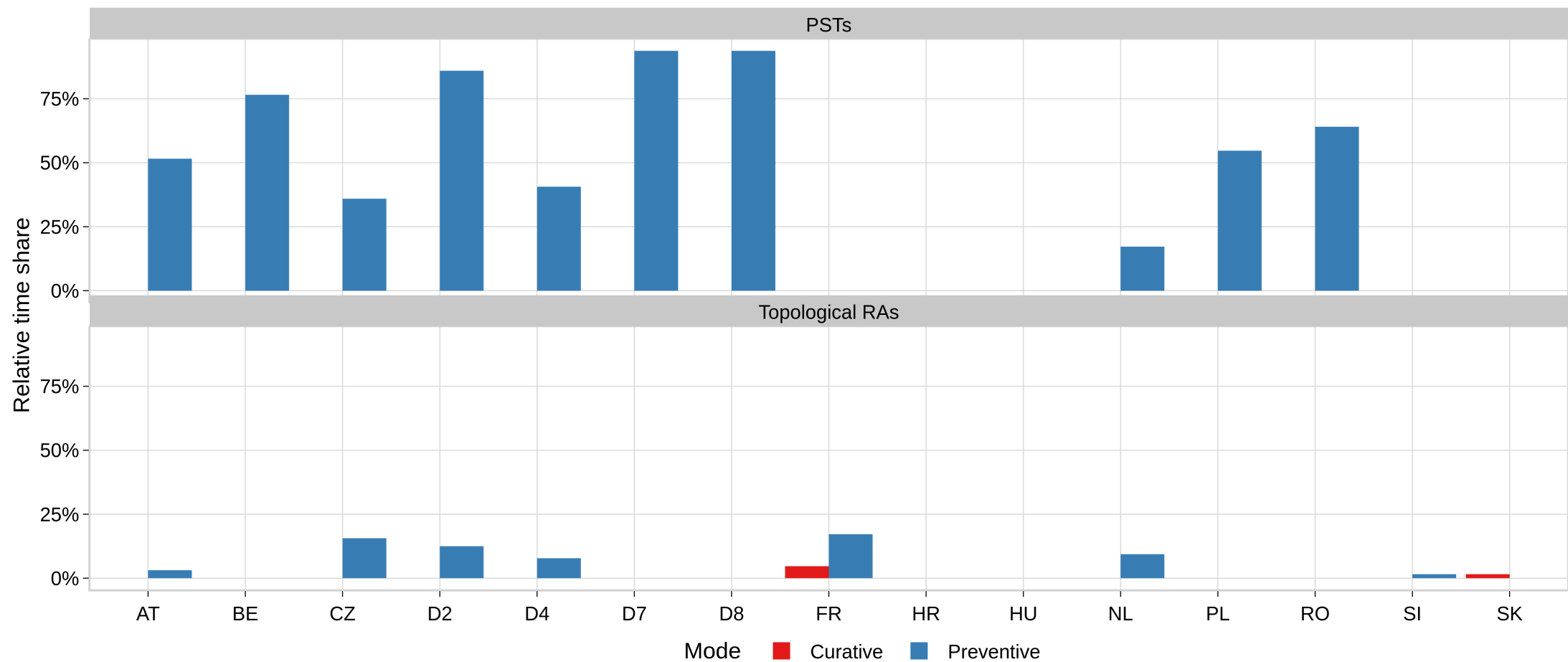
In the following plots, the relative time share relates to the hours labeled ‘NRAO Ran and Applied RAs’.

Total MTUs: 240 hours

Category	Hours (%)
NRAO ran and did not apply RAs	176 hours (73.3%)
NRAO ran and applied RAs	64 hours (26.7%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

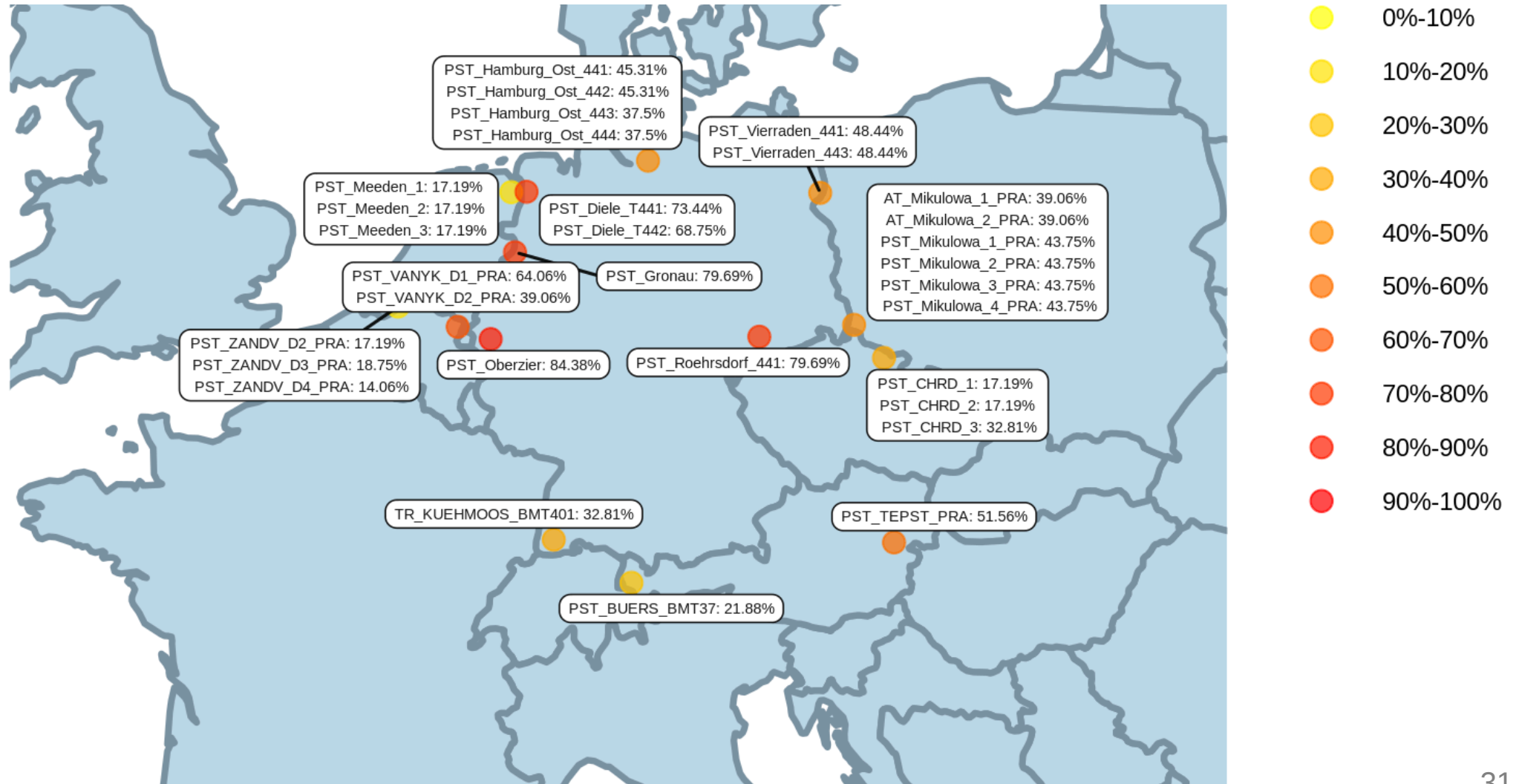


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



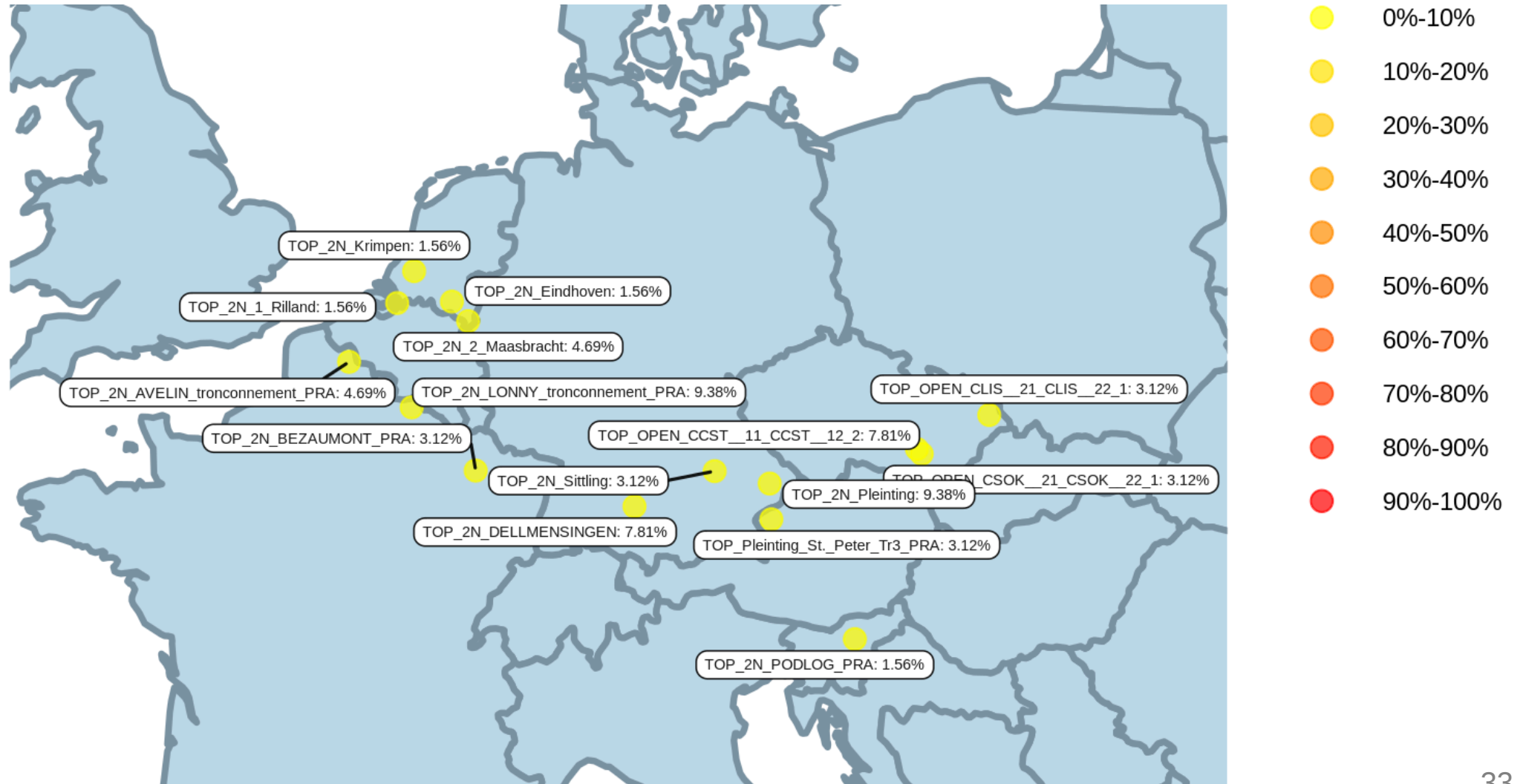
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



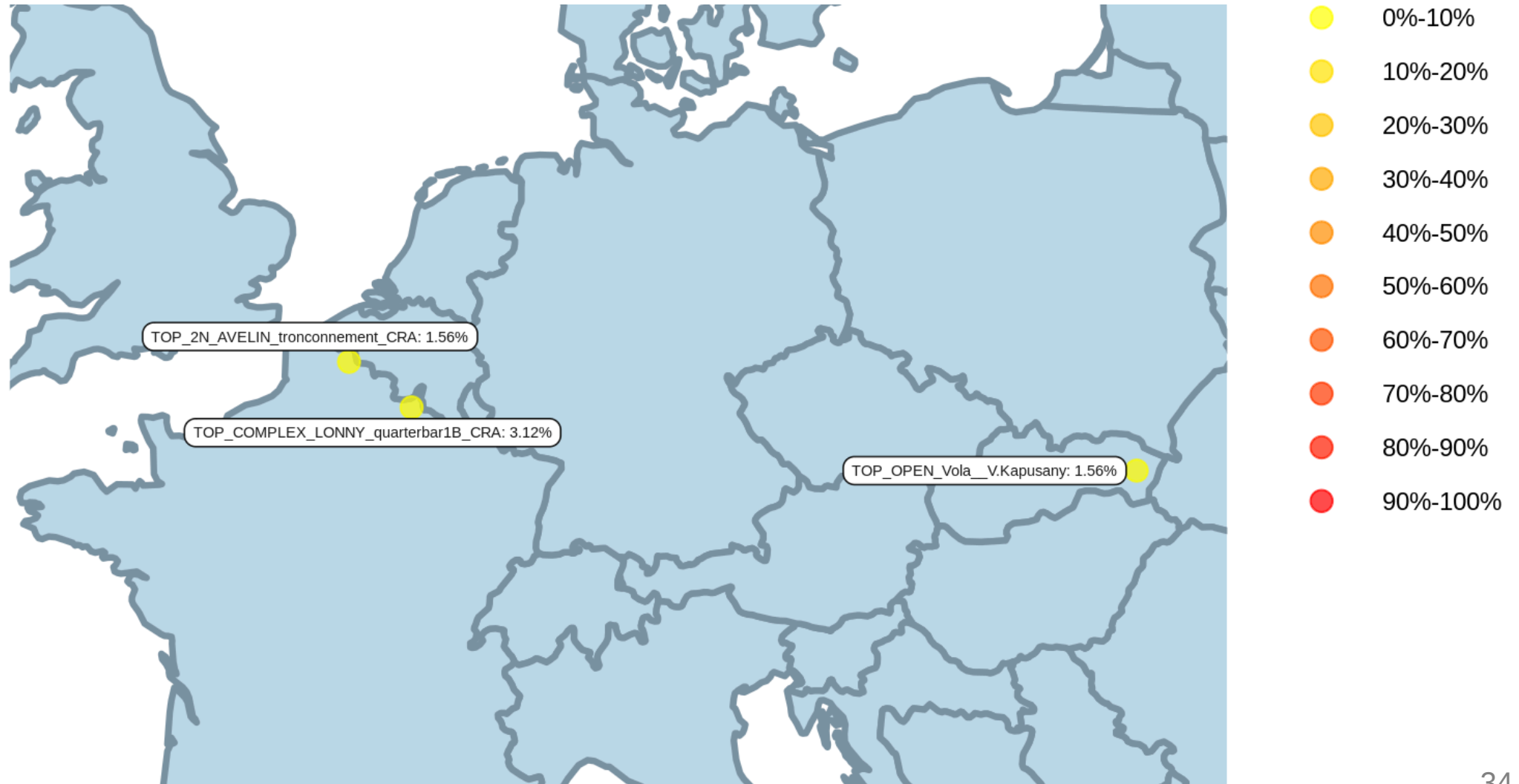
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

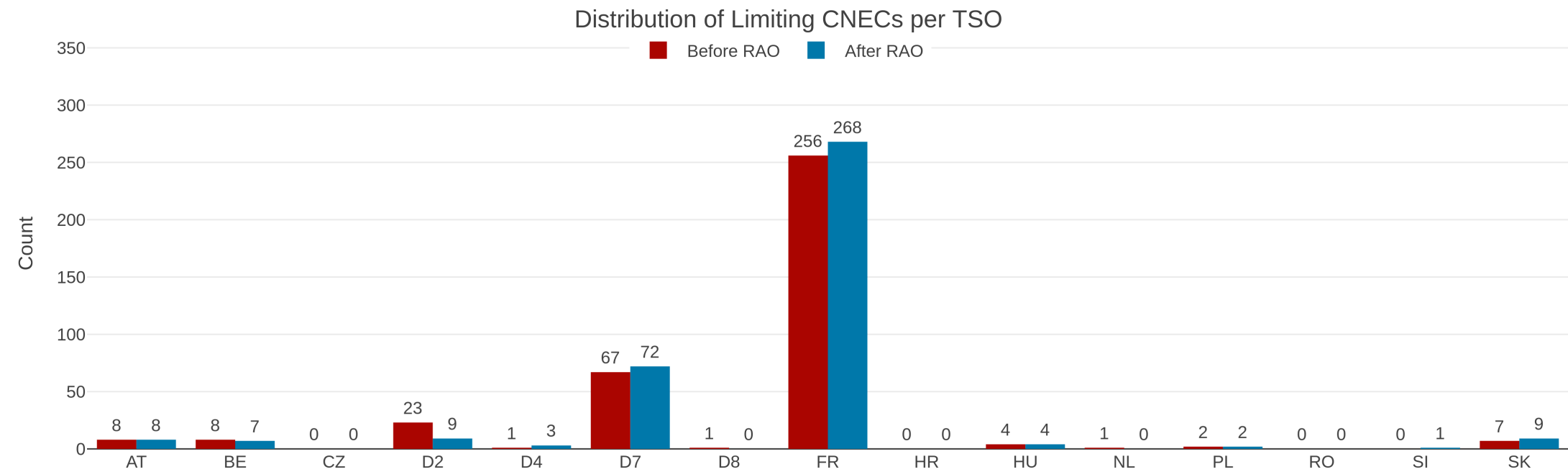
Relative Time Share of Applied Topological RAs in Curative Mode



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.

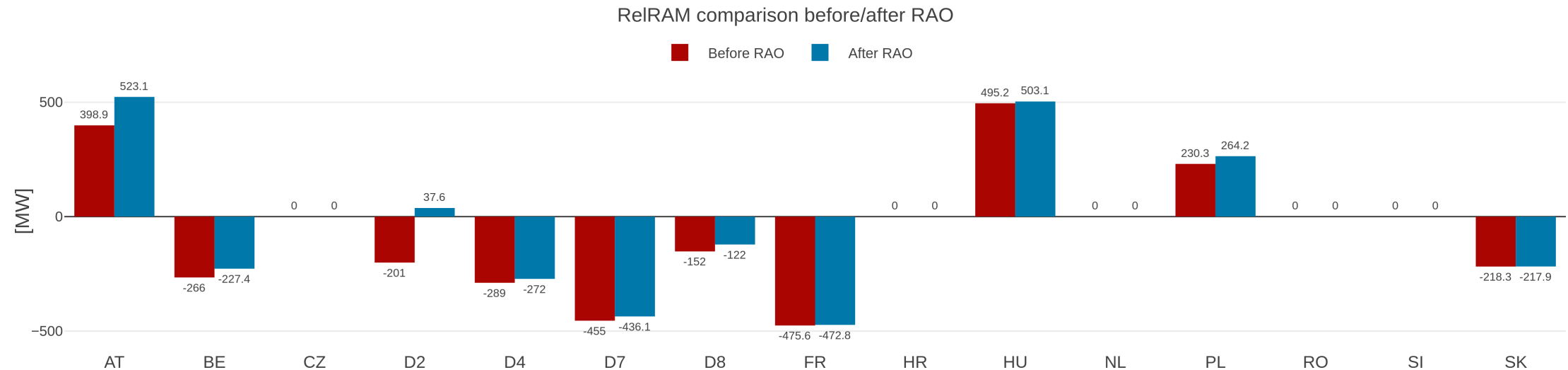
KPI 10: Average variation of relative RAM before and after NRAO



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 [DIR] [CZ]	240	379	74.52%	58.39%	103.86%	0.3454	1.3624
[SI-HU] Cirkovce - Heviz [OPP] [HU]	240	240	71.53%	59.67%	91.99%	0.2526	1.1126
[SK-UA] V.Kapusany - Mukachevo (WPS) [OPP] [SK]	240	284	101.83%	74.72%	133.18%	0.2249	0.7898
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	240	240	58.32%	38.85%	81.30%	0.3134	1.2627
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	240	240	65.66%	40.29%	90.65%	0.2537	0.9142
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	240	474	109.09%	87.02%	132.64%	0.1882	0.9671
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	240	242	63.86%	25.13%	103.21%	0.2953	0.6617
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	240	481	72.03%	60.32%	92.97%	0.1882	0.9671
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	240	476	105.72%	77.01%	137.43%	0.2953	0.6617
[BE-BE] Doel - Zandvliet 380.25 [OPP]	240	240	96.09%	70.04%	123.15%	0.2938	0.667
[CZ-SK] Liskovec - P. Bystrica [OPP] [CZ]	239	239	94.75%	74.13%	109.65%	0.086	0.3109
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	239	240	76.83%	45.80%	102.39%	0.2249	0.7898
[BE-BE] Doel - Zandvliet 380.25 [DIR]	239	239	83.95%	57.58%	118.61%	0.2938	0.667
[SK-SK] Gabcikovo - P.Biskupice [DIR]	238	263	88.83%	72.15%	109.81%	0.3338	1.1509
[AT-D2] St. Peter 2 - Pleinting 258 [DIR] [AT]	238	511	81.61%	19.85%	125.84%	0.1841	0.6938
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	237	570	74.06%	19.90%	145.80%	0.271	1.0962
[BE-BE] Achene - Gramme 380.10 [OPP]	236	683	92.45%	68.55%	125.23%	0.3208	0.7654
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	235	419	66.25%	36.75%	81.41%	0.3336	1.2572
[CZ-D8] Hradec - Rohrsdorf - V445 [DIR] [CZ]	235	294	118.45%	78.84%	148.68%	0.4156	1.7776
[CZ-PL] Wielopole - Nosovice [OPP] [PL]	234	419	117.10%	87.54%	145.71%	0.3336	1.2572

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]	145	145	1055.72	21.23%	19.99%	71.53%	0.1379
[BE-BE] Achene - Gramme 380.10 [DIR]	114	122	681.21	78.15%	51.30%	106.16%	0.3198
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	83	84	430.02	80.56%	62.84%	100.11%	0.3202
[FR-D7] Vigy - Ensdorf VIGY1 N [DIR] [D7]	76	76	643.24	24.77%	19.90%	46.28%	0.2361
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	49	49	1031.6	20.34%	19.99%	28.12%	0.1389
[RO-RO] TR Iernut 400/220 2 [DIR]	38	38	891.02	41.22%	19.75%	90.25%	0.1503
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	30	30	541.55	49.96%	22.10%	82.04%	0.1493
[SK-HU] Levice - God [DIR] [HU]	25	25	536.2	36.40%	23.45%	55.41%	0.2528
[SK-SK] V.Dur - Levice 1 [DIR]	22	22	430.7	32.69%	29.35%	45.57%	0.2163
[CZ-D8] Hradec - Rohrsdorf - V445 [OPP] [CZ]	18	18	114.14	66.17%	52.06%	80.49%	0.4056
[D8-PL] Mikulowa PST1 [DIR] [PL]	10	10	133.7	57.61%	51.52%	62.20%	0.254
[D7-FR] Ensdorf - Vigy VIGY1 N [OPP] [FR]	7	7	342.91	24.12%	19.96%	29.99%	0.2248
[BE-BE] Doel - Zandvliet 380.25 [OPP]	7	7	7.5	99.53%	90.87%	120.85%	0.282
[FR-D7] Vigy - Ensdorf VIGY2 S [DIR] [D7]	7	7	752.02	23.73%	19.90%	43.52%	0.2305
[RO-RO] TR Resita 400/220 3 [OPP]	7	7	875.66	92.82%	82.25%	103.25%	0.1206
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	7	7	31.86	115.66%	106.68%	133.42%	0.257
[HU-HU] Martonvasar - Dunamenti 1 [DIR]	6	6	85.79	50.04%	41.28%	61.93%	0.1062
[D2-D2] Altheim - Simbach 233/230 [DIR]	5	5	532.28	92.84%	51.29%	111.34%	0.1062
[RO-RO] Resita - Timisoara c1 [DIR]	5	5	2113.82	40.37%	30.48%	49.47%	0.0802
[NL-D7] Maasbracht-Oberzier 380 W [DIR] [NL]	4	4	1.16	48.74%	45.32%	51.67%	0.2803

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	211
AC < 0 MW	52
AC = 0 MW	159
AC > 0 MW	0

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-2164.24	5361.61
Min.	-9391.00	500.00
Max.	0.00	13961.00

