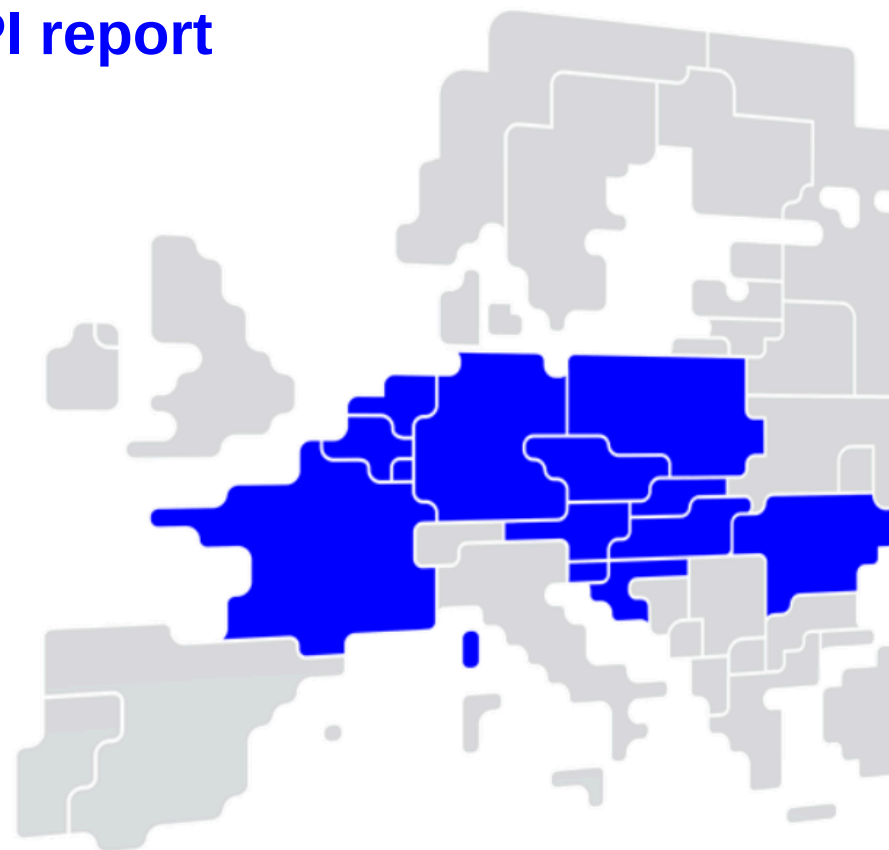




Core FB MC Operational KPI report

July 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

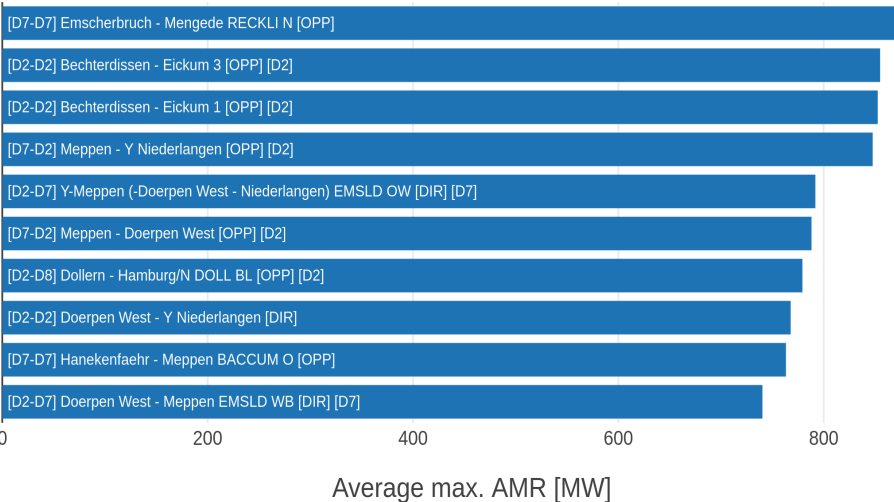
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

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)
[D7-D7] Emscherbruch - Mengede RECKLI N [OPP]	868.78	42.33%	41.99%
[D2-D2] Bechterdissen - Eickum 3 [OPP] [D2]	854.94	44.93%	32.06%
[D2-D2] Bechterdissen - Eickum 1 [OPP] [D2]	852.60	44.80%	31.98%
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	847.67	45.98%	37.76%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	791.87	31.75%	23.77%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	788.09	42.87%	38.67%
[D2-D8] Dollern - Hamburg/N DOLL BL [OPP] [D2]	779.25	35.66%	17.59%
[D2-D2] Doerpen West - Y Niederlangen [DIR]	767.79	41.61%	33.22%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	763.23	35.18%	27.81%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	740.31	29.68%	23.94%

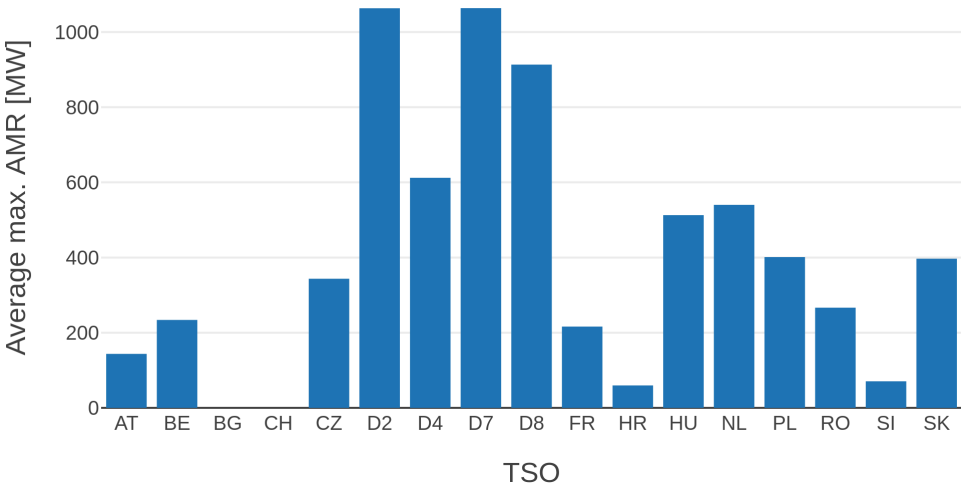


KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	143.76
BE	233.92
BG	0.00
CH	0.00
CZ	343.59
D2	1063.43
D4	612.24
D7	1063.65
D8	913.40
FR	216.25

TSO	Average maximum AMR per TSO
HR	59.73
HU	512.84
NL	540.19
PL	401.08
RO	266.69
SI	70.72
SK	396.84



KPI 3: Share of MTUs with intervention per TSO



Total BDs
31

Total MTUs
744

MTUs without IVA
18

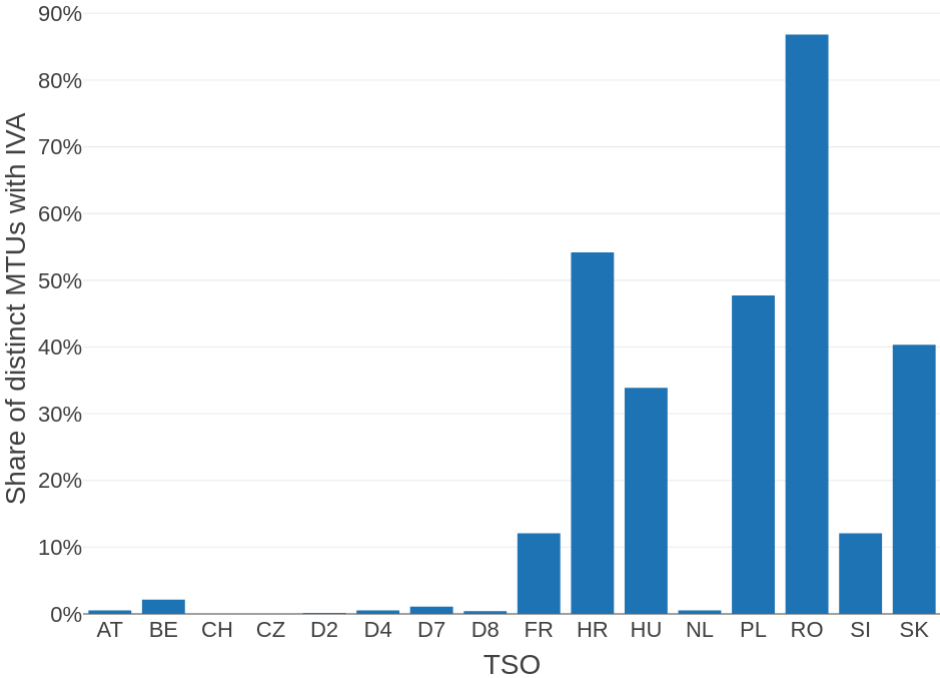
Share of distinct MTUs without IVA
2.42%

MTUs with IVA
726

Share of distinct MTUs with IVA
97.6%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.54%	4
BE	2.15%	16
CH	0.00%	0
CZ	0.00%	0
D2	0.13%	1
D4	0.54%	4
D7	1.08%	8
D8	0.40%	3
FR	12.10%	90
HR	54.17%	403

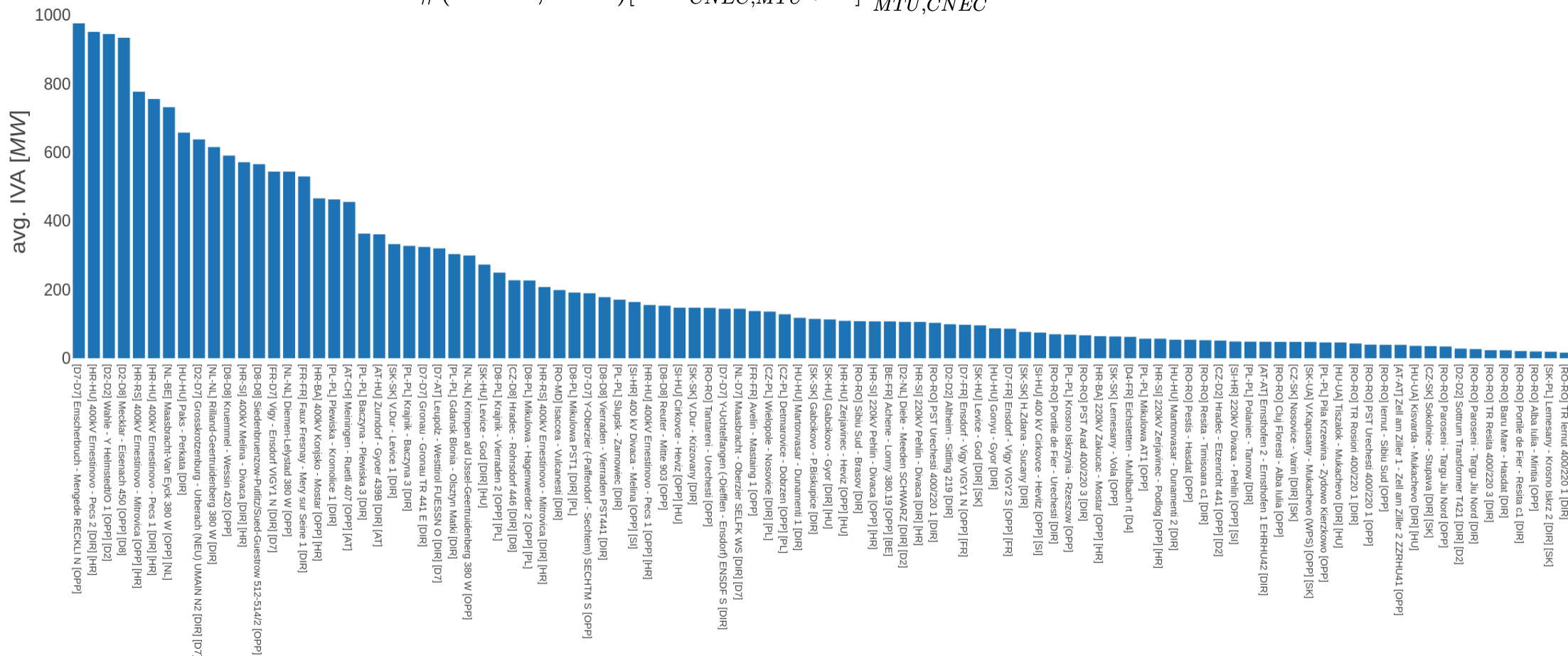
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
HU	33.87%	252
NL	0.54%	4
PL	47.72%	355
RO	86.83%	646
SI	12.10%	90
SK	40.32%	300



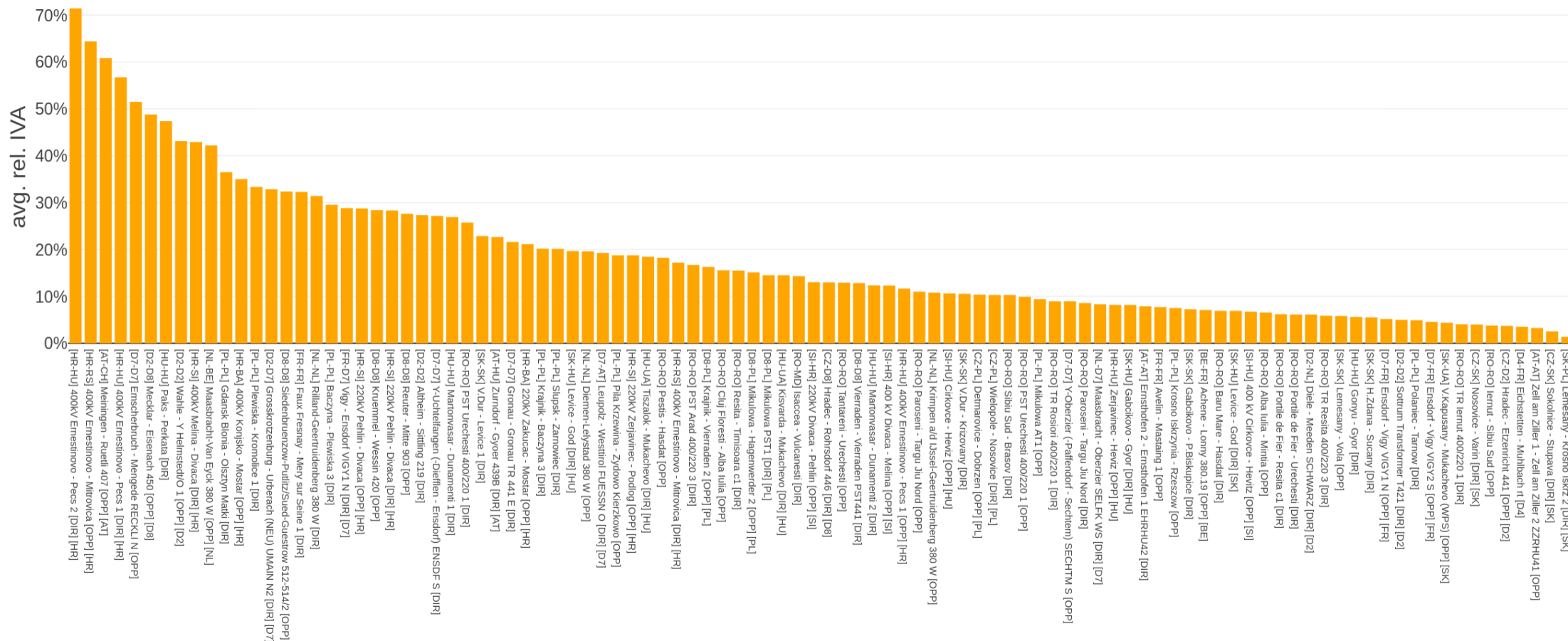
KPI 4a: Average IVA applied for each CNE affected by TSO intervention



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



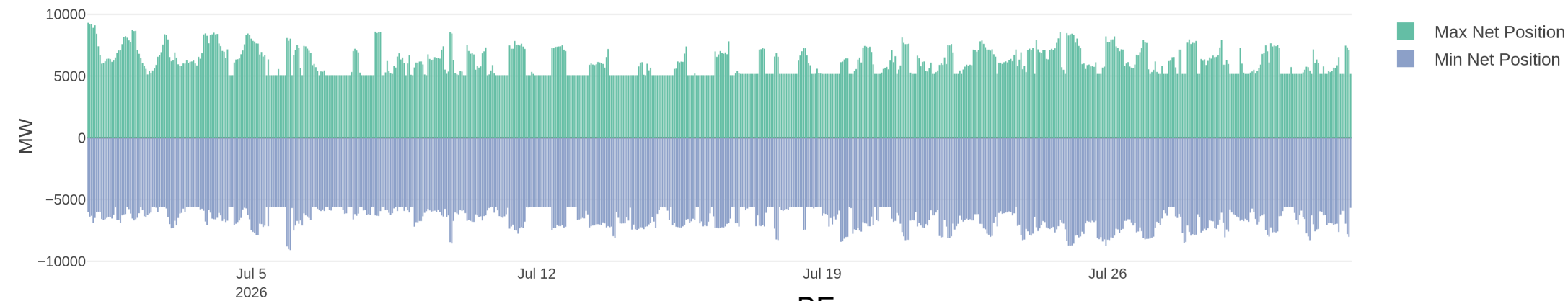
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{max_{CNEC, MTU}}[IVA_{CNEC, MTU} > 0]}$$



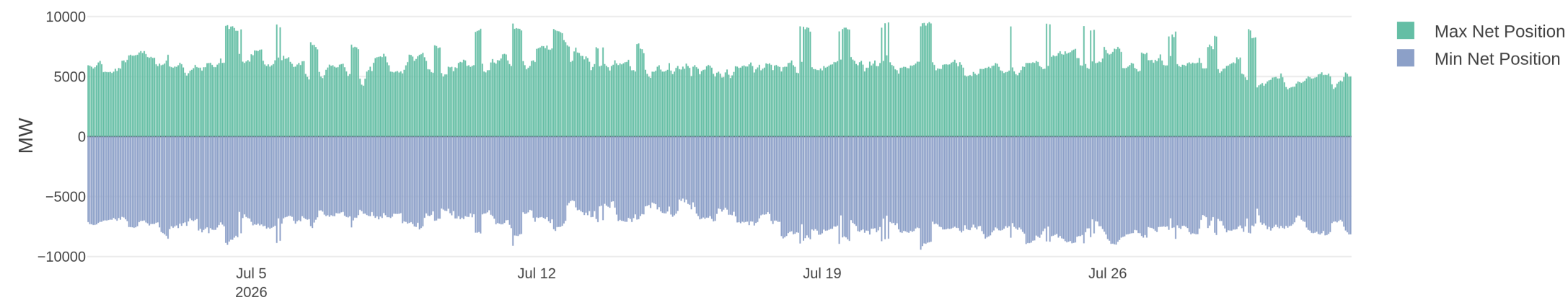
KPI 5: Min & max net positions per BZ hub



AT



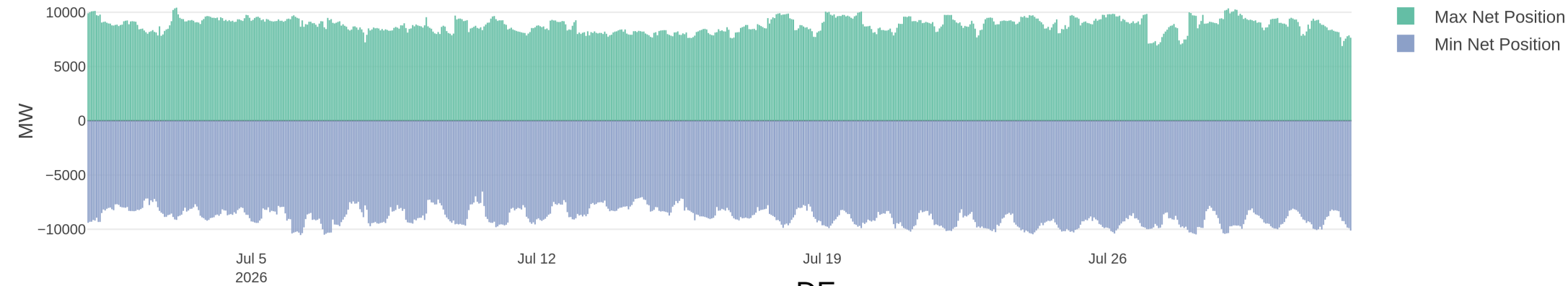
BE



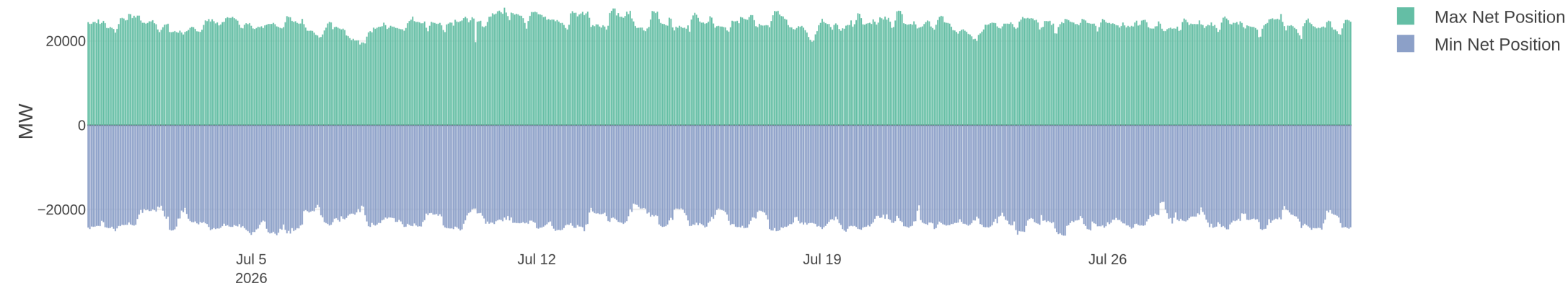
KPI 5: Min & max net positions per BZ hub



CZ



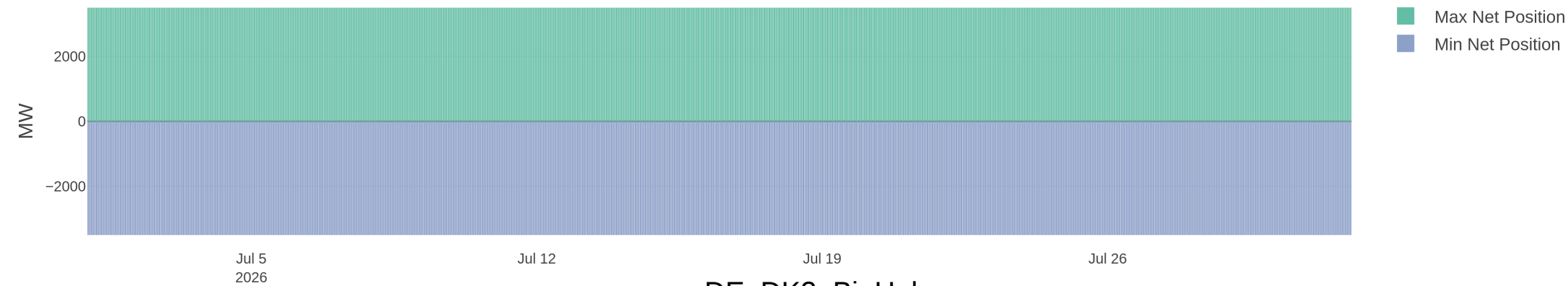
DE



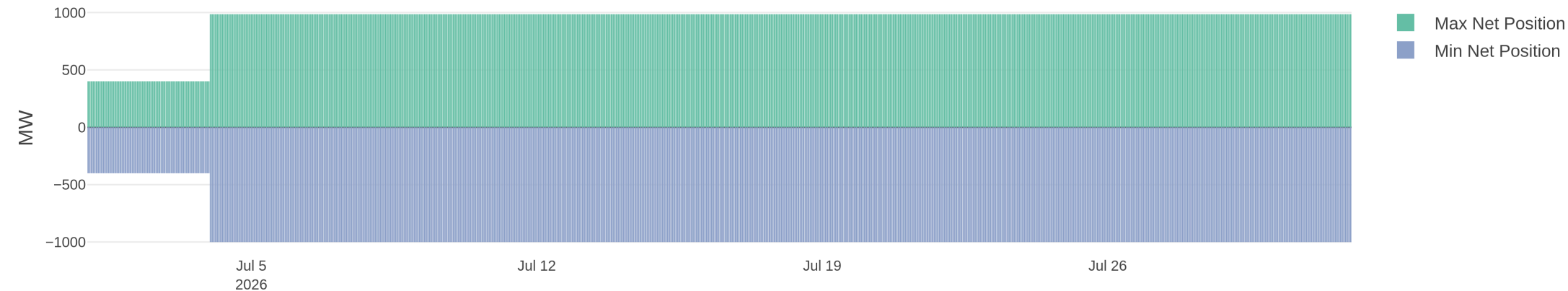
KPI 5: Min & max net positions per BZ hub



DE_DK1_VH



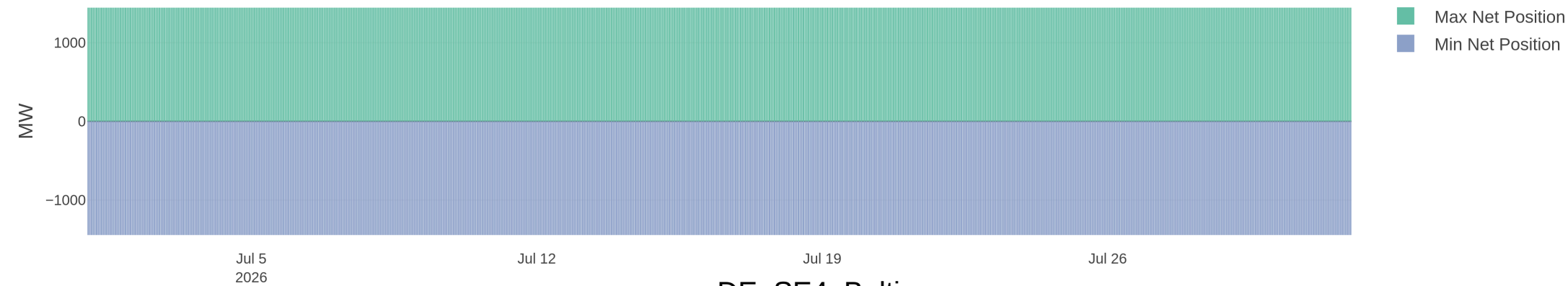
DE_DK2_BigHub



KPI 5: Min & max net positions per BZ hub



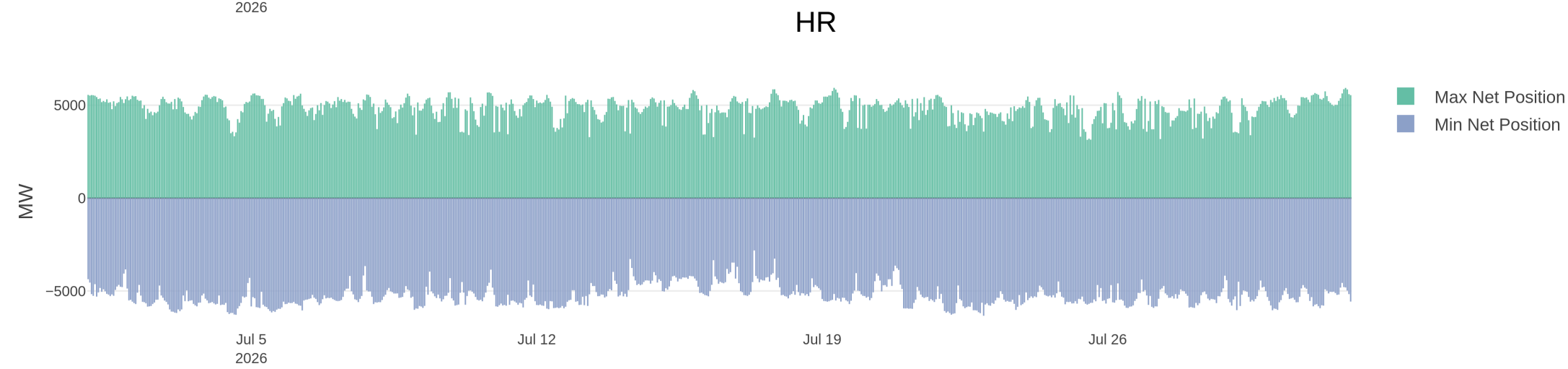
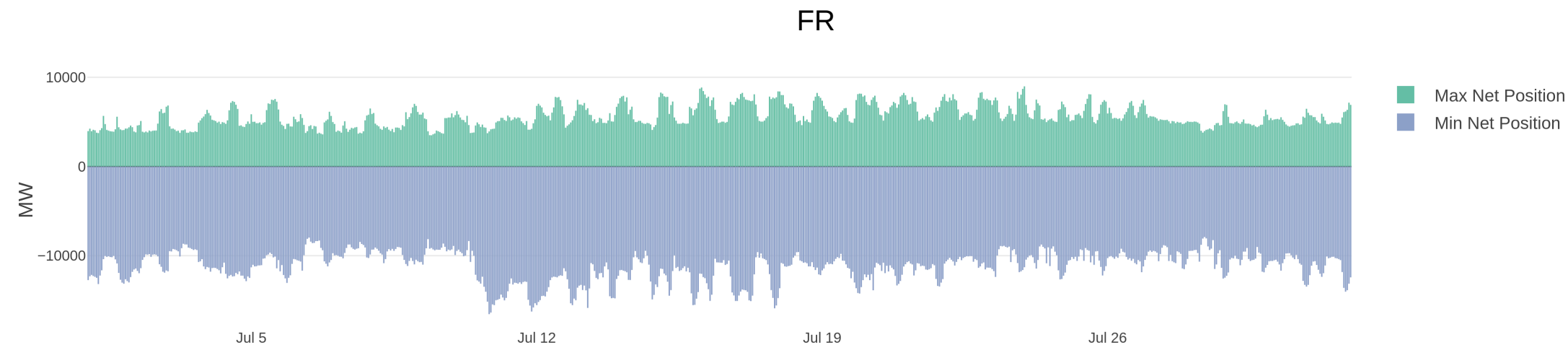
DE_NO2_BigHub



DE_SE4_Baltic



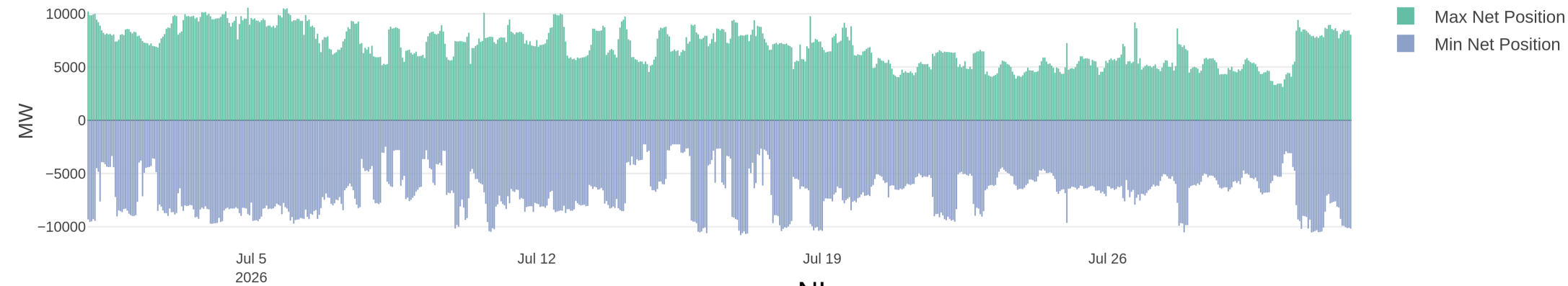
KPI 5: Min & max net positions per BZ hub



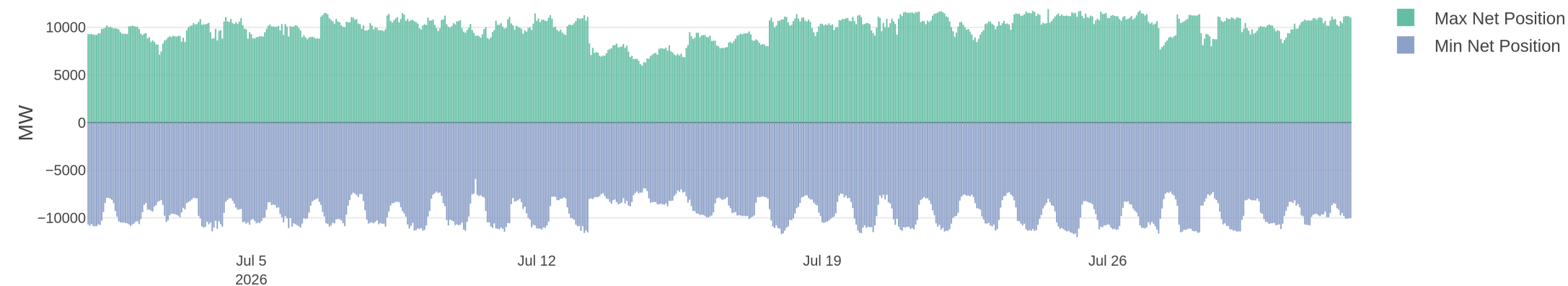
KPI 5: Min & max net positions per BZ hub



HU



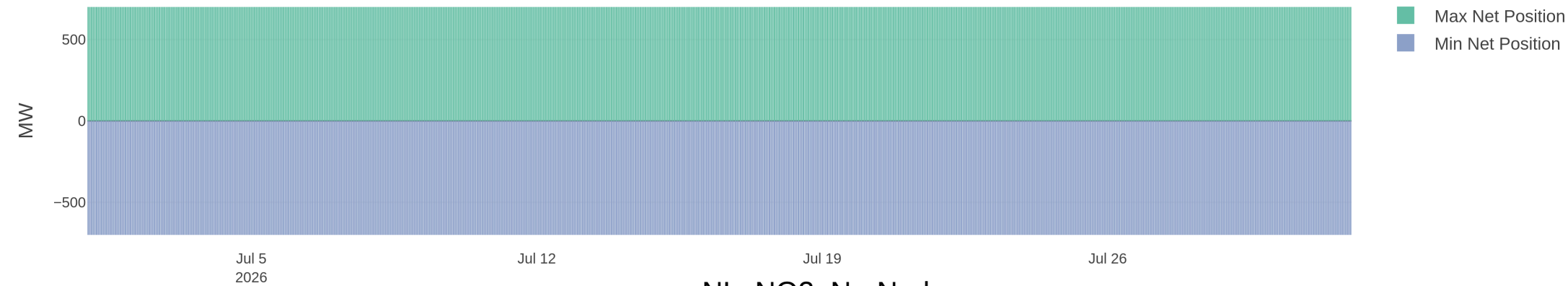
NL



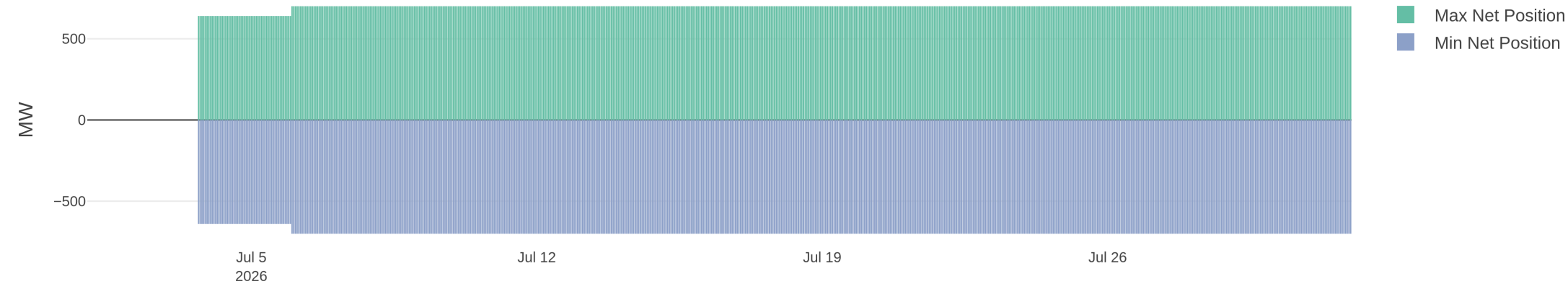
KPI 5: Min & max net positions per BZ hub



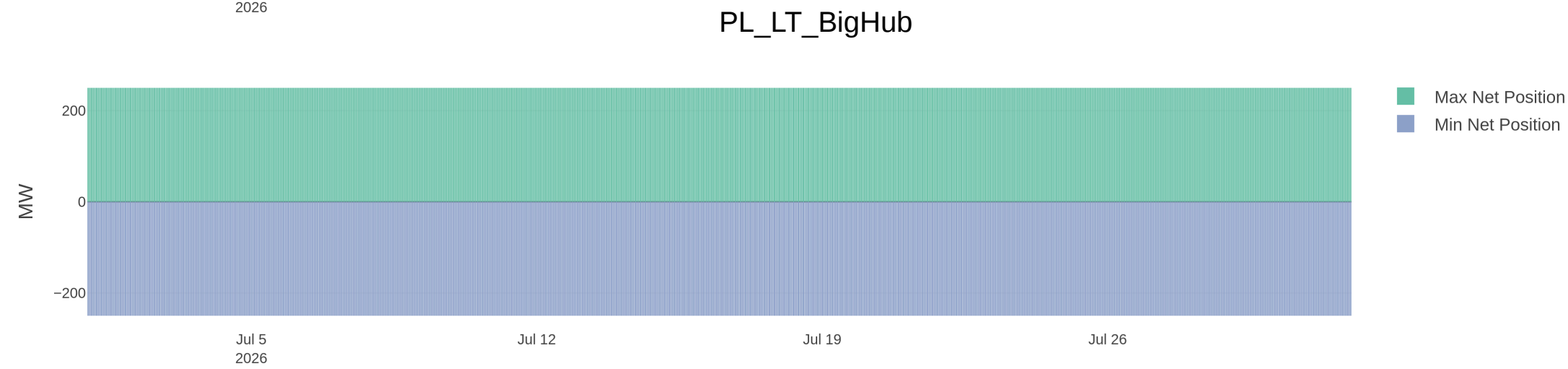
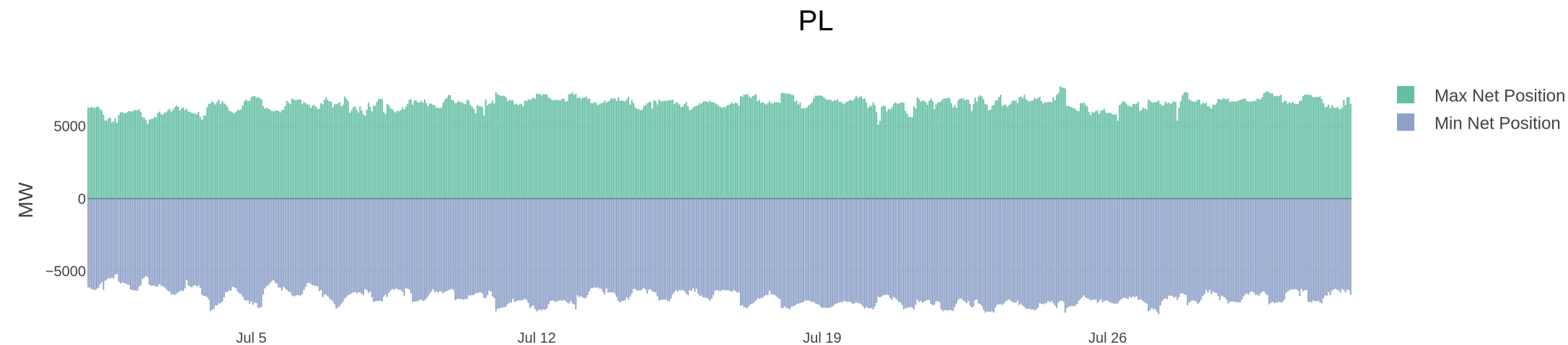
NL_DK1_COBRA



NL_NO2_NorNed



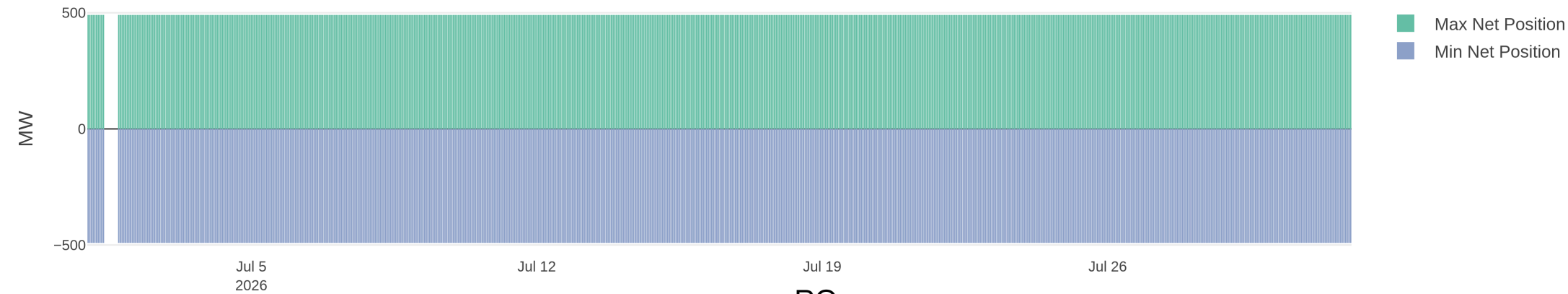
KPI 5: Min & max net positions per BZ hub



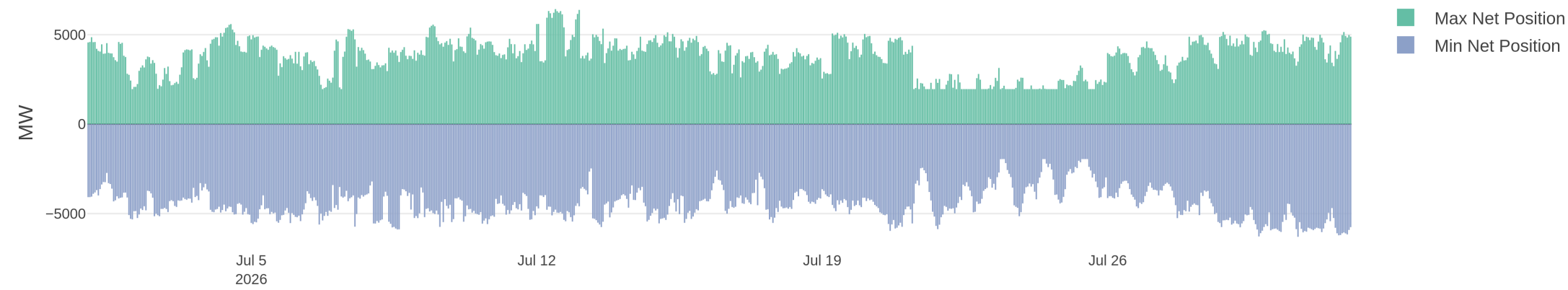
KPI 5: Min & max net positions per BZ hub



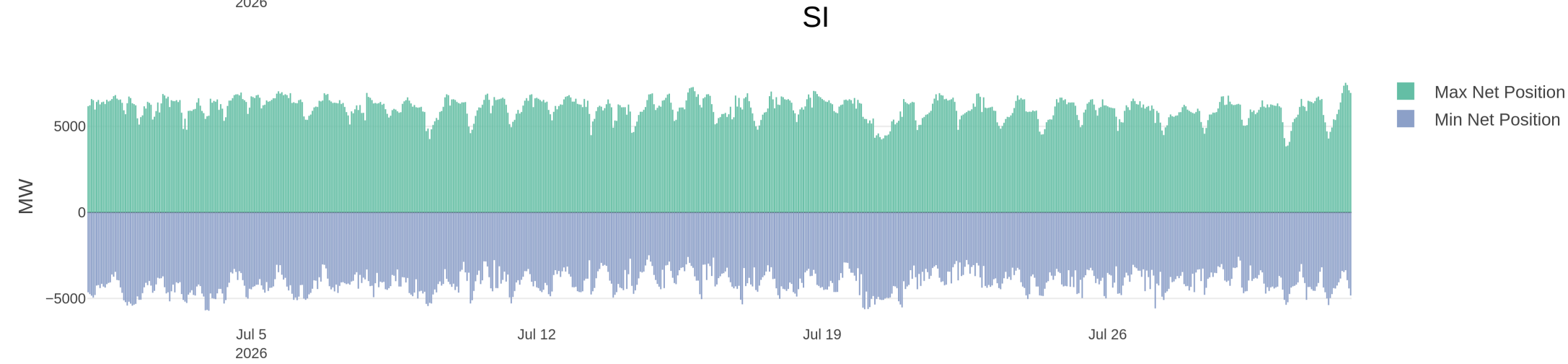
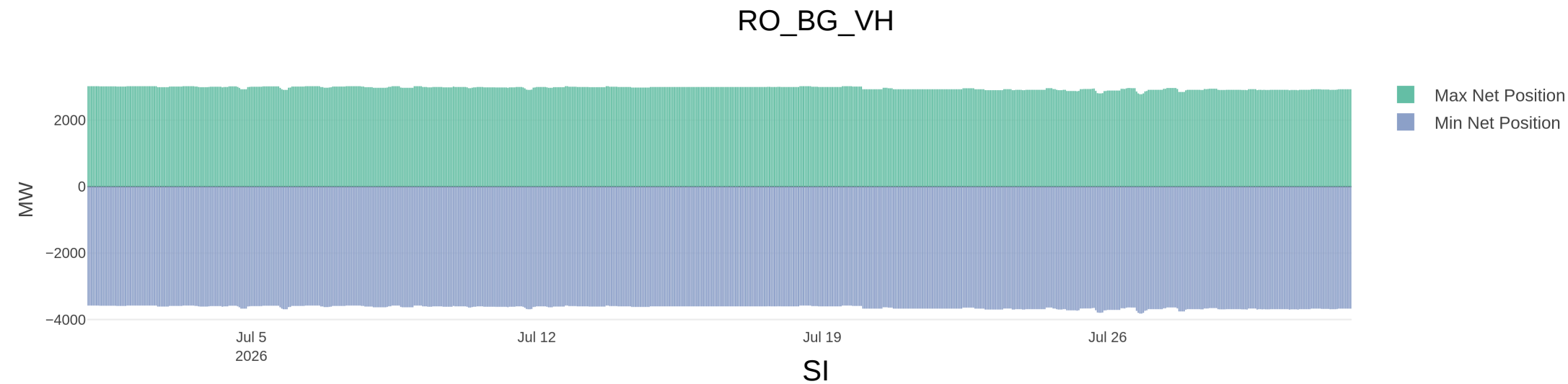
PL_SE4_SwePol



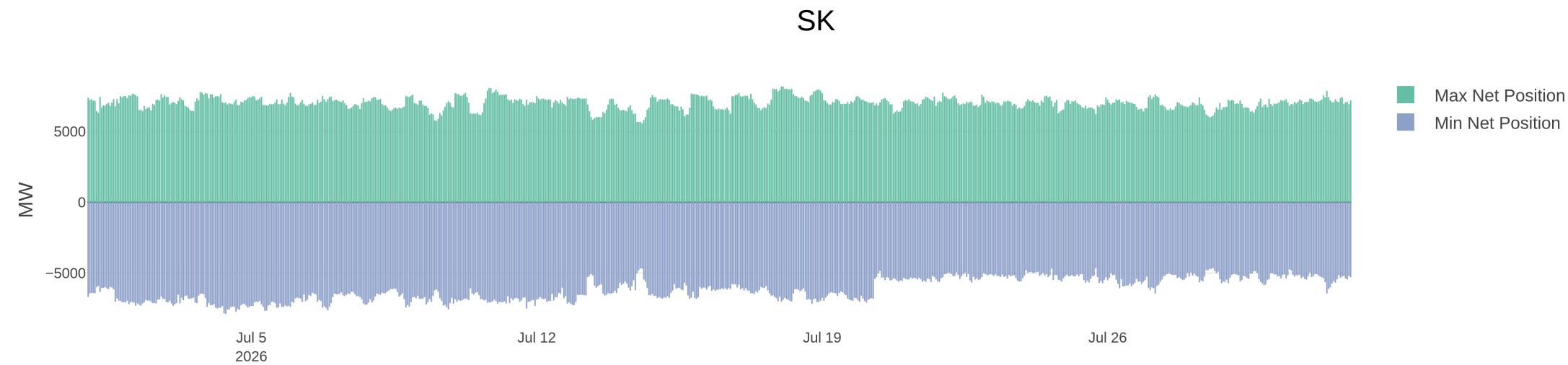
RO



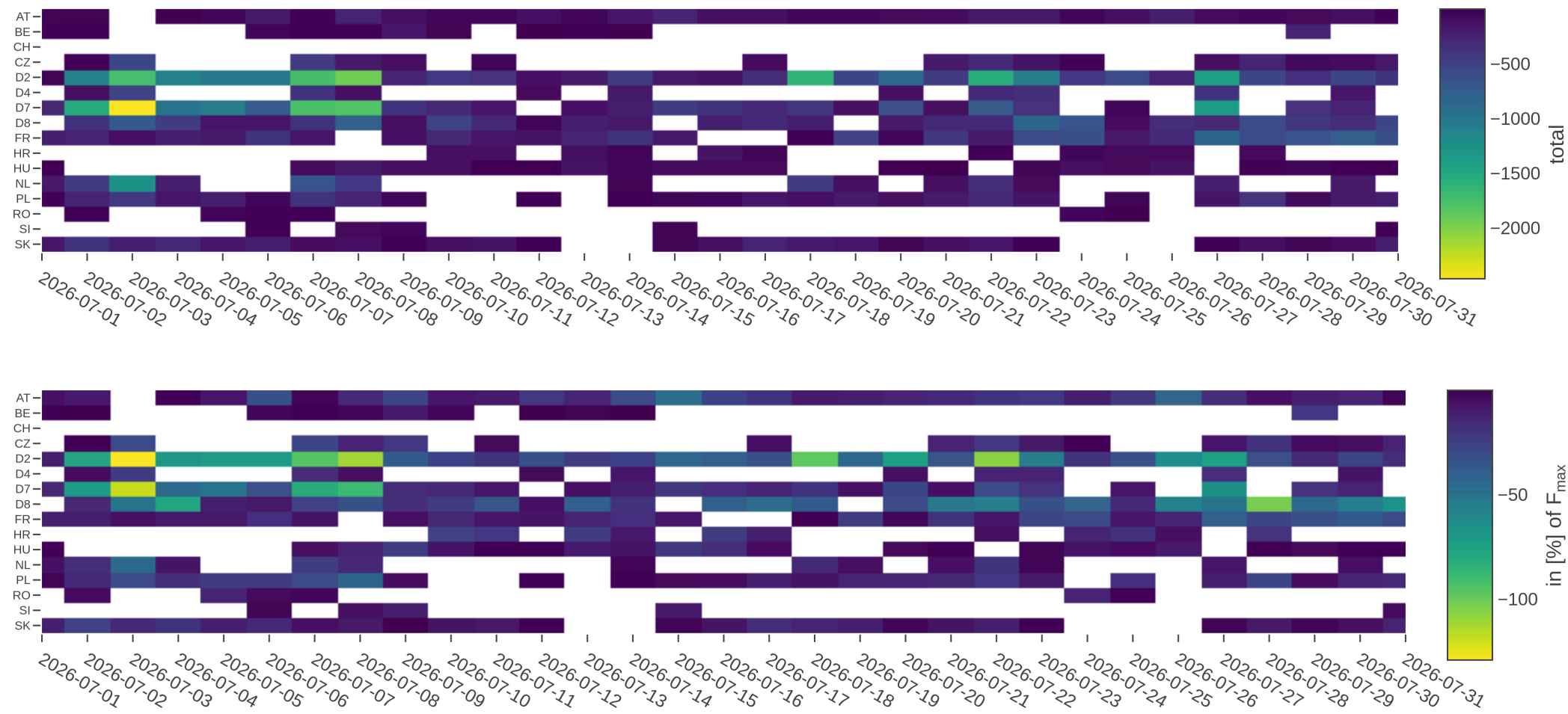
KPI 5: Min & max net positions per BZ hub



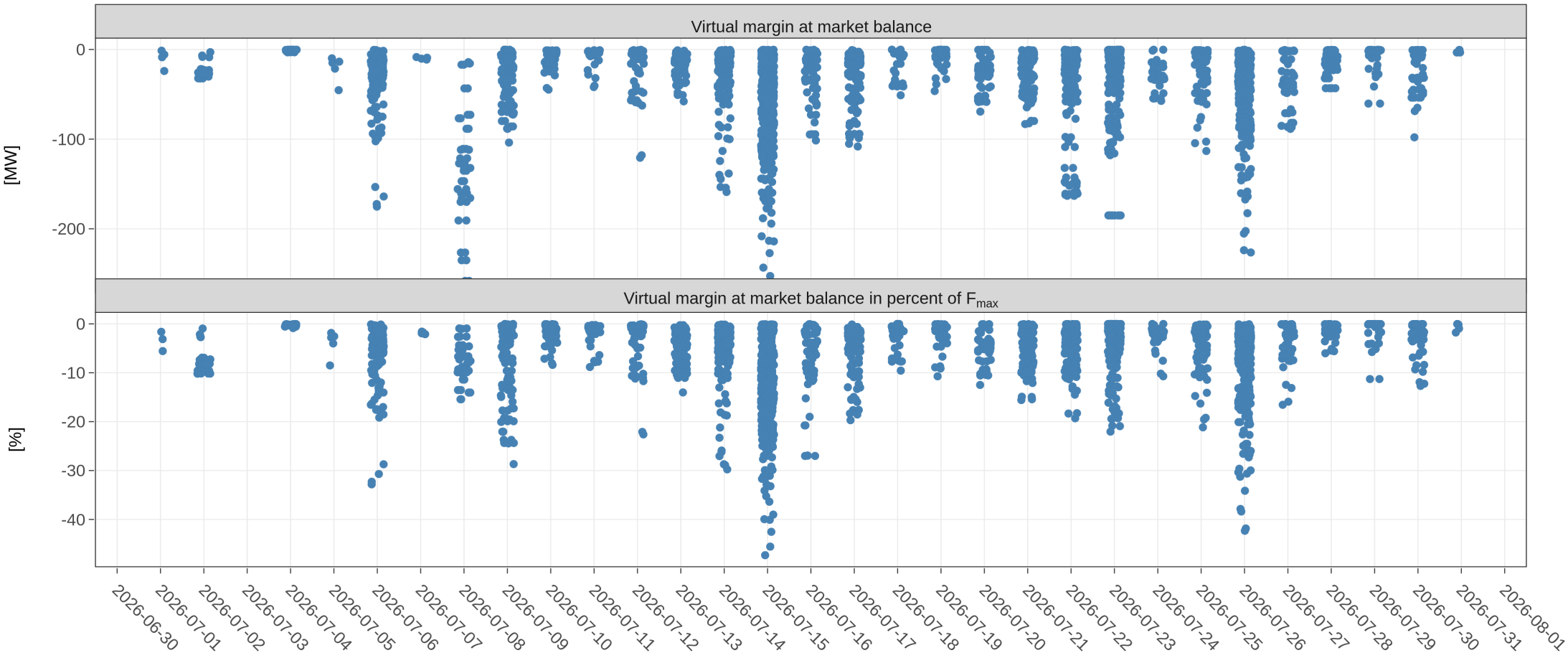
KPI 5: Min & max net positions per BZ hub



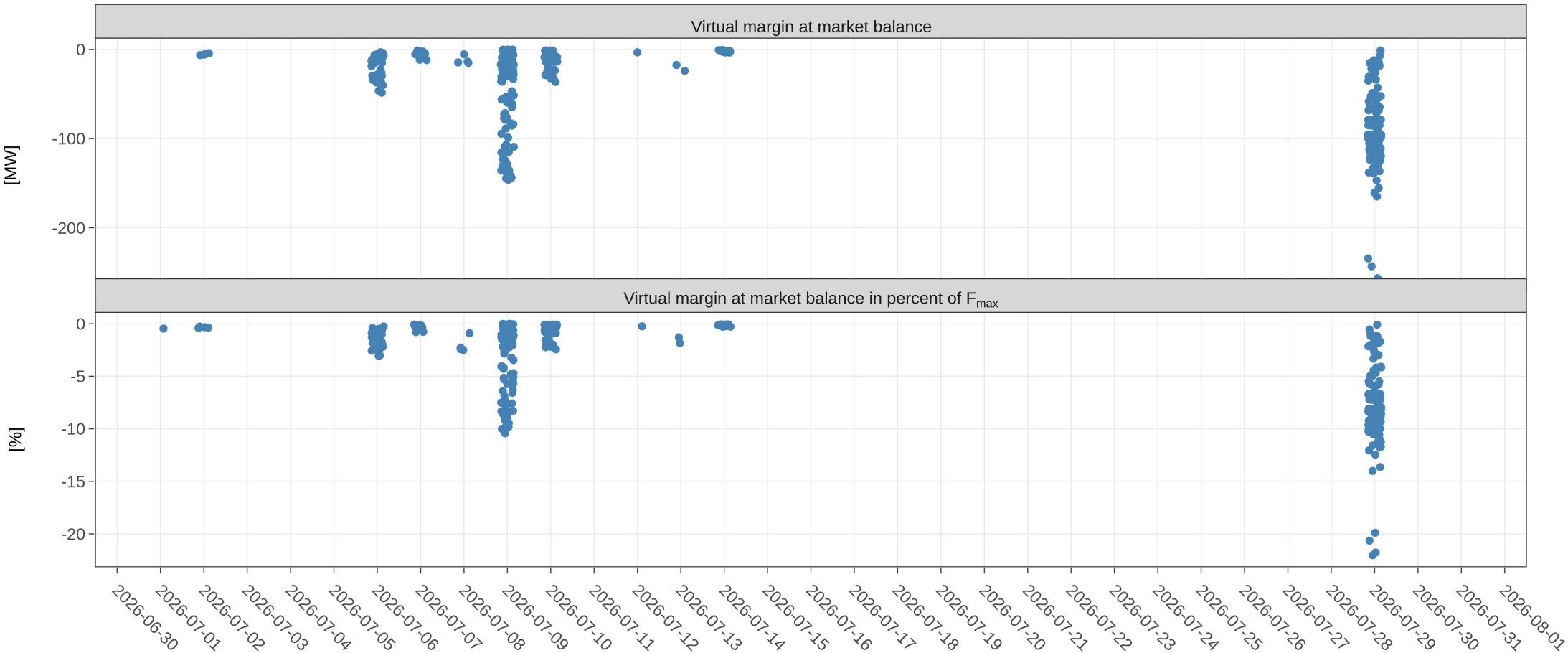
KPI 6a: Highest virtual margins at market balance for CORE TSOs



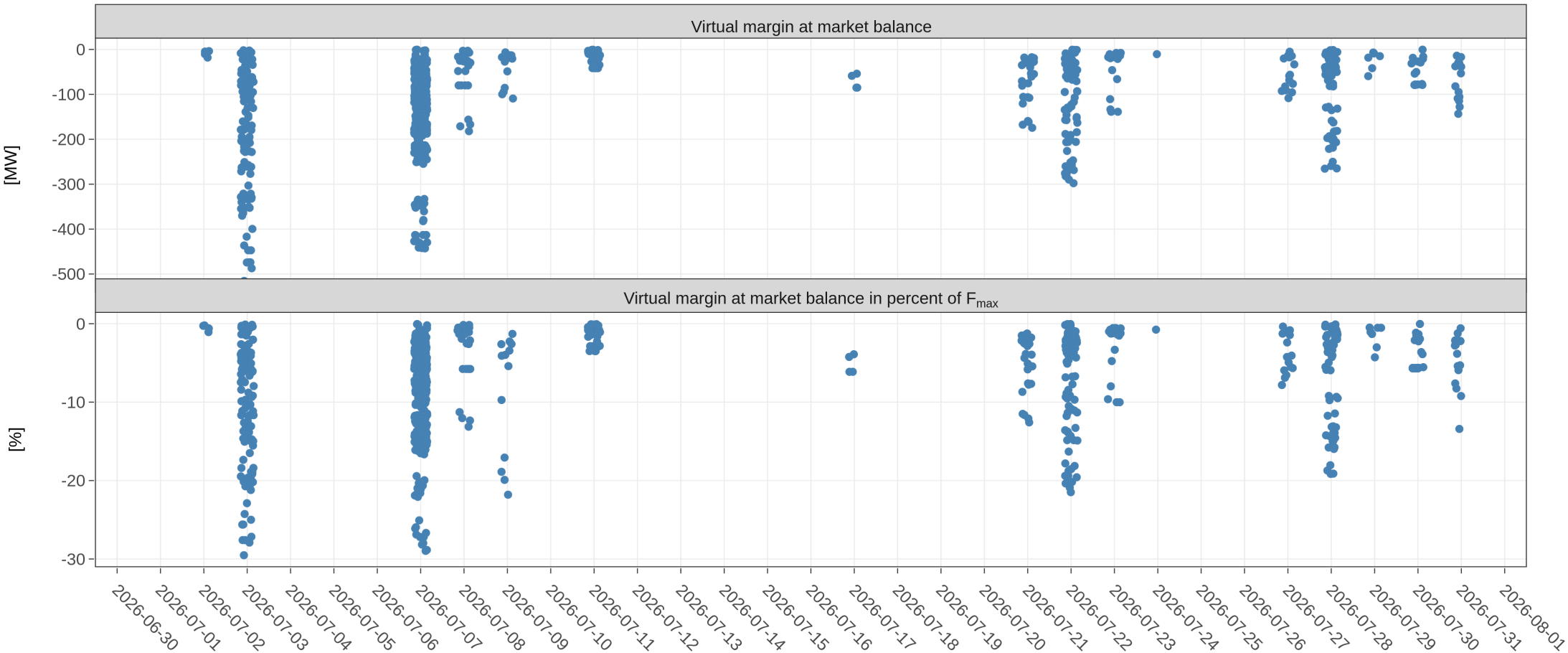
KPI 6b: Virtual margins at market balance AT



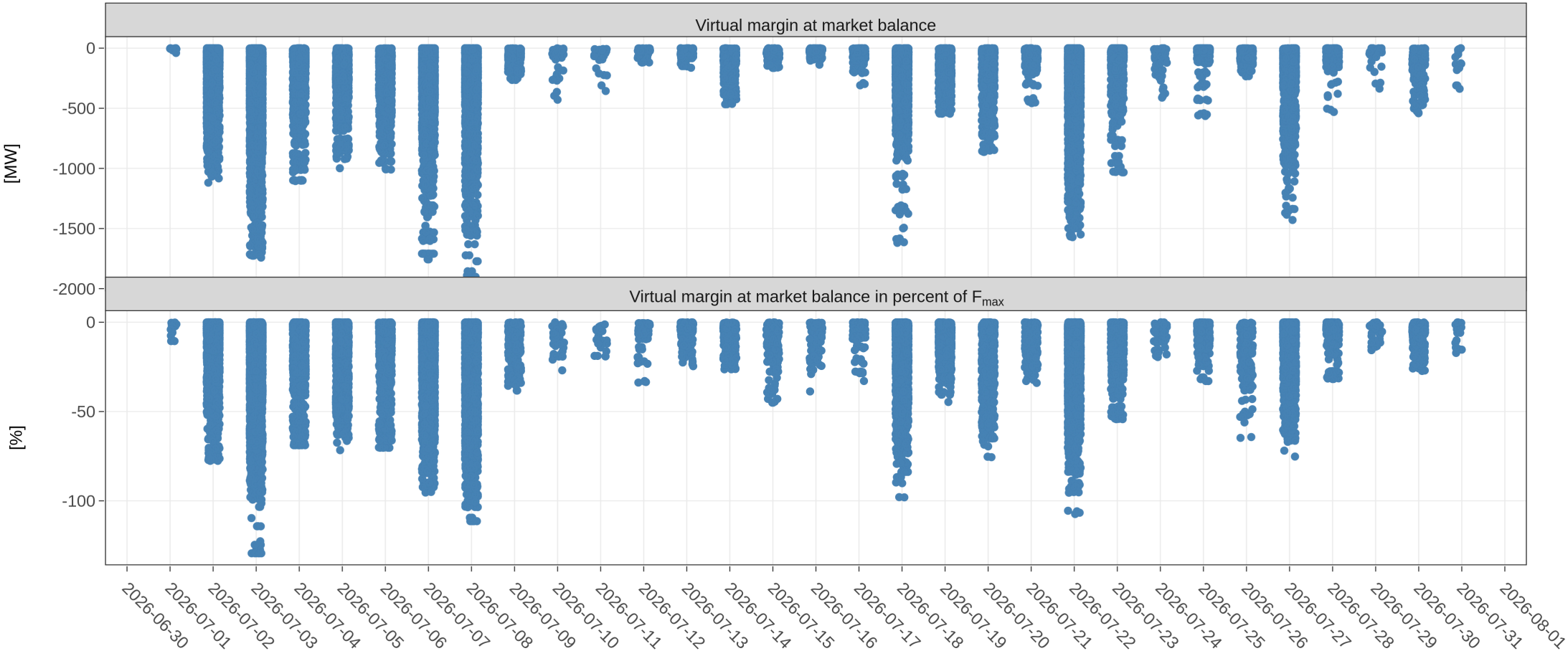
KPI 6b: Virtual margins at market balance BE



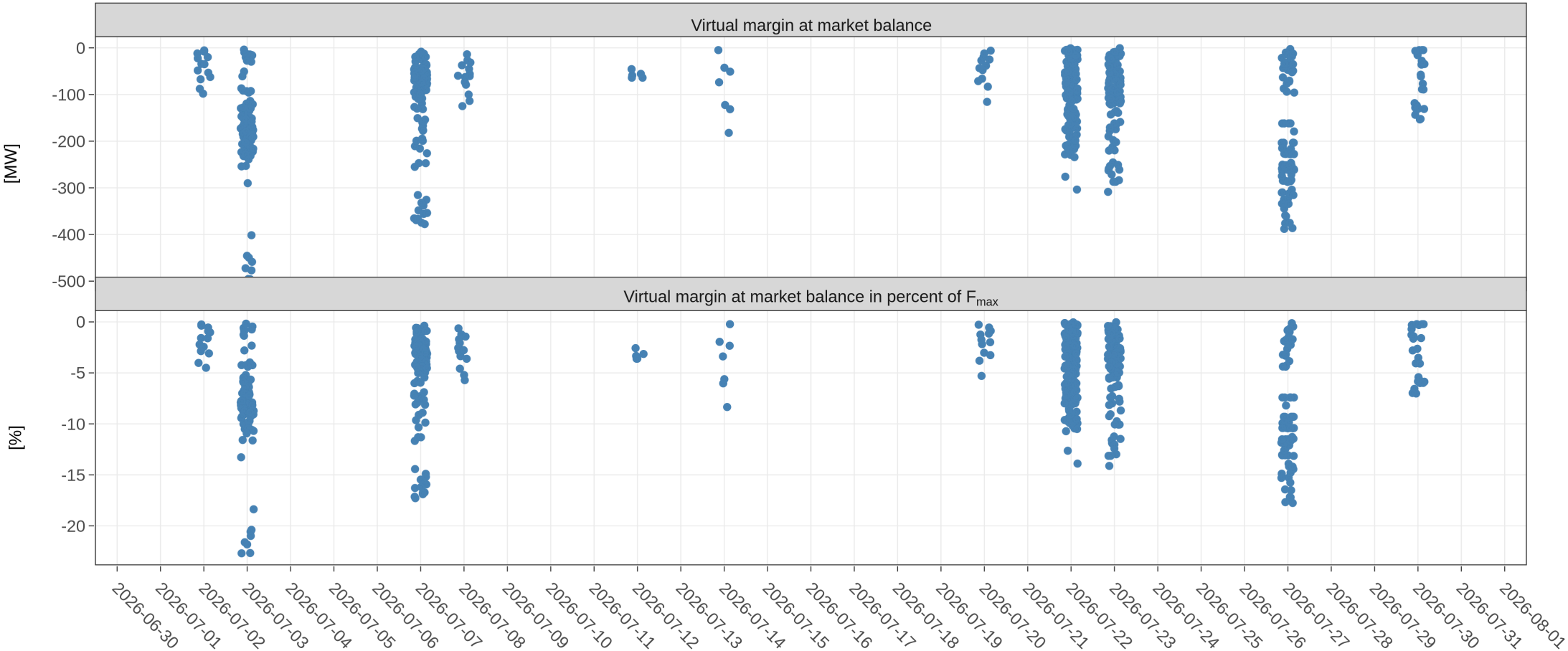
KPI 6b: Virtual margins at market balance CZ



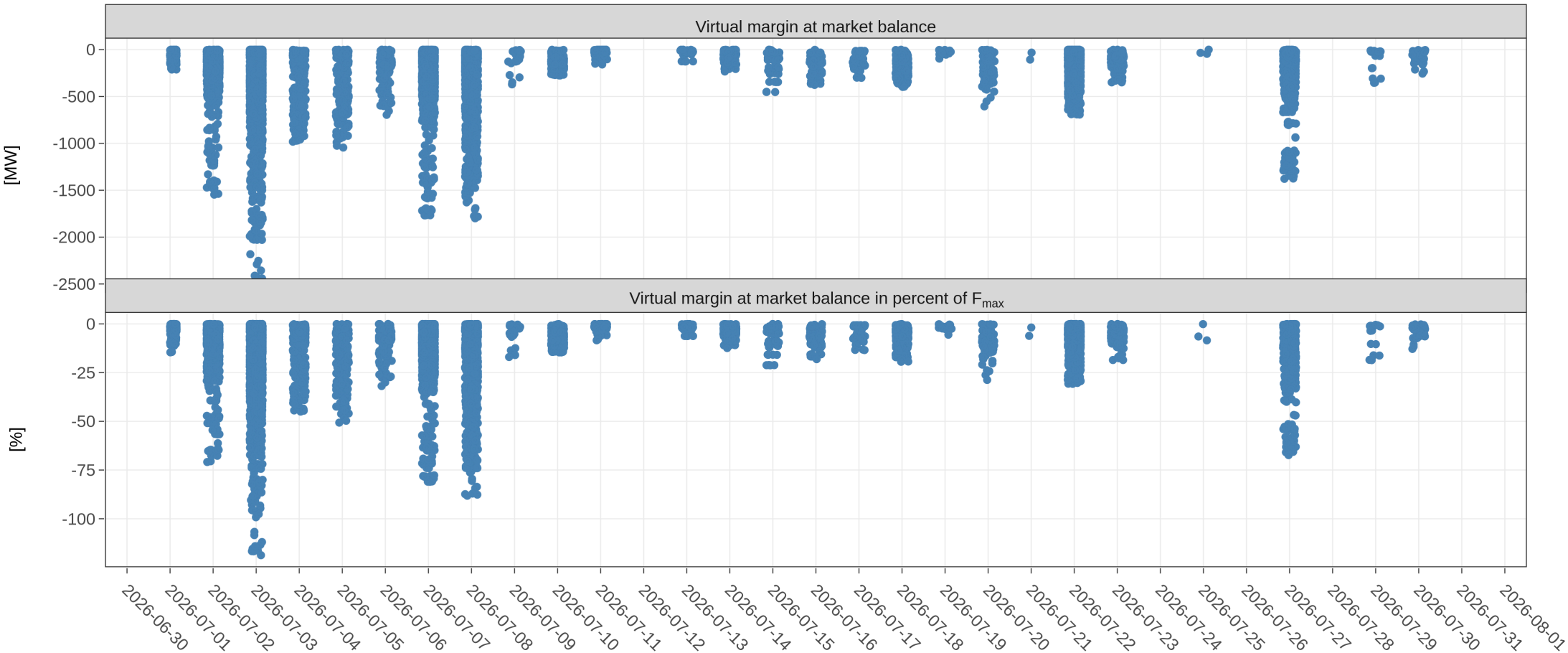
KPI 6b: Virtual margins at market balance D2



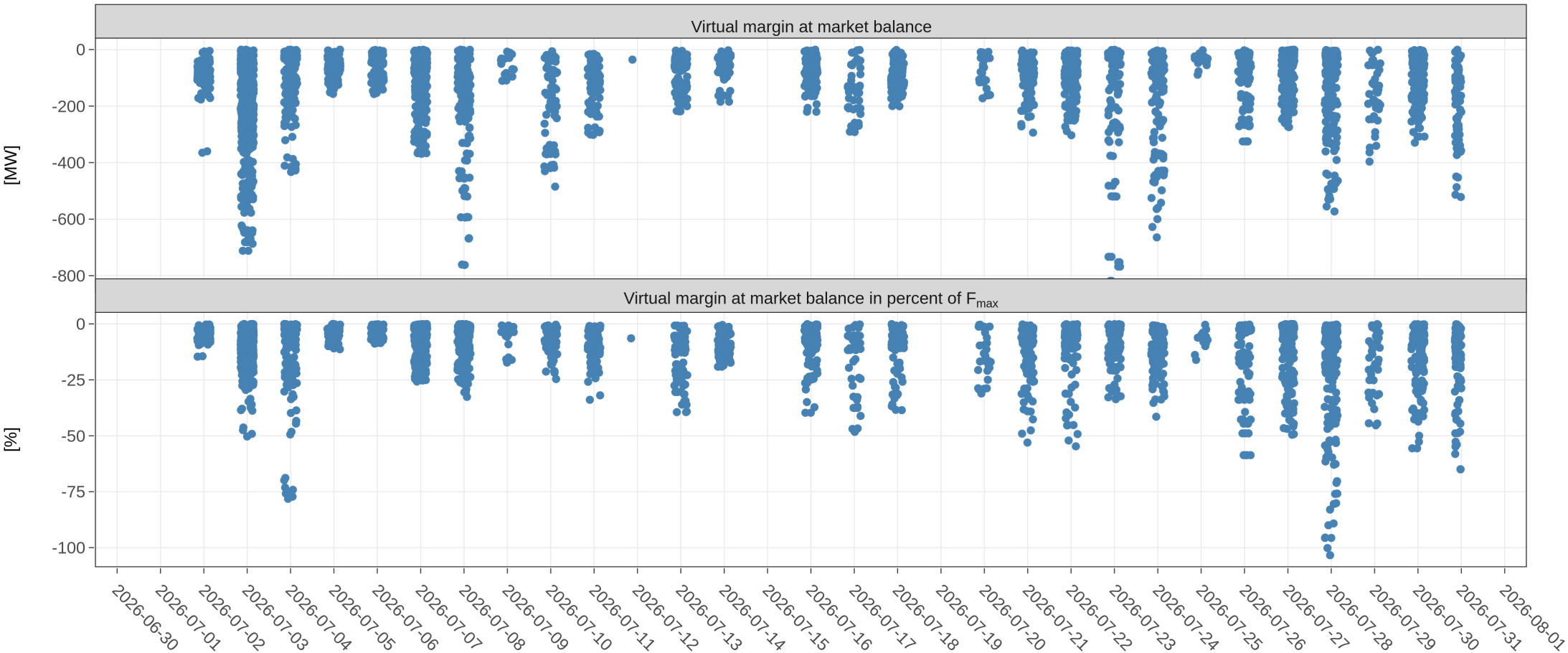
KPI 6b: Virtual margins at market balance D4



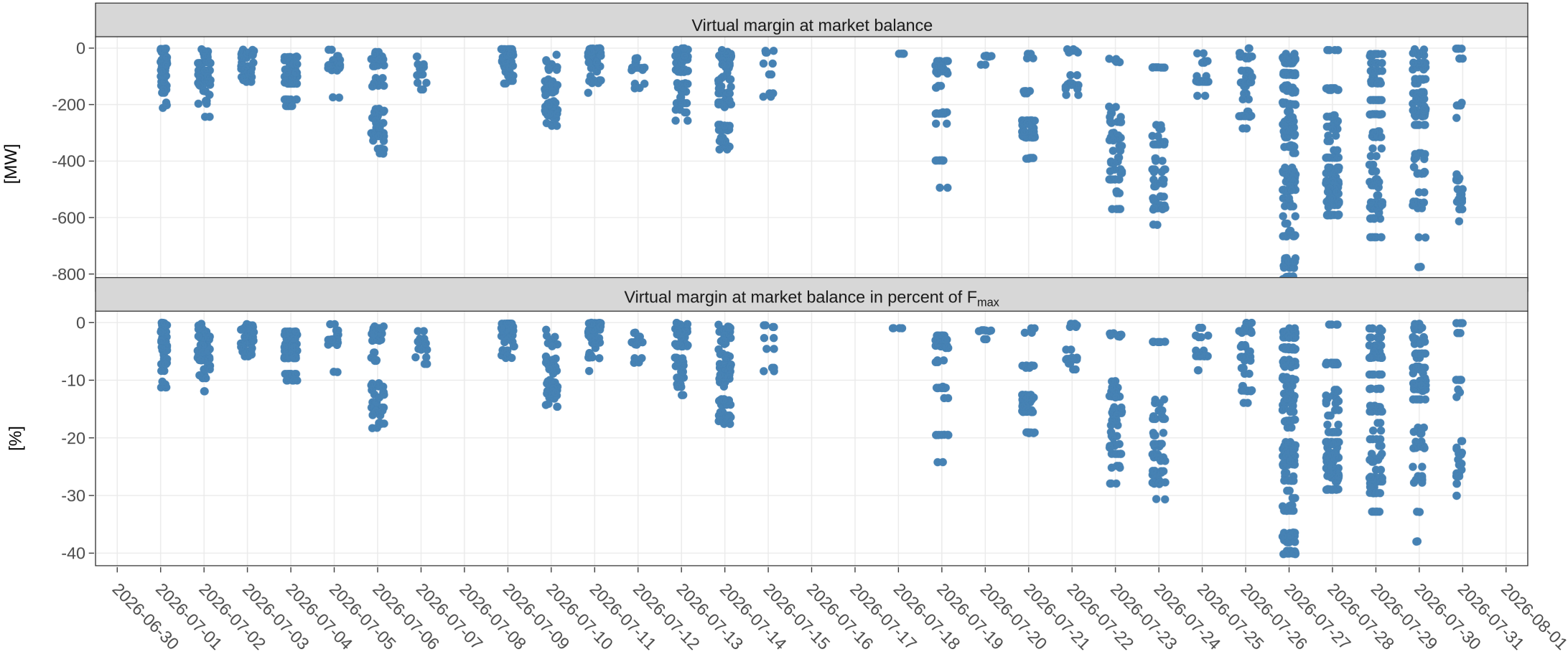
KPI 6b: Virtual margins at market balance D7



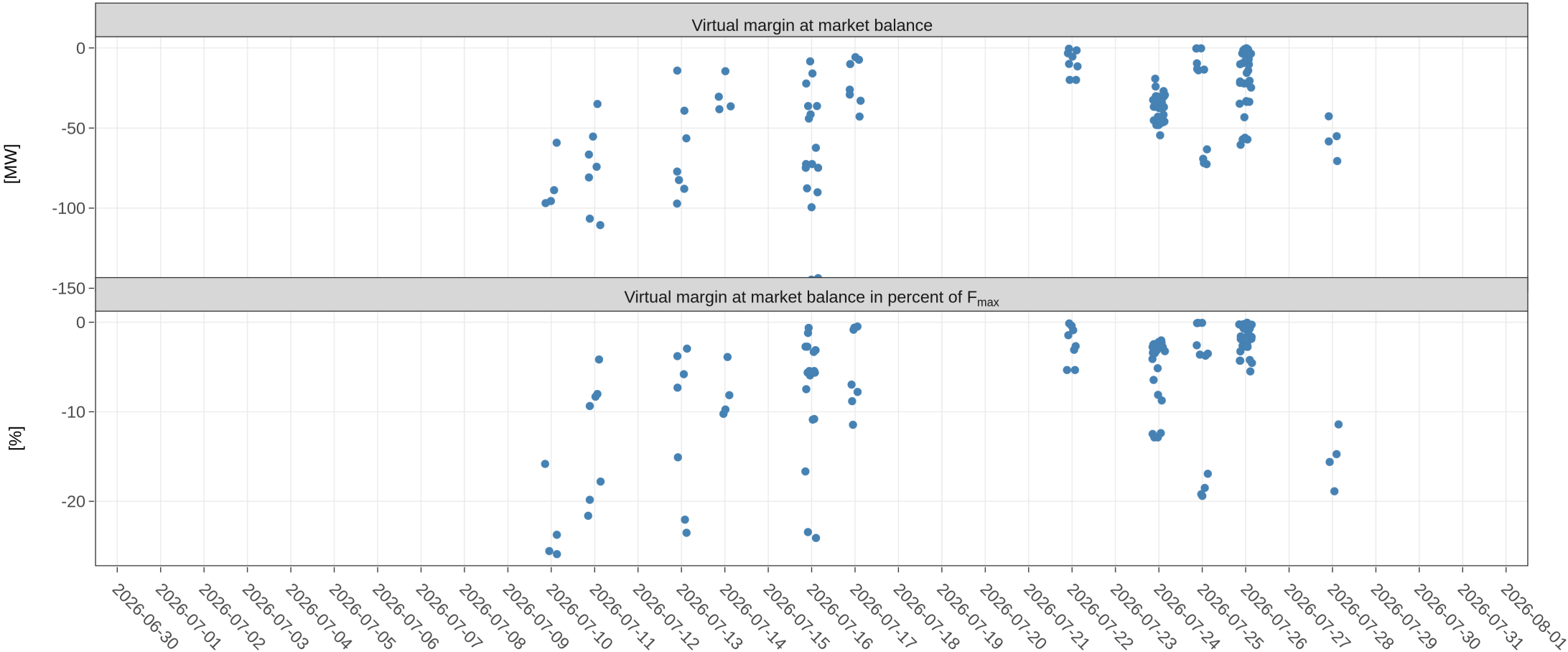
KPI 6b: Virtual margins at market balance D8



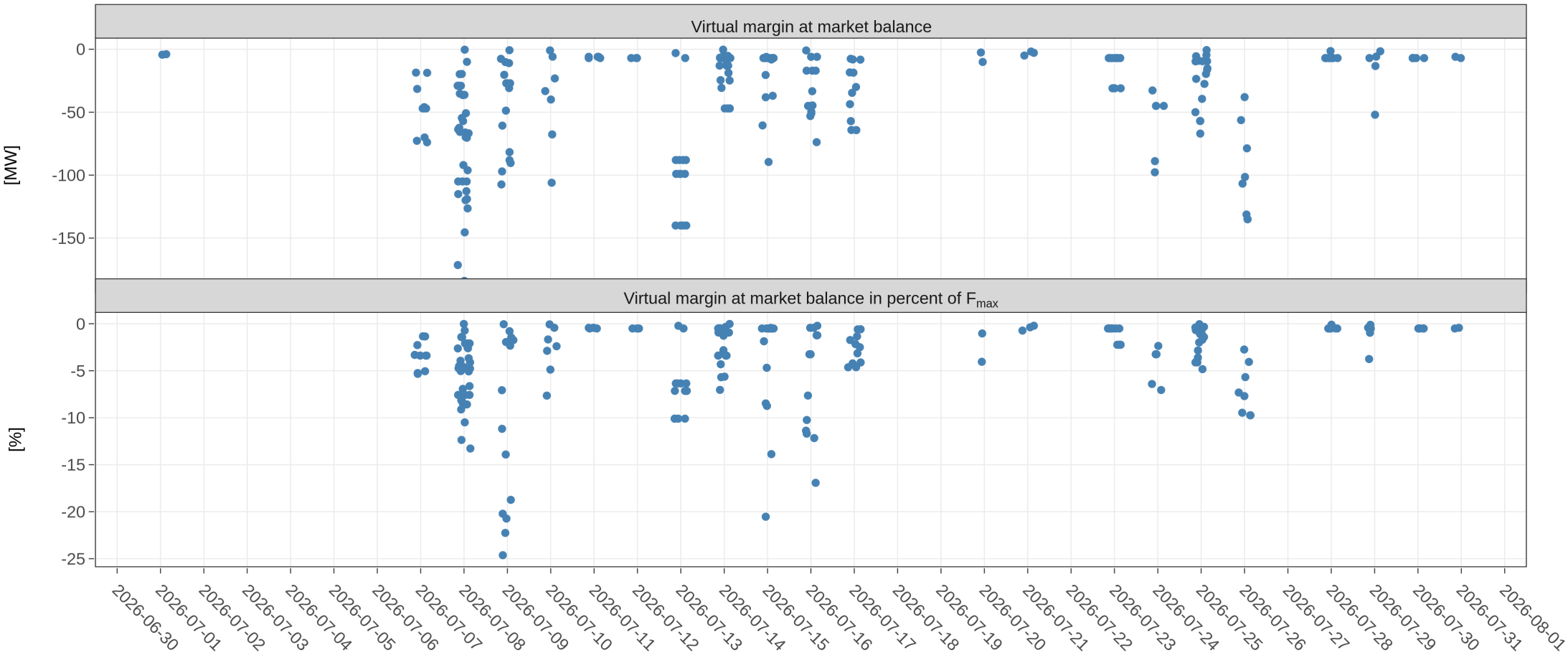
KPI 6b: Virtual margins at market balance FR



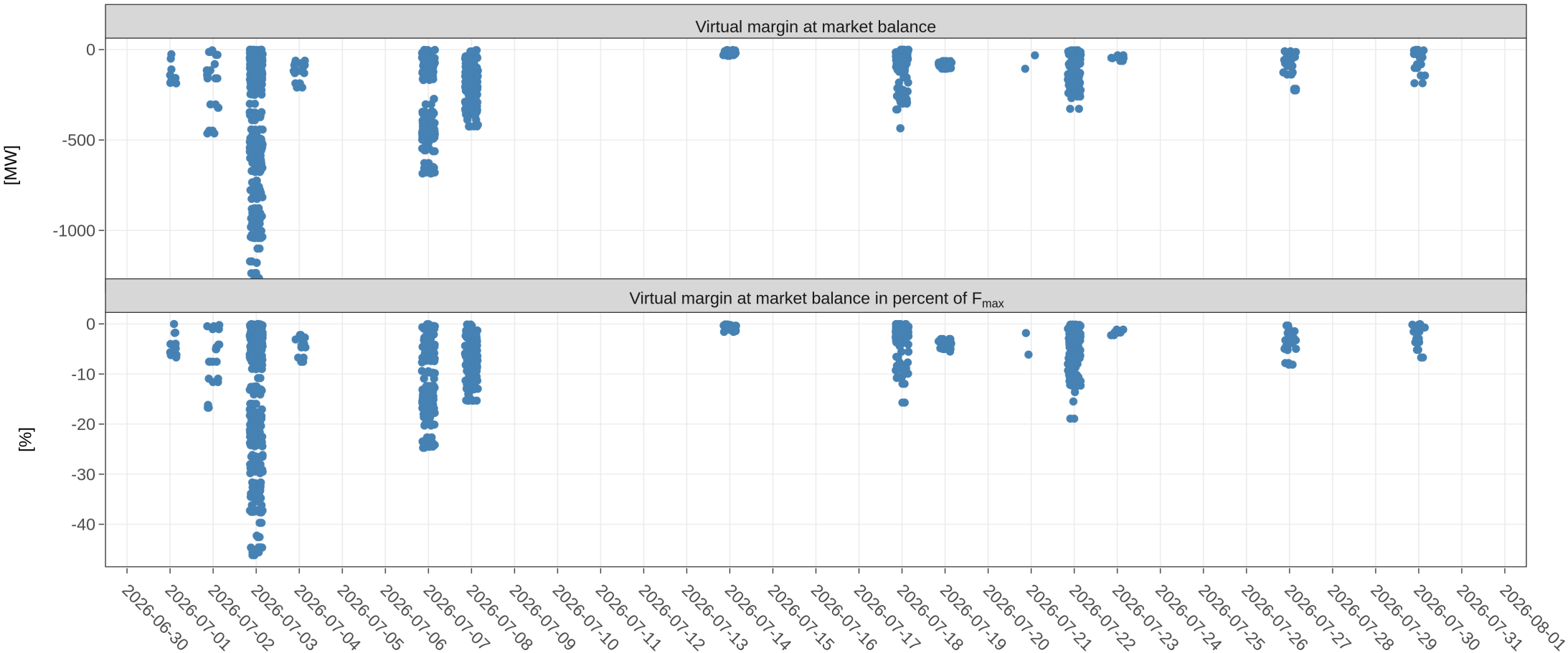
KPI 6b: Virtual margins at market balance HR



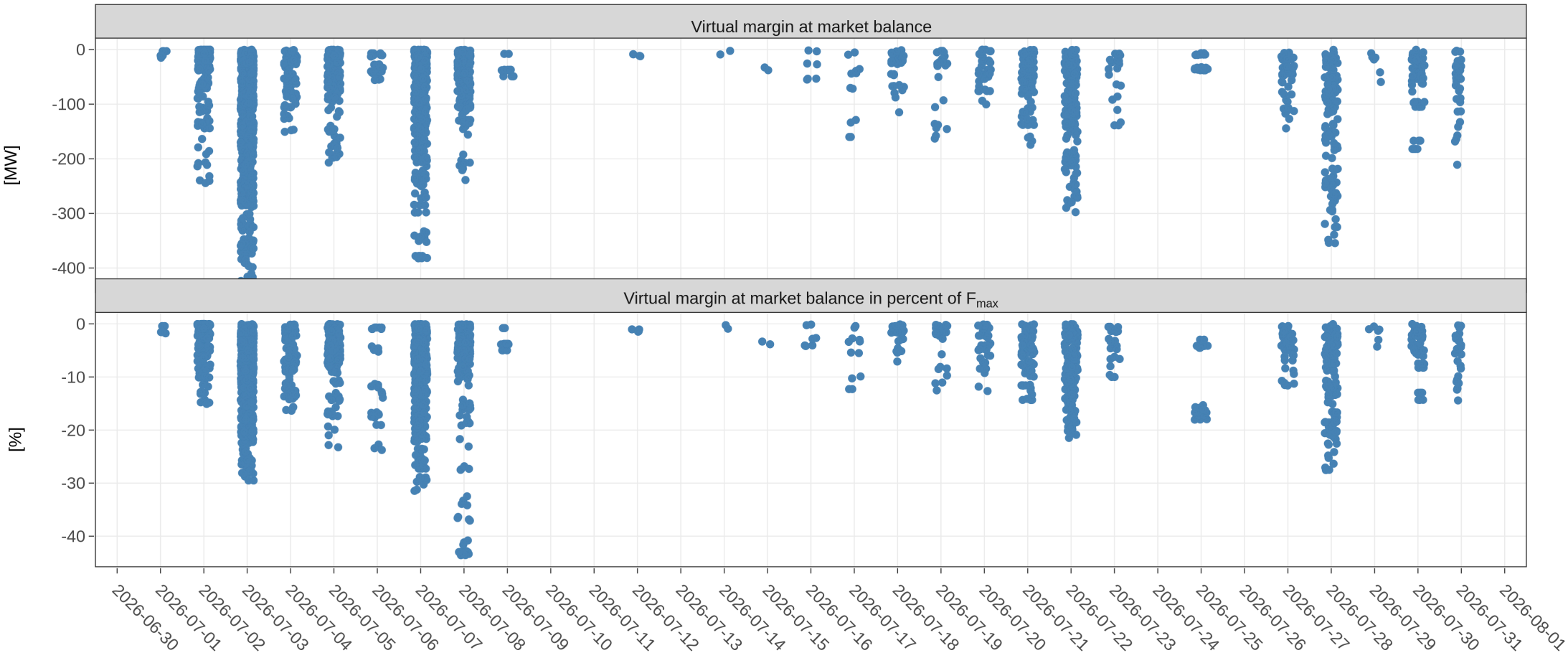
KPI 6b: Virtual margins at market balance HU



KPI 6b: Virtual margins at market balance NL



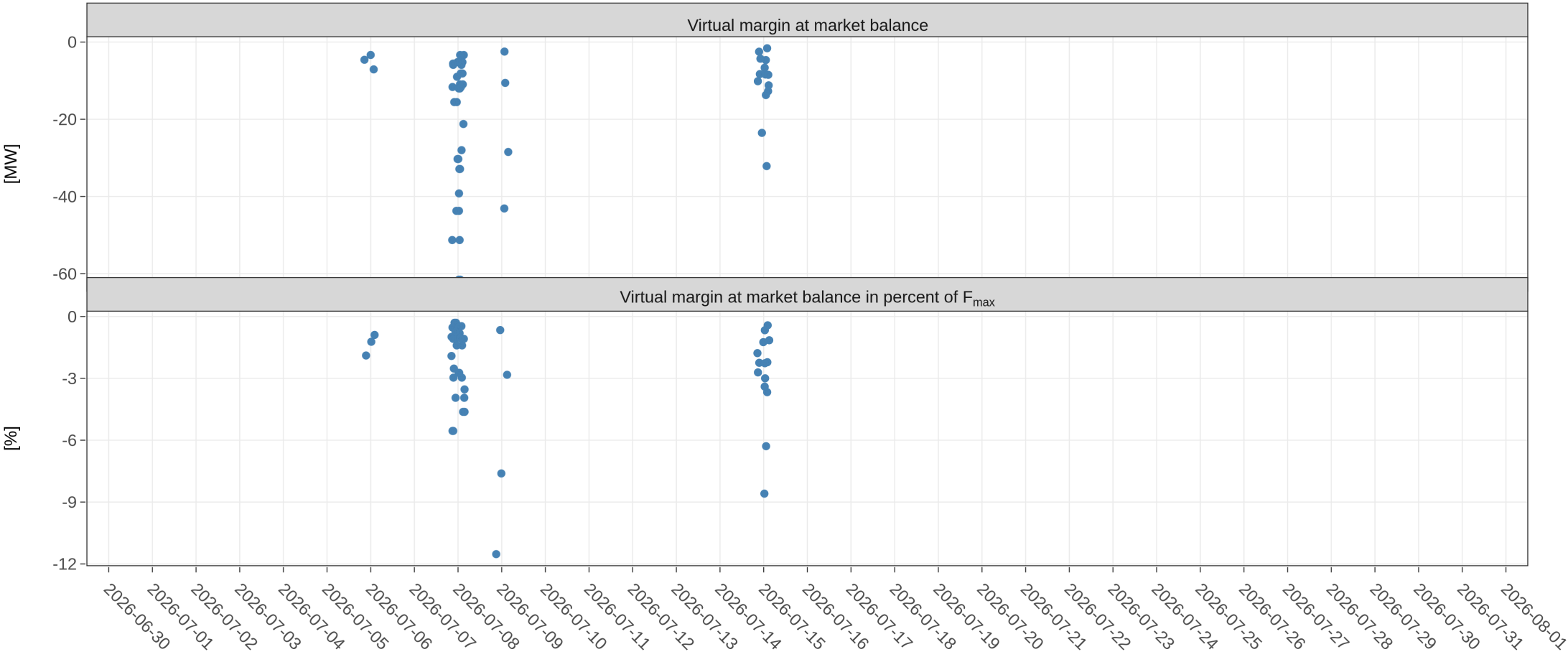
KPI 6b: Virtual margins at market balance PL



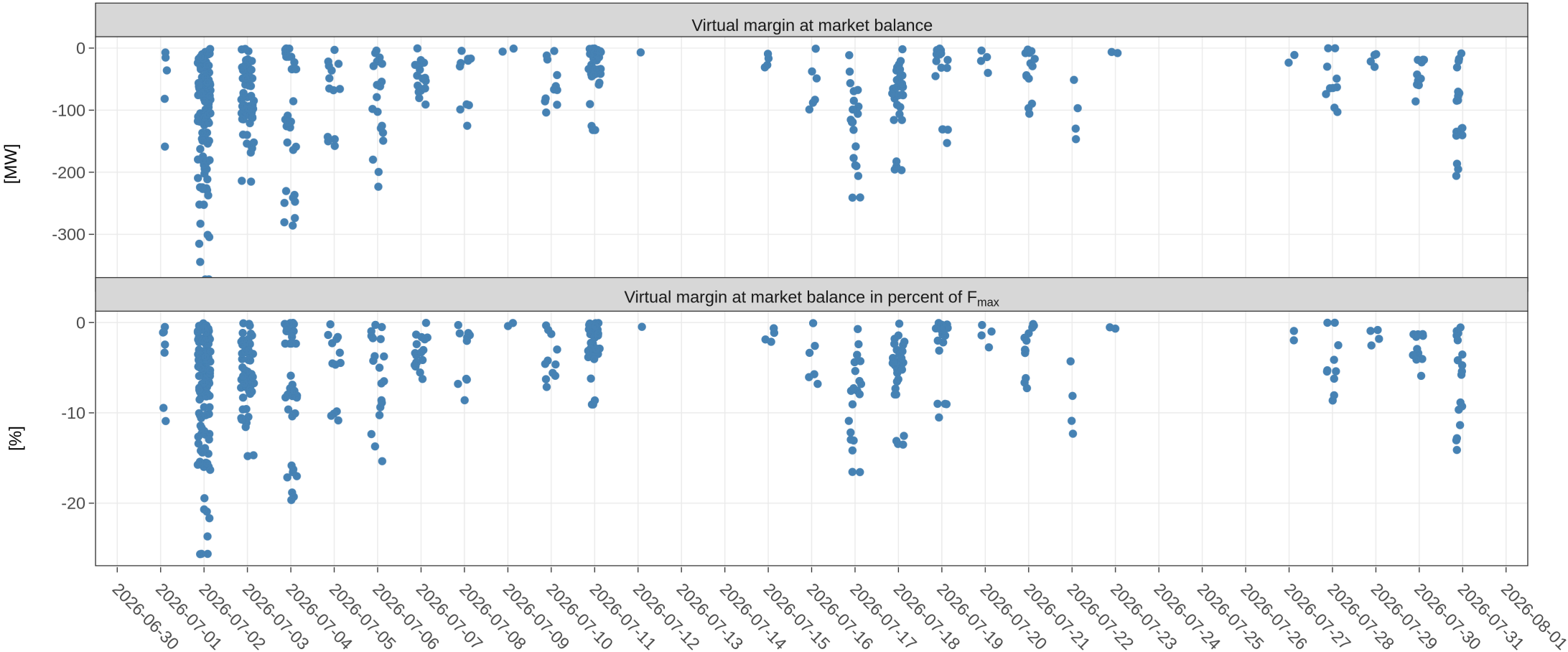
KPI 6b: Virtual margins at market balance RO



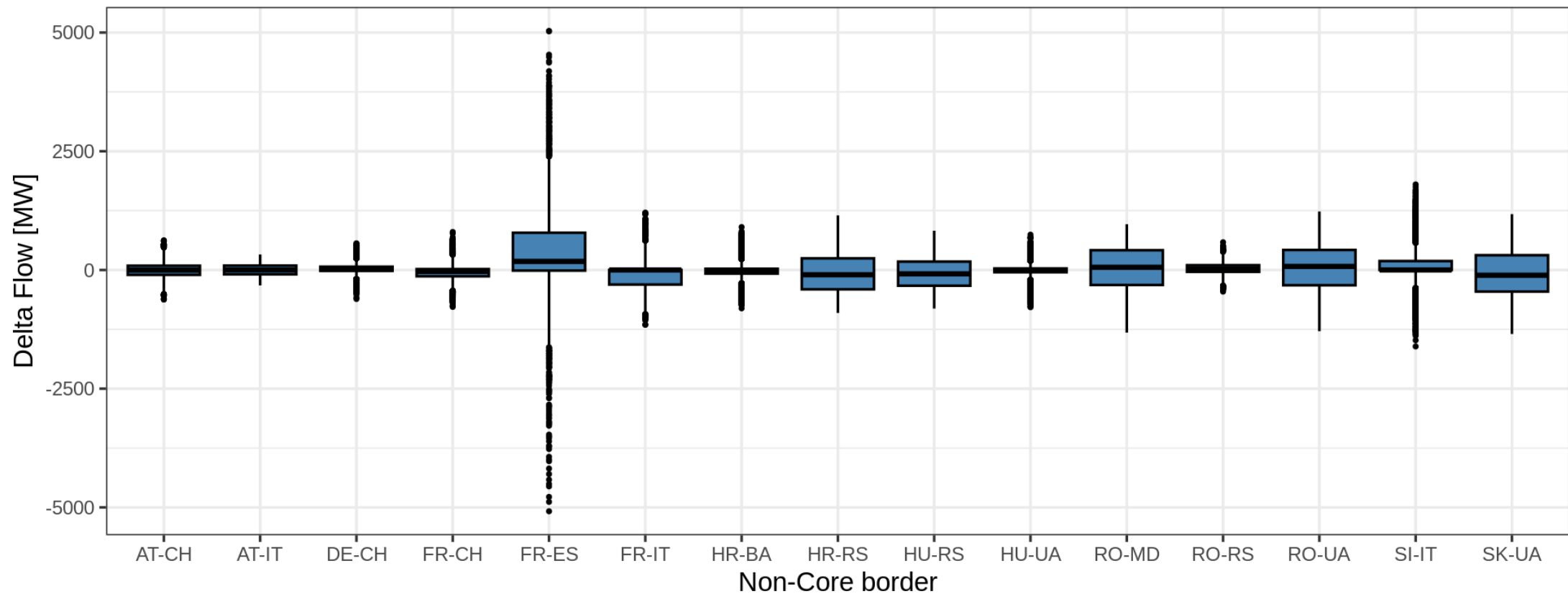
KPI 6b: Virtual margins at market balance SI



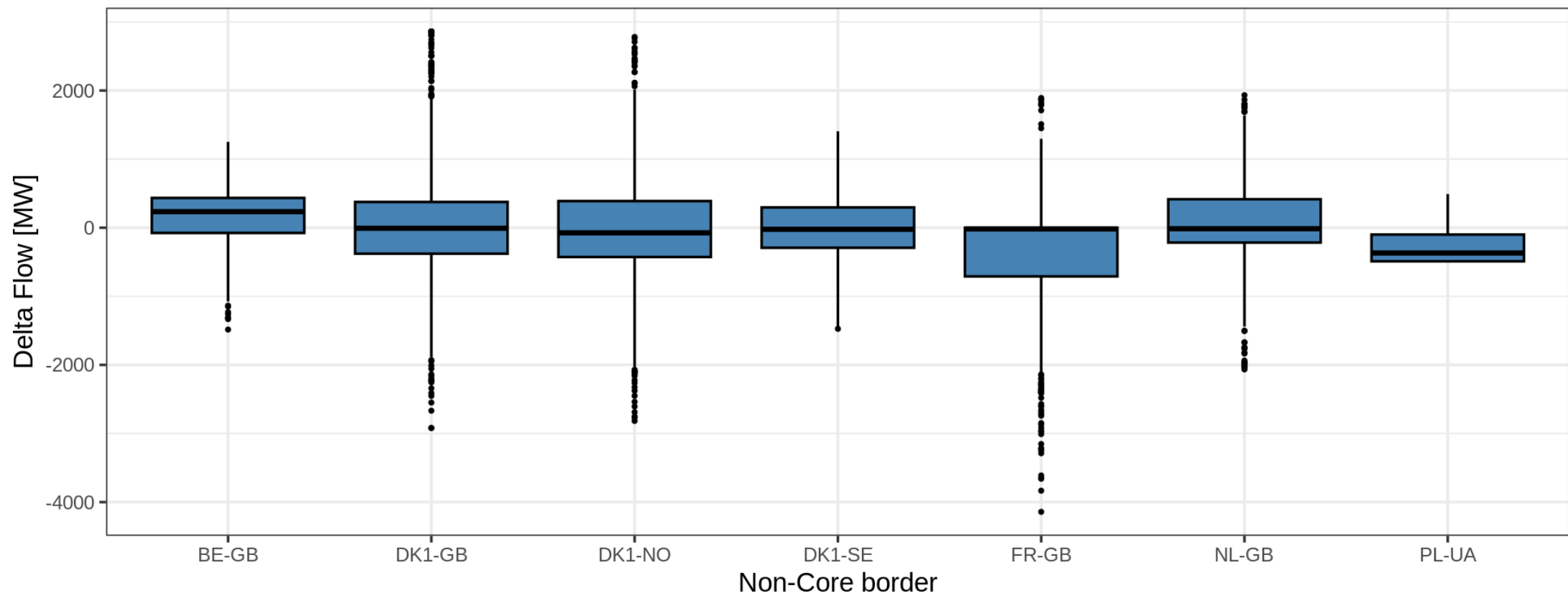
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



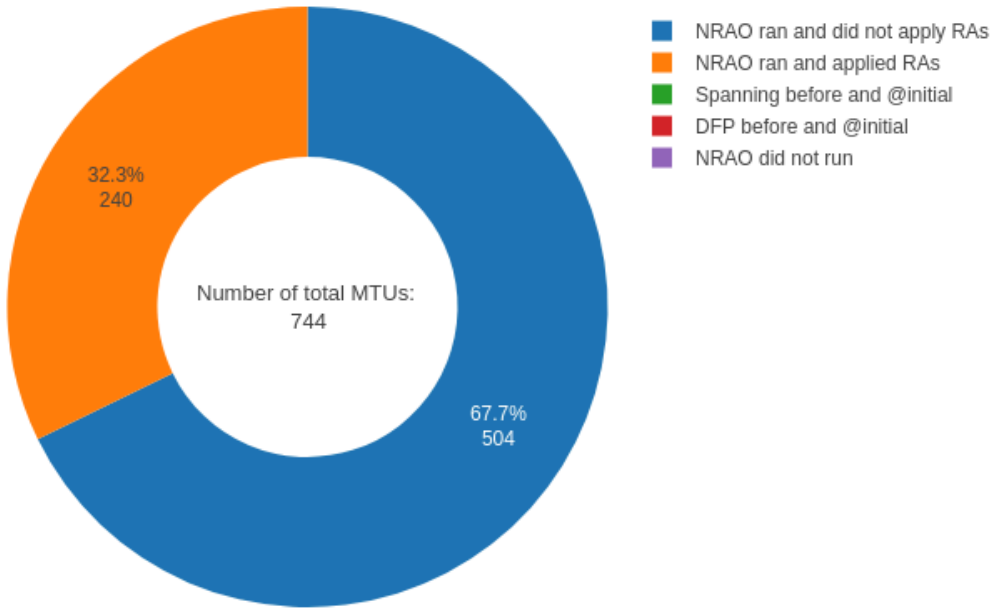
KPI 8: NRAO – Applied Remedial Action



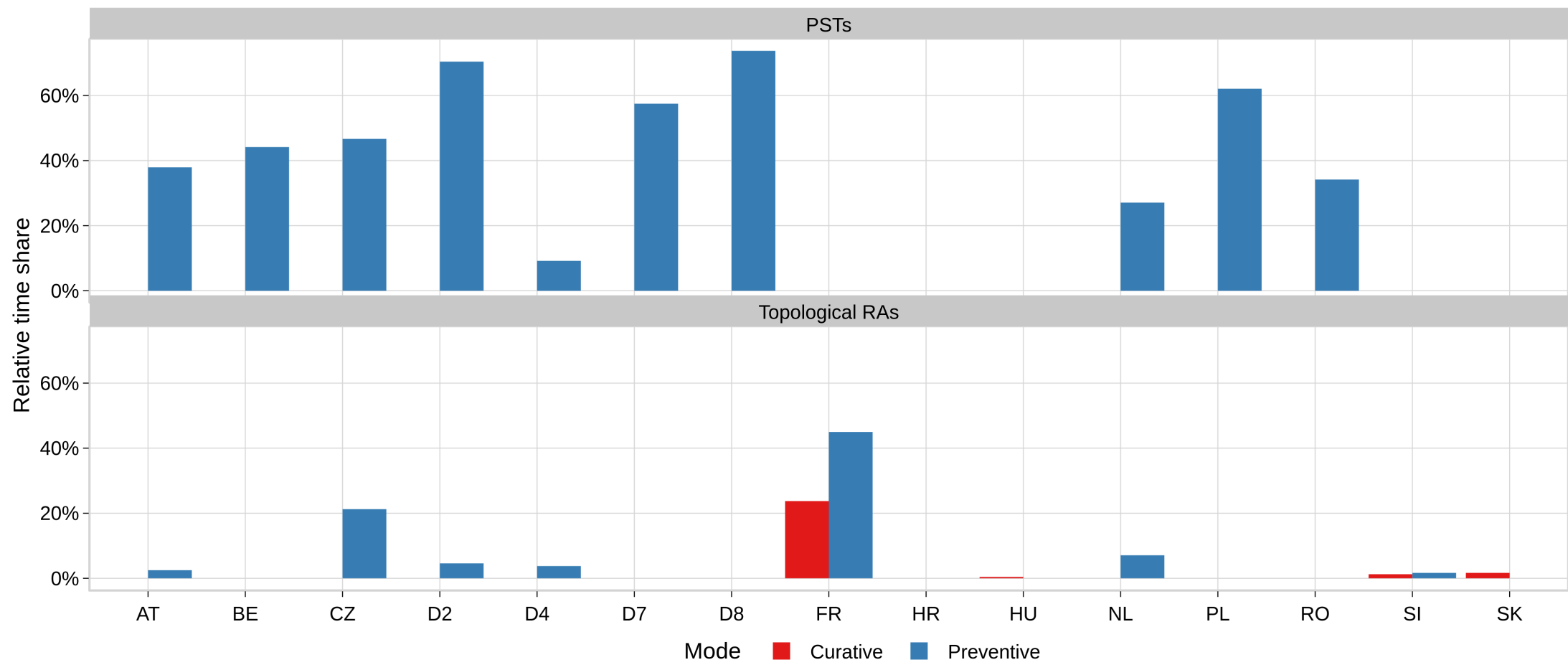
In the following plots, the relative time share relates to the hours labeled ‘NRAO Ran and Applied RAs’.

Total MTUs: 744 hours

Category	Hours (%)
NRAO ran and did not apply RAs	504 hours (67.7%)
NRAO ran and applied RAs	240 hours (32.3%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

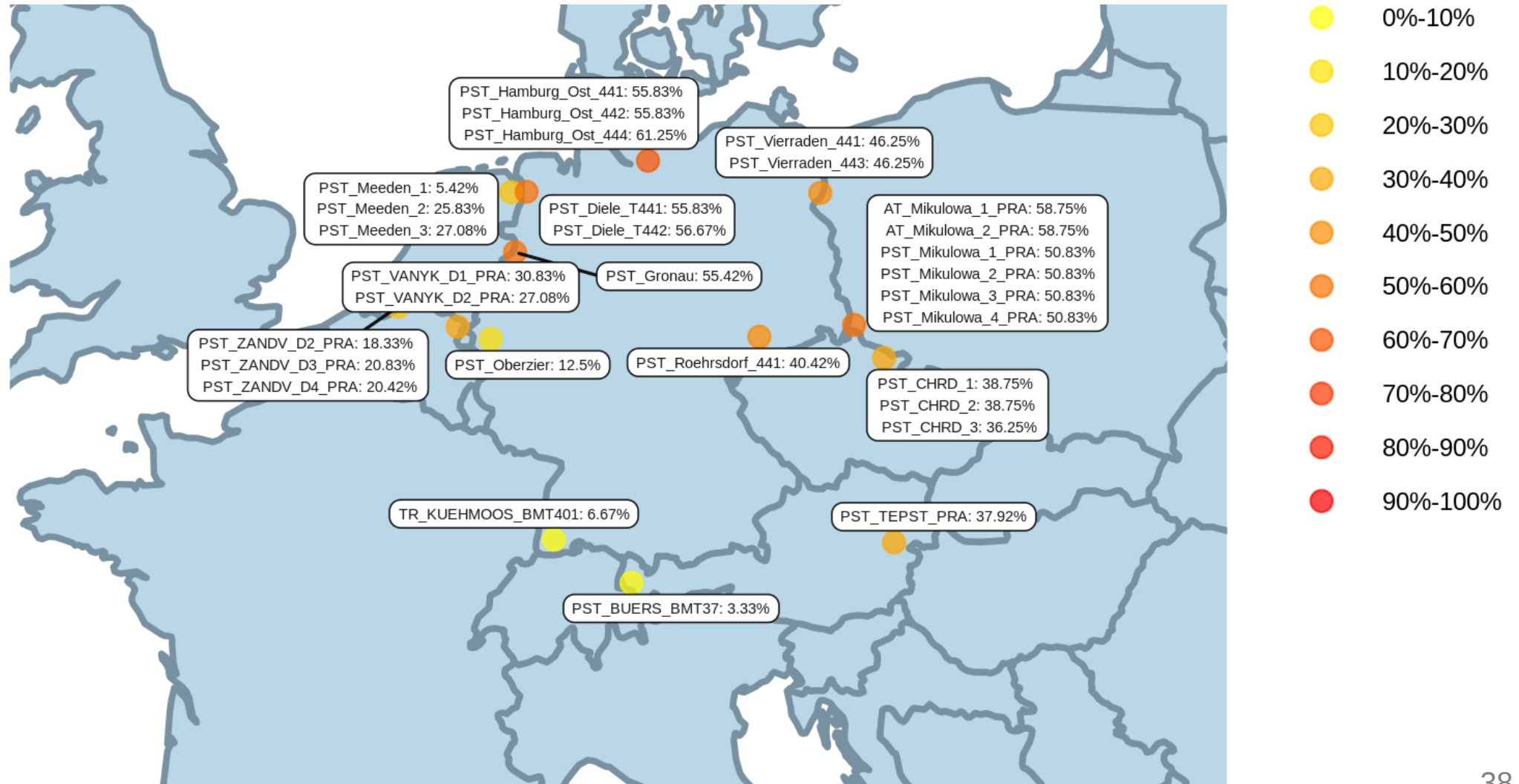


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



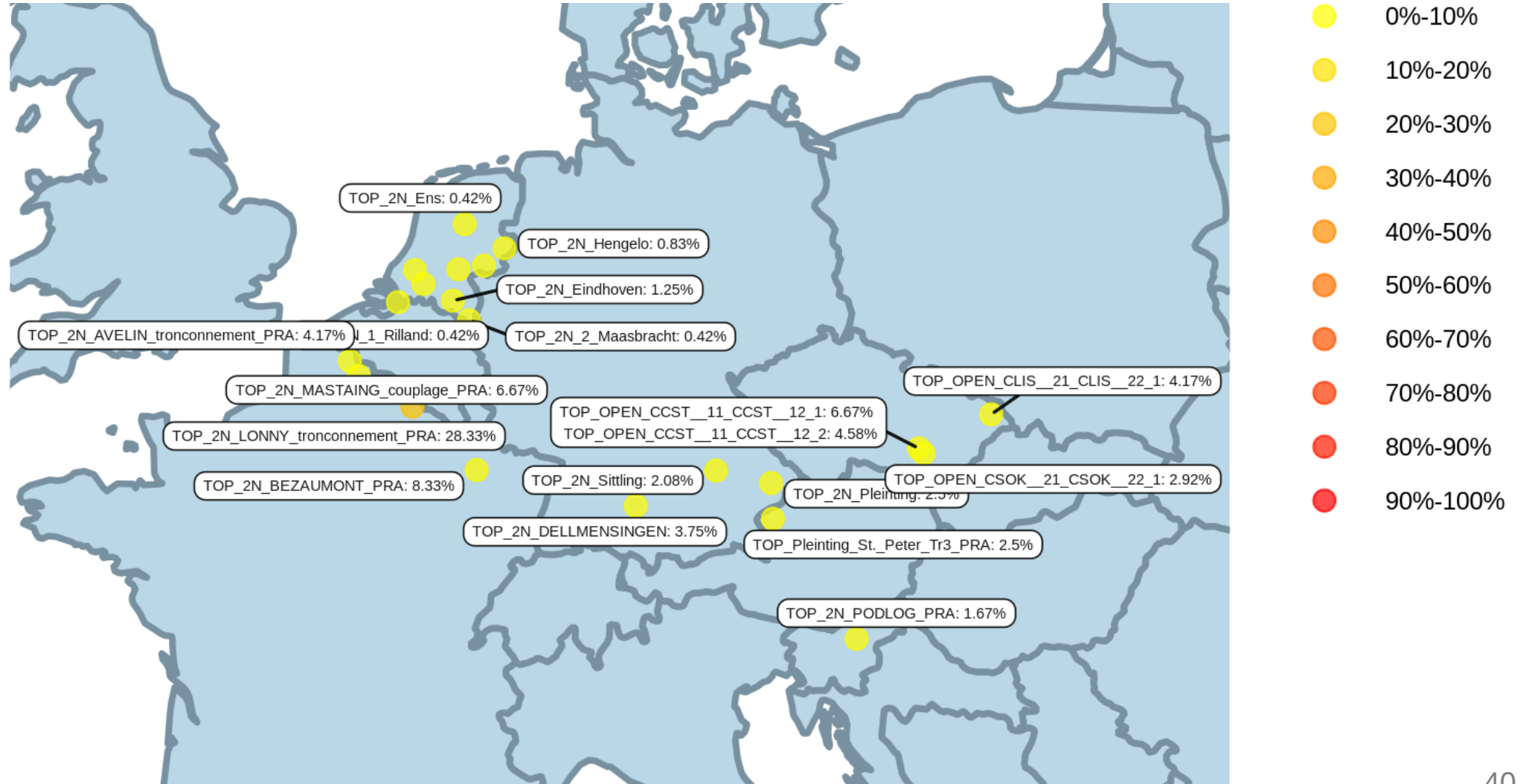
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



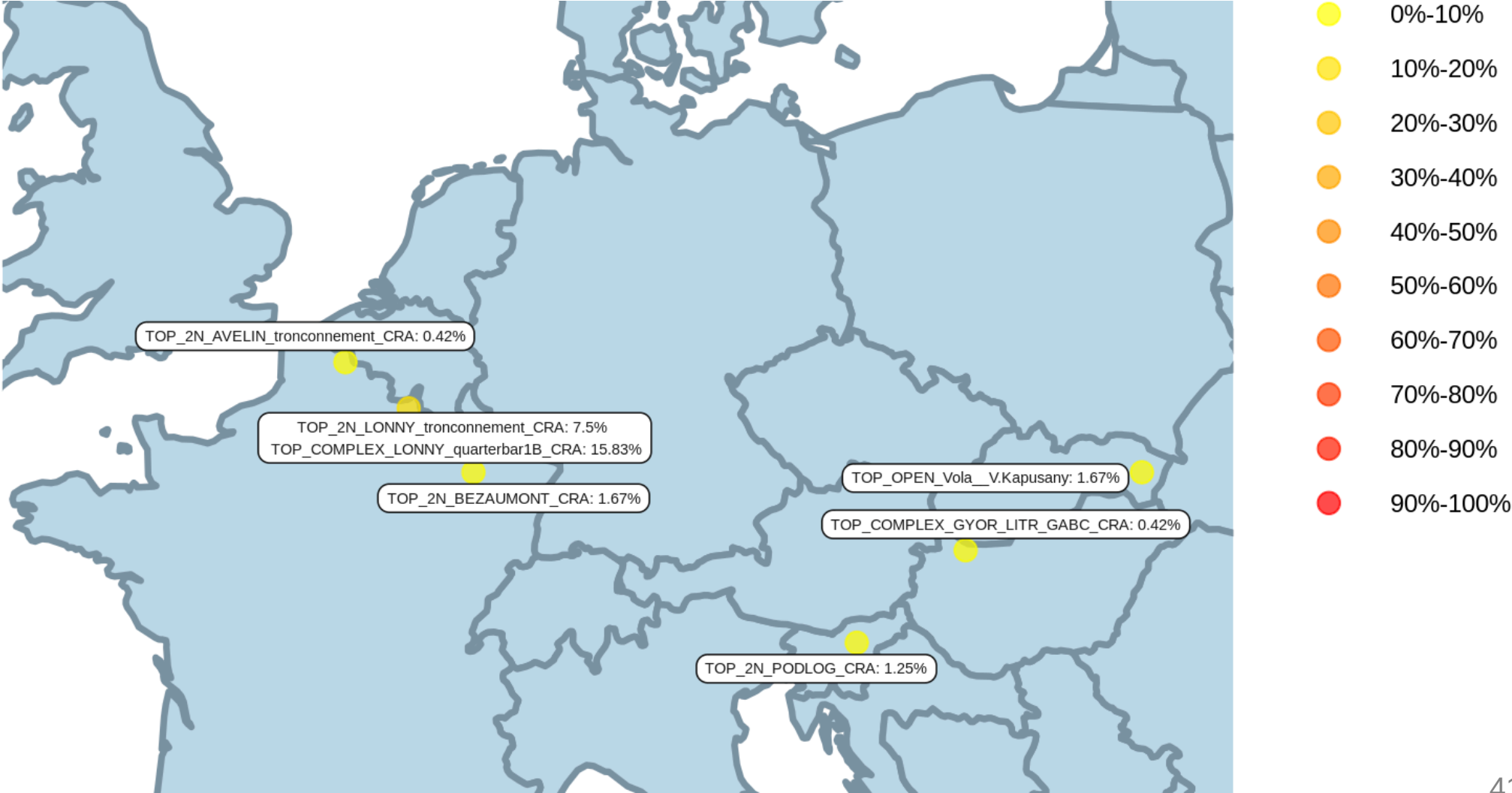
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

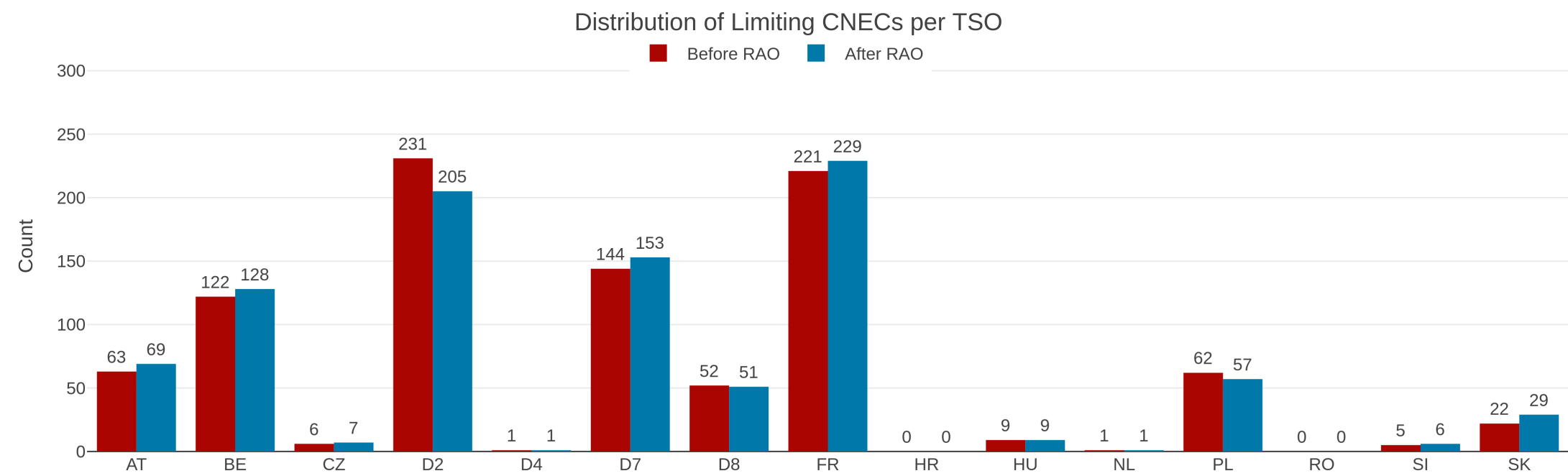
Relative Time Share of Applied Topological RAs in Curative Mode



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.

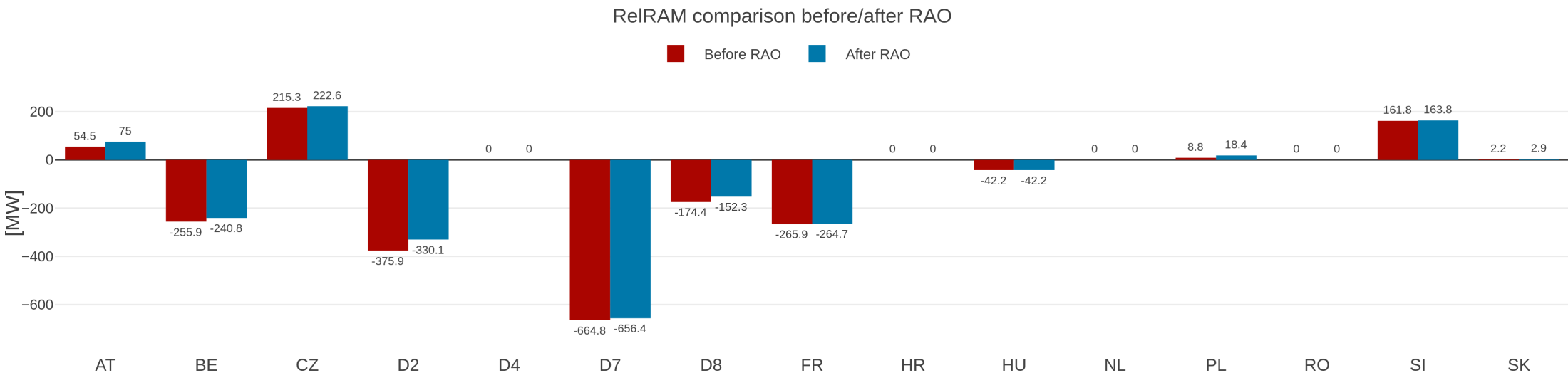
KPI 10: Average variation of relative RAM before and after NRAO



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
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	744	1616	41.46%	19.80%	107.30%	0.2429	1.0328
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	744	1425	107.75%	47.86%	162.03%	0.175	0.4498
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	744	1608	66.81%	32.38%	90.43%	0.3469	1.4158
[D8-PL] Mikulowa PST1 [DIR] [PL]	740	742	63.77%	20.83%	95.38%	0.2724	1.1996
[D2-D2] Sottrum Transformer T421 [DIR] [D2]	736	947	76.66%	65.84%	117.44%	0.1531	0.4736
[D8-D8] Reuter - Mitte 903 [OPP]	736	835	79.10%	46.39%	115.52%	0.1218	0.548
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	734	775	87.90%	48.81%	119.67%	0.289	1.0727
[SK-SK] Gabcikovo - P.Biskupice [DIR]	733	783	84.39%	62.41%	104.94%	0.3905	1.3978
[RO-RO] TR Rosiori 400/220 1 [DIR]	730	796	69.57%	24.58%	104.79%	0.1605	0.3607
[HU-HU] Gonyu - Gyor [DIR]	726	1060	74.38%	60.12%	102.58%	0.3258	1.5124
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	725	725	54.54%	20.70%	82.79%	0.3292	1.417
[AT-D2] St. Peter 2 - Pleinting 258 [DIR] [AT]	722	1440	81.93%	20.00%	132.58%	0.1802	0.7259
[BE-BE] Achene - Gramme 380.10 [OPP]	721	2524	95.31%	68.05%	136.18%	0.4063	1.423
[AT-AT] Sarasdorf - Zurndorf 439A [OPP]	717	717	78.51%	60.14%	96.48%	0.3595	1.5249
[SK-HU] Gabcikovo - Gyor [DIR] [HU]	717	1155	78.44%	57.79%	100.29%	0.2443	1.249
[SK-SK] V.Dur - Levice 1 [DIR]	717	717	57.89%	24.19%	73.33%	0.2324	0.9921
[SK-UA] V.Kapusany - Mukachevo (WPS) [OPP] [SK]	717	924	89.57%	61.03%	131.16%	0.289	1.0727
[NL-D7] Maasbracht - Oberzier SELFK WS [OPP] [D7]	716	769	115.51%	74.65%	165.76%	0.2745	1.1627
[CZ-D8] Hradec - Rohrsdorf - V445 [OPP] [CZ]	714	978	66.04%	51.89%	101.14%	0.3461	1.6335
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	713	1702	66.38%	20.99%	165.47%	0.1811	0.6151

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]	217	217	961.26	23.74%	19.99%	41.89%	0.1986
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	197	215	553.23	74.30%	31.02%	102.59%	0.4064
[D2-D2] Sottrum Transformer T421 [DIR] [D2]	171	171	514.08	72.77%	68.68%	92.17%	0.1464
[BE-BE] Achene - Gramme 380.10 [DIR]	142	149	466.31	74.97%	43.19%	103.78%	0.4061
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	125	125	1225.85	58.39%	38.20%	77.39%	0.3026
[D2-D2] Altheim - Simbach 233/230 [DIR]	122	122	1841.52	59.53%	32.96%	85.98%	0.1061
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	121	128	1953.83	53.34%	21.27%	117.96%	0.1607
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	77	82	1256.76	55.90%	28.41%	102.62%	0.1798
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	75	75	300.45	44.31%	20.70%	75.93%	0.325
[HU-HU] Paks - Perkata [DIR]	54	54	702.49	27.97%	21.50%	45.89%	0.2882
[SK-SK] V.Dur - Levice 1 [DIR]	52	52	4594.87	32.65%	24.19%	45.22%	0.2224
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	52	52	127.81	71.01%	55.48%	91.92%	0.3136
[NL-BE] Maasbracht - Van Eyck 380 White/28 [DIR] [BE]	45	48	274.72	105.93%	72.62%	132.98%	0.4145
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	38	38	706.22	20.55%	19.99%	29.94%	0.1781
[D2-D2] Altheim - Simbach 234/230 [DIR]	36	36	1835.43	58.50%	41.03%	77.18%	0.1022
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	32	32	486.09	65.28%	48.81%	80.51%	0.2347
[NL-BE] PST Zandvliet 3 [DIR] [BE]	31	31	281.91	94.30%	78.55%	110.42%	0.4647
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	30	30	541.86	41.94%	22.74%	59.12%	0.2248
[D8-PL] Mikulowa PST1 [DIR] [PL]	30	30	659.85	43.44%	20.83%	64.62%	0.2687
[D7-D7] Y-Oberzier (-Paffendorf - Sechtem) SECHTM S [OPP]	29	29	343.33	55.87%	46.47%	74.36%	0.4928

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 = $500\text{MW}/0.4 = 1250\text{MW}$

KPI 13 : Allocation Constraints - Poland



	# MTUs
AC was limiting MC	593
AC < 0 MW	81
AC = 0 MW	413
AC > 0 MW	99

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-2054.1	4045.66
Min.	-9178.0	0.00
Max.	0.0	13324.00

