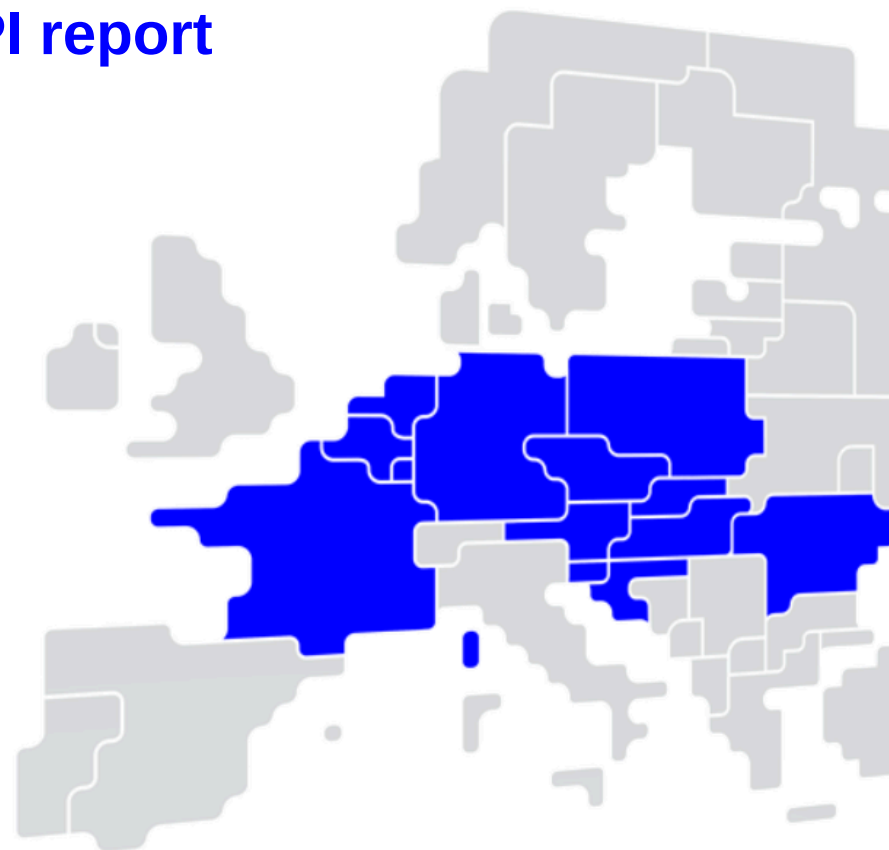




Core FB MC Operational KPI report

August 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

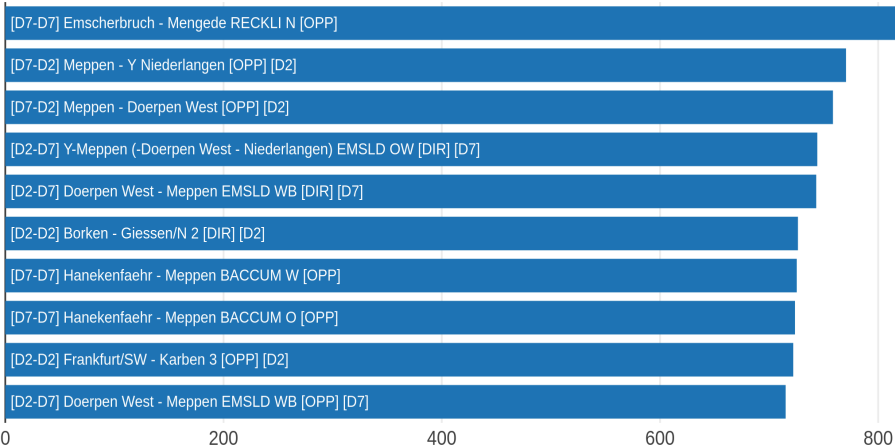
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

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]	817.50	39.61%	39.18%
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	770.48	41.79%	34.88%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	758.47	41.18%	29.89%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	744.13	29.84%	21.74%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	743.19	29.80%	18.54%
[D2-D2] Borken - Giessen/N 2 [DIR] [D2]	726.39	34.81%	32.29%
[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	725.33	33.87%	22.53%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	723.71	33.64%	26.09%
[D2-D2] Frankfurt/SW - Karben 3 [OPP] [D2]	722.10	43.42%	15.41%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	715.15	28.67%	17.73%



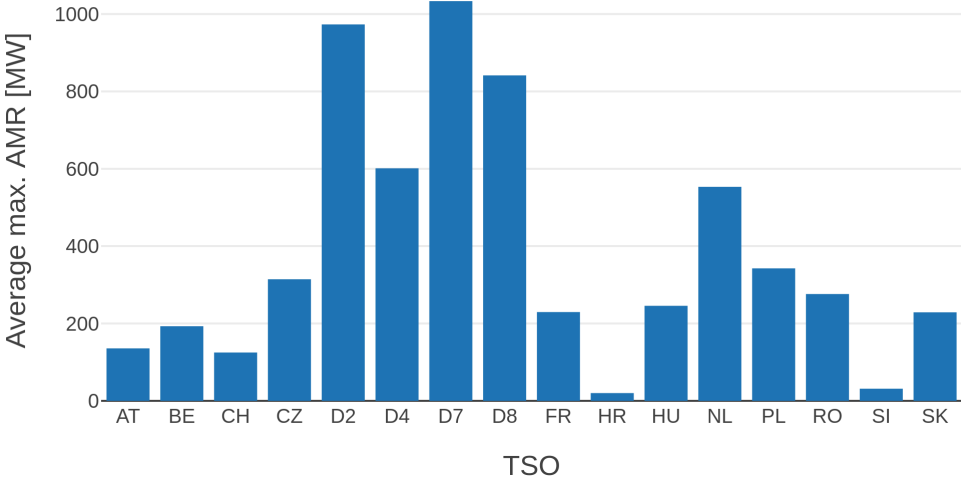
Average max. AMR [MW]

KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	135.71
BE	193.11
CH	125.09
CZ	314.41
D2	973.03
D4	601.02
D7	1033.33
D8	841.22
FR	229.57
HR	20.12

TSO	Average maximum AMR per TSO
HU	245.65
NL	553.37
PL	342.49
RO	276.23
SI	31.54
SK	228.98



KPI 3: Share of MTUs with intervention per TSO



Total BDs
31

Total MTUs
744

MTUs without IVA
92

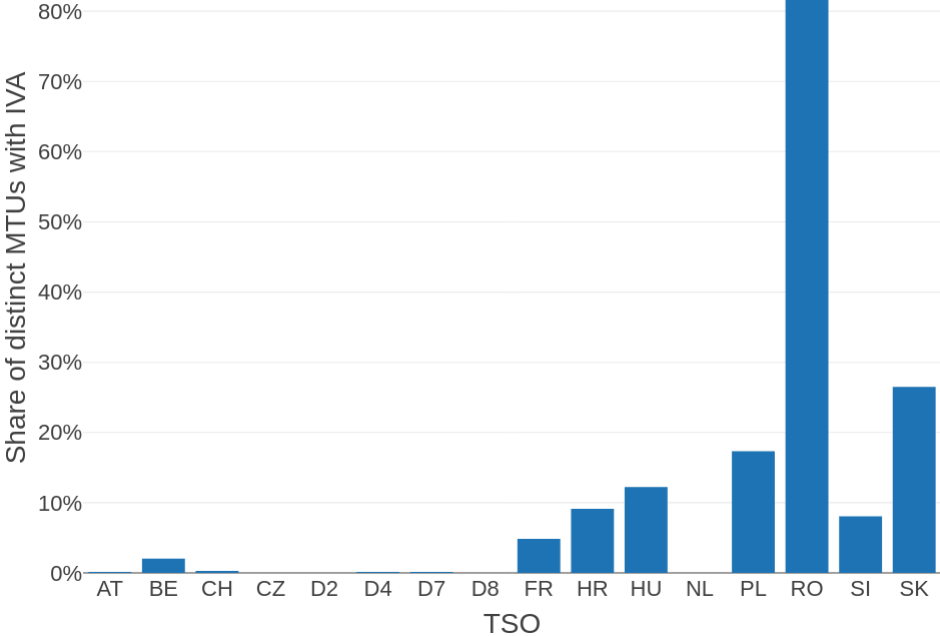
Share of distinct MTUs without IVA
12.37%

MTUs with IVA
652

Share of distinct MTUs with IVA
87.6%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.13%	1
BE	2.02%	15
CH	0.27%	2
CZ	0.00%	0
D2	0.00%	0
D4	0.13%	1
D7	0.13%	1
D8	0.00%	0
FR	4.84%	36
HR	9.14%	68

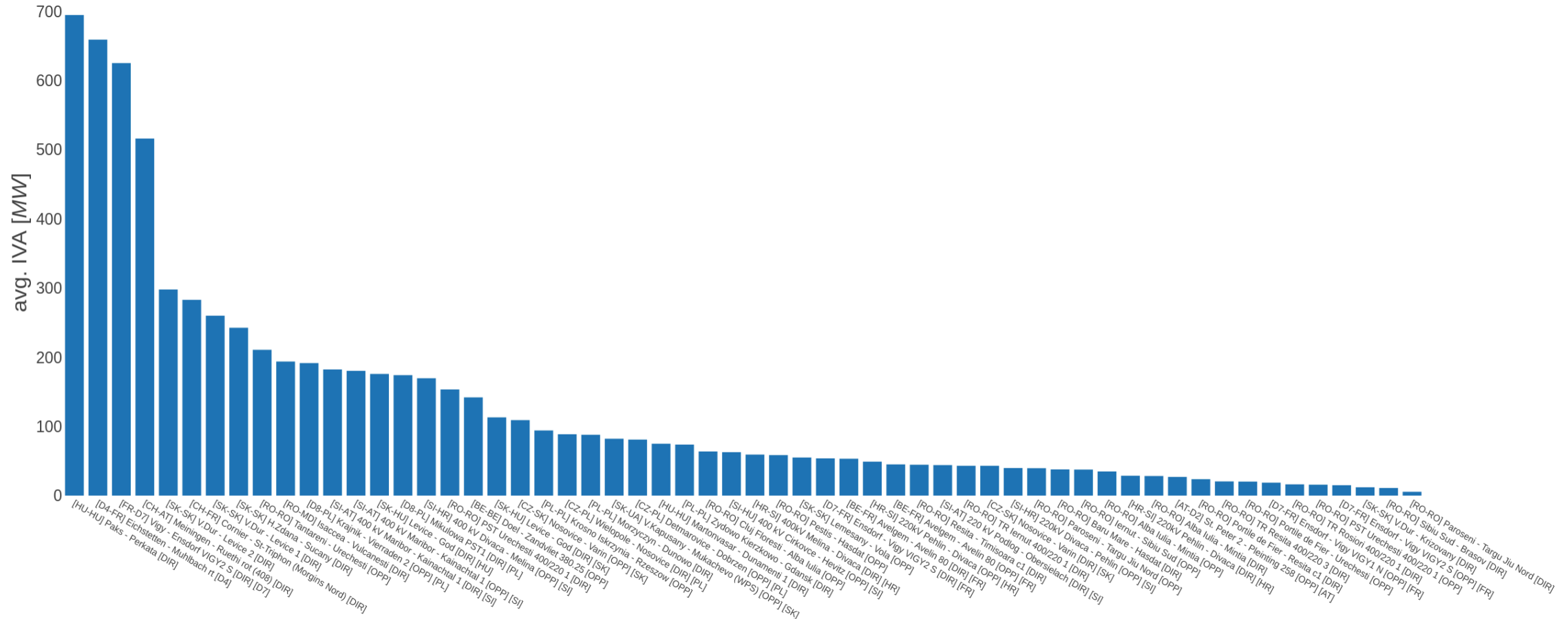
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
HU	12.23%	91
NL	0.00%	0
PL	17.34%	129
RO	82.53%	614
SI	8.06%	60
SK	26.48%	197



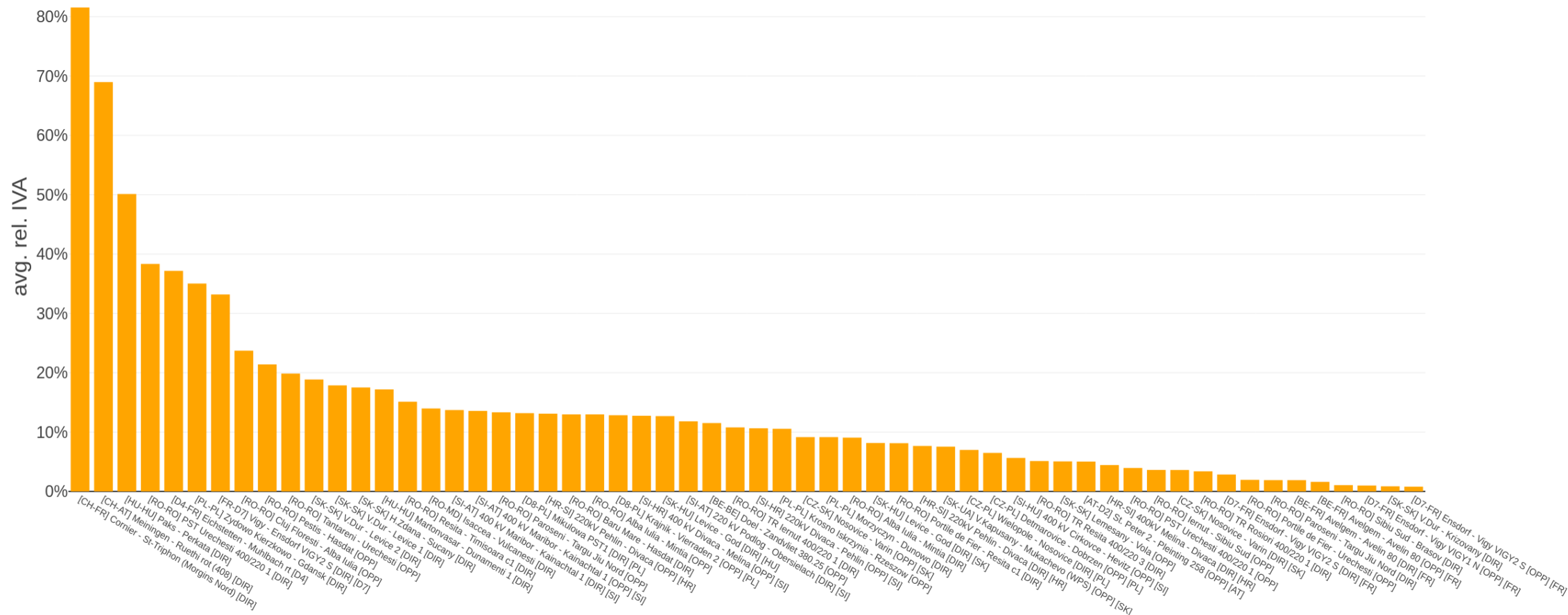
KPI 4a: Average IVA applied for each CNE affected by TSO intervention



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



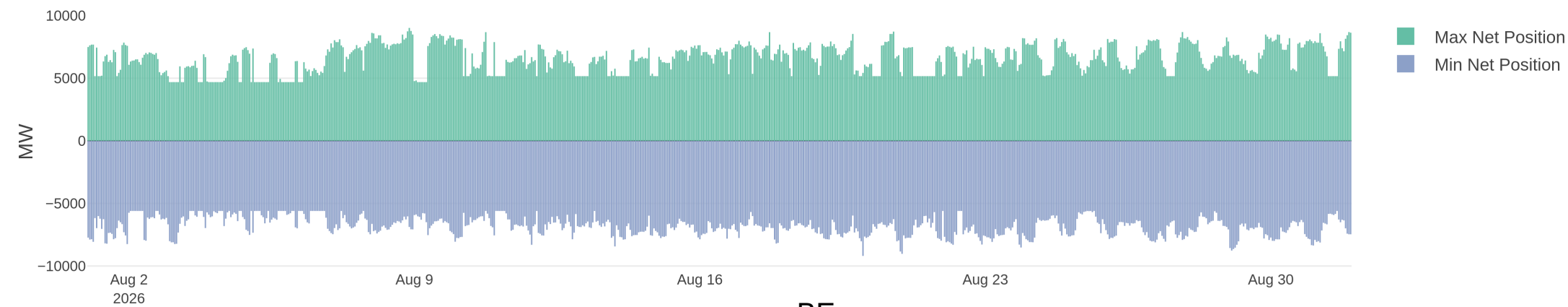
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{max_{CNEC, MTU}}[IVA_{CNEC, MTU} > 0]}$$



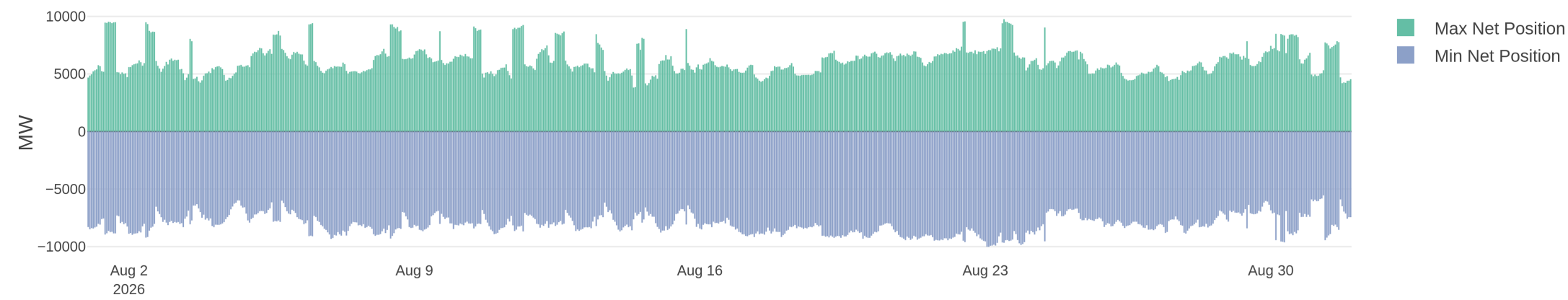
KPI 5: Min & max net positions per BZ hub



AT



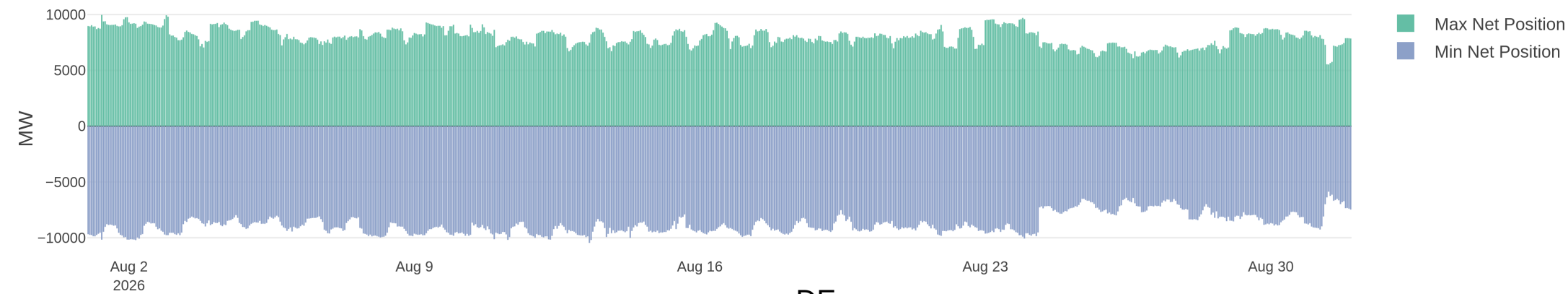
BE



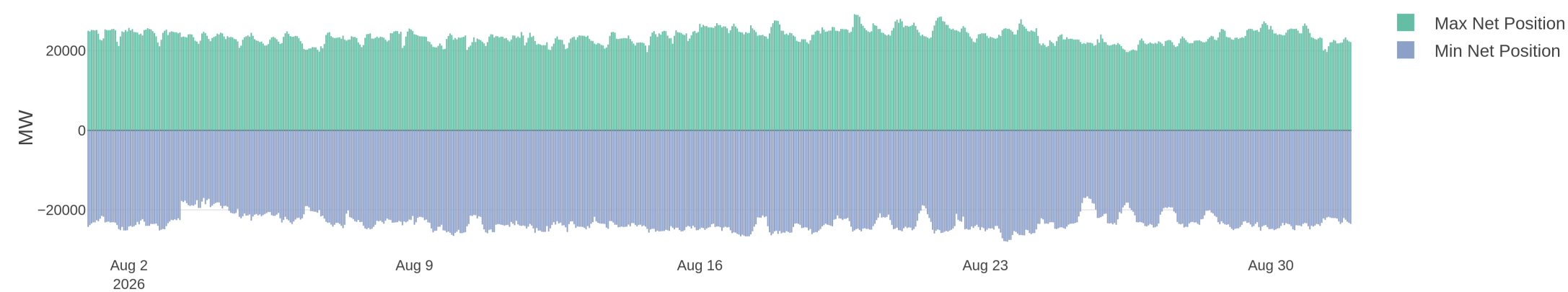
KPI 5: Min & max net positions per BZ hub



CZ



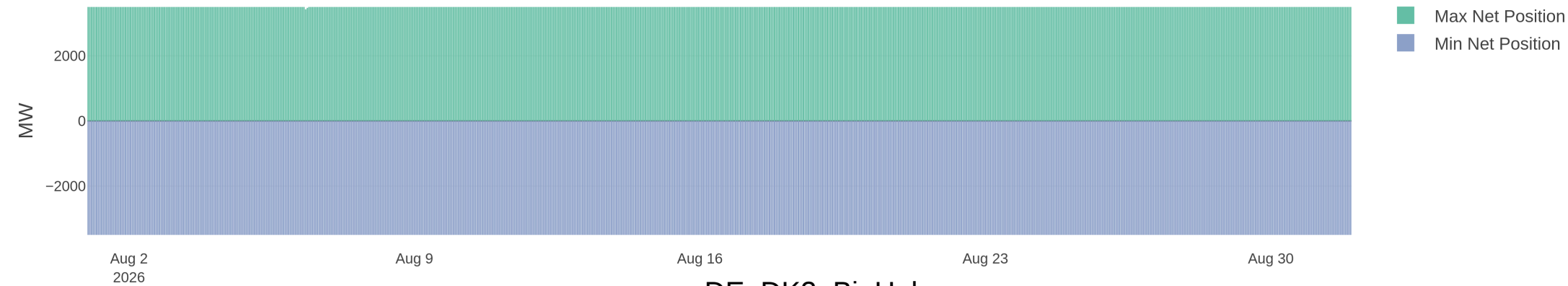
DE



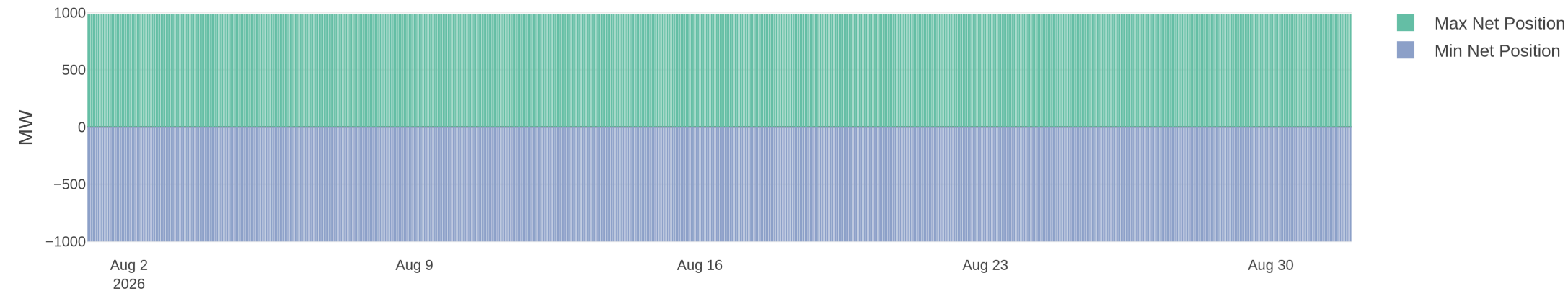
KPI 5: Min & max net positions per BZ hub



DE_DK1_VH



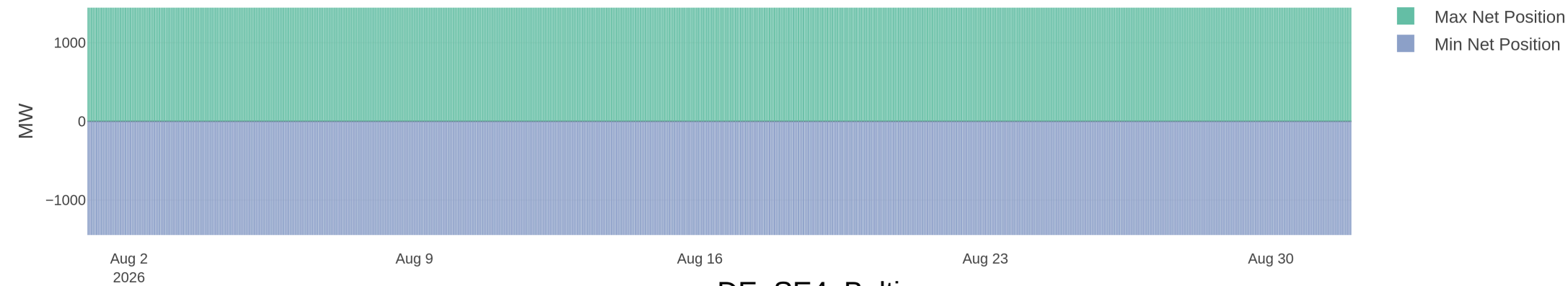
DE_DK2_BigHub



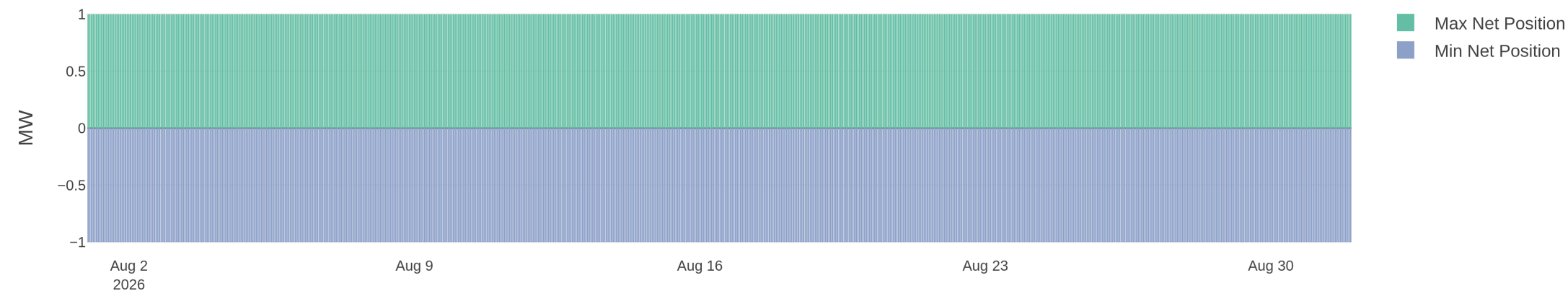
KPI 5: Min & max net positions per BZ hub



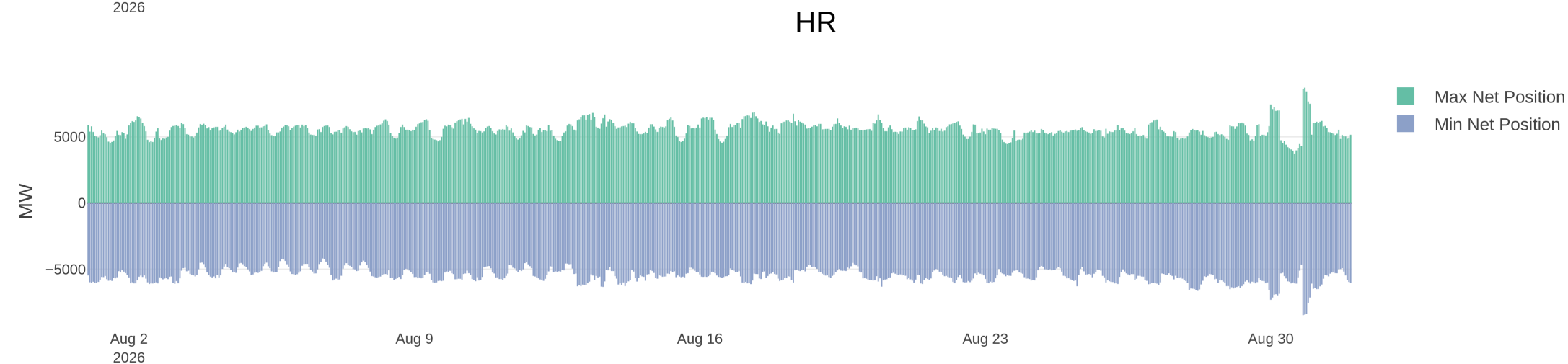
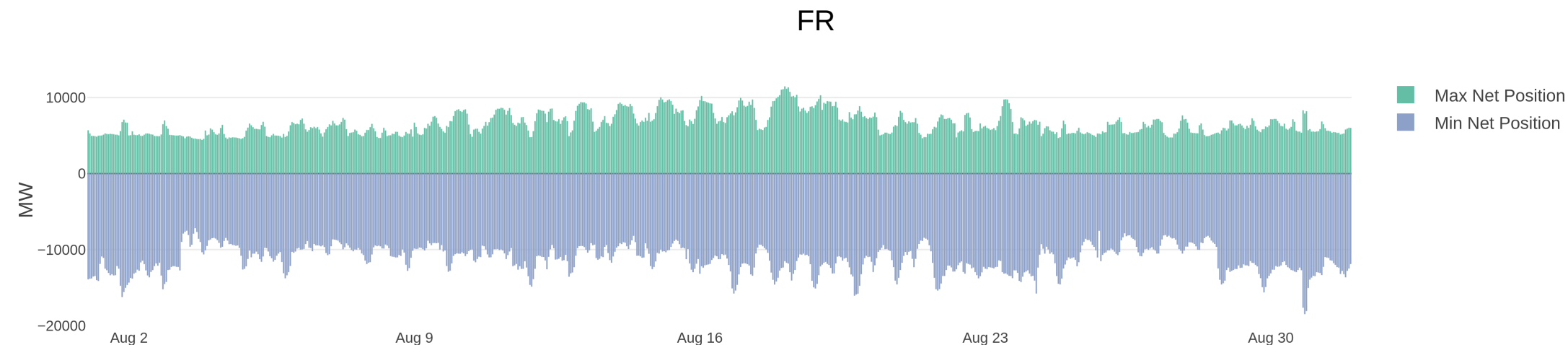
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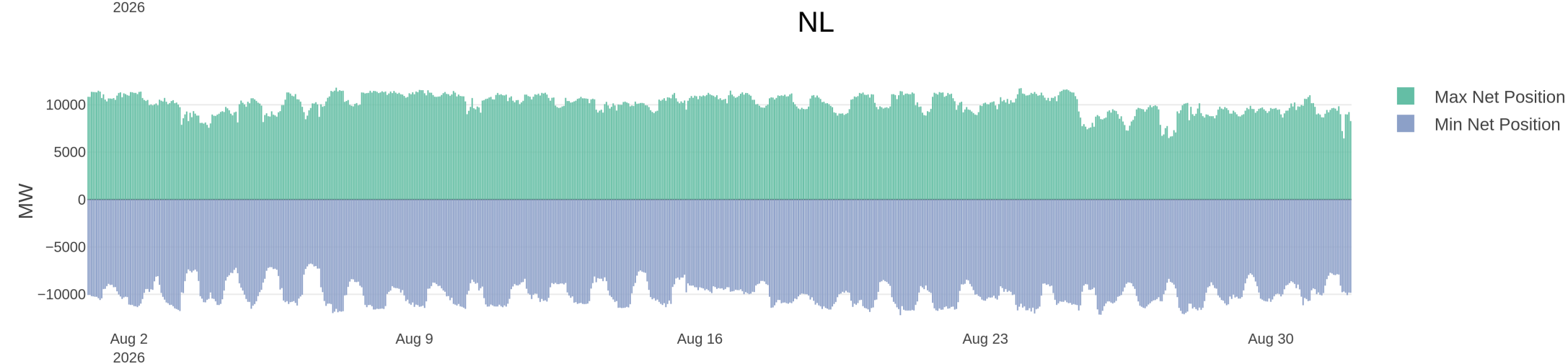
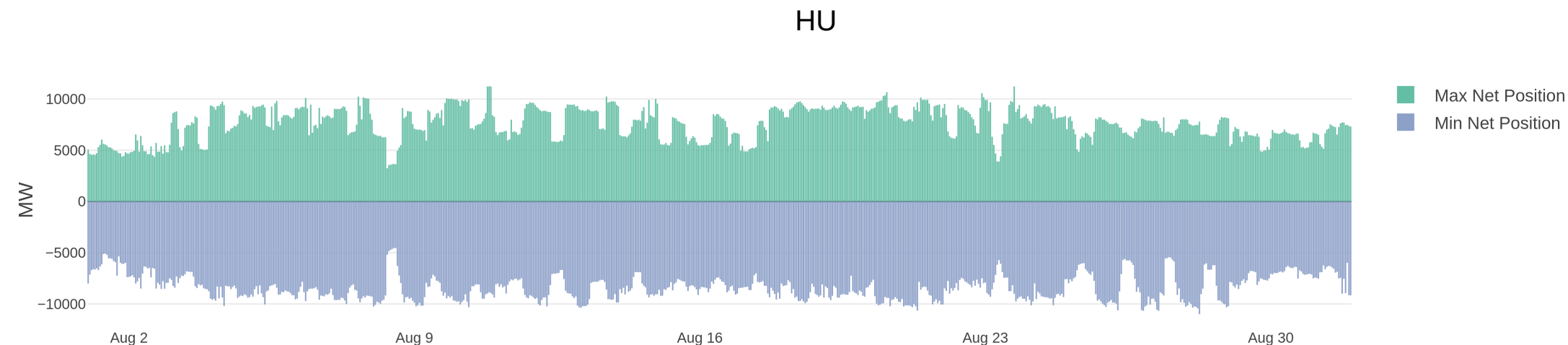
DE_SE4_Baltic



KPI 5: Min & max net positions per BZ hub



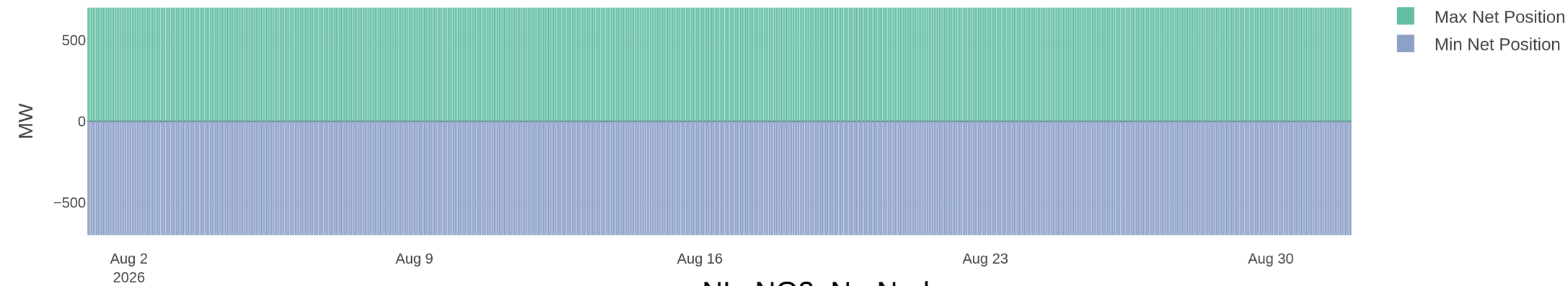
KPI 5: Min & max net positions per BZ hub



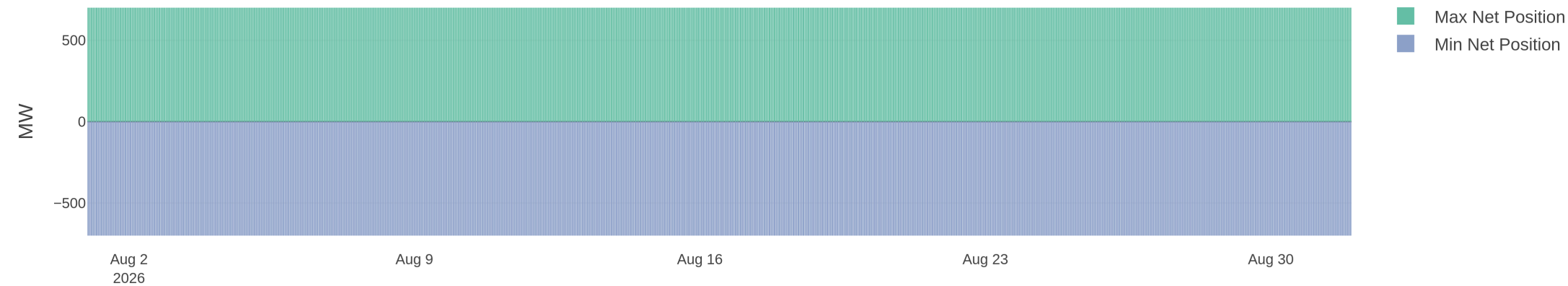
KPI 5: Min & max net positions per BZ hub



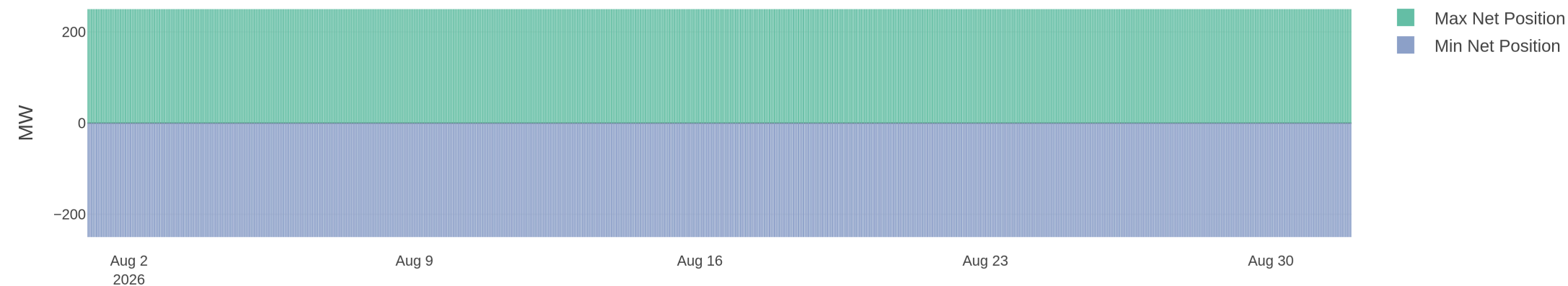
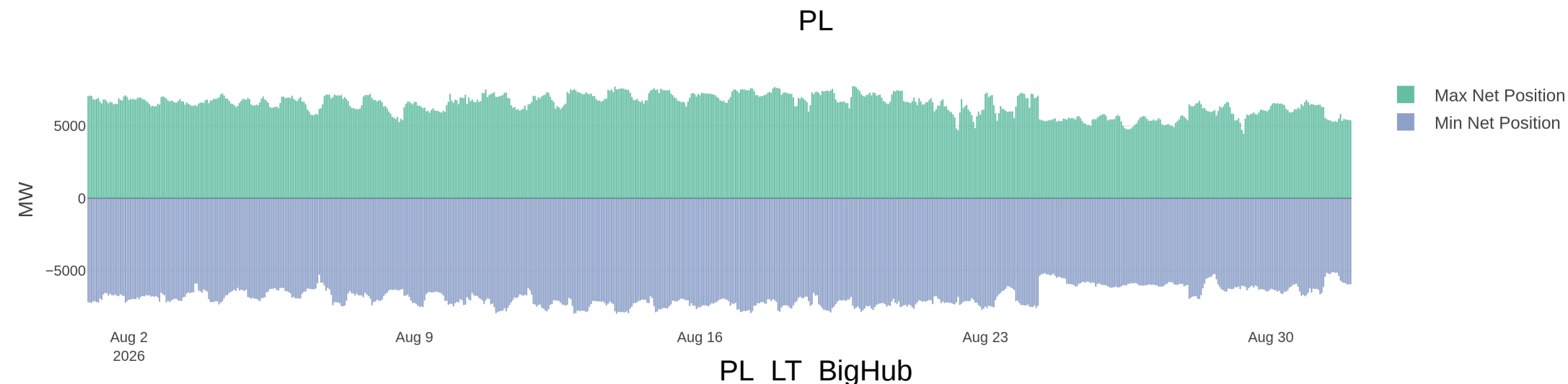
NL_DK1_COBRA



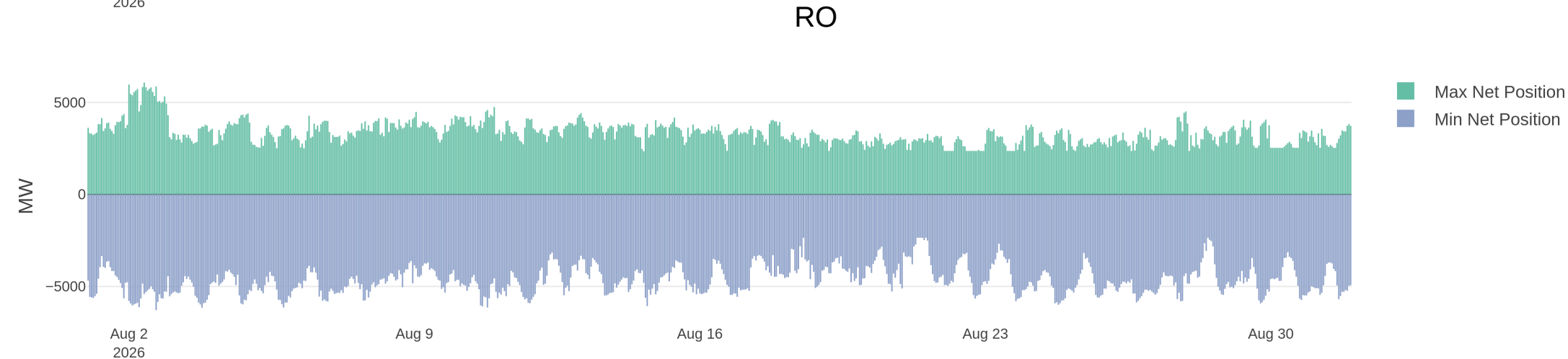
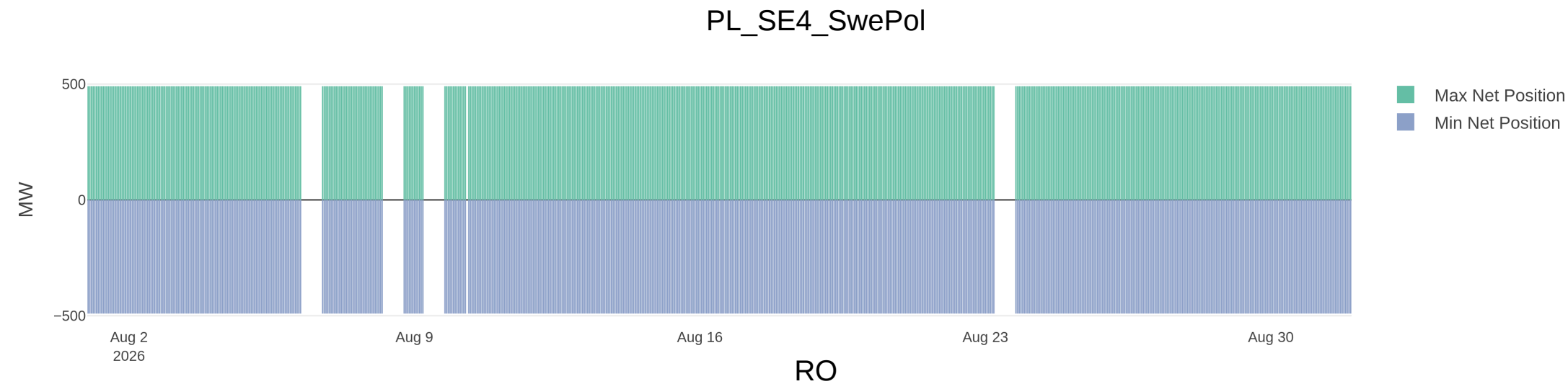
NL_NO2_NorNed



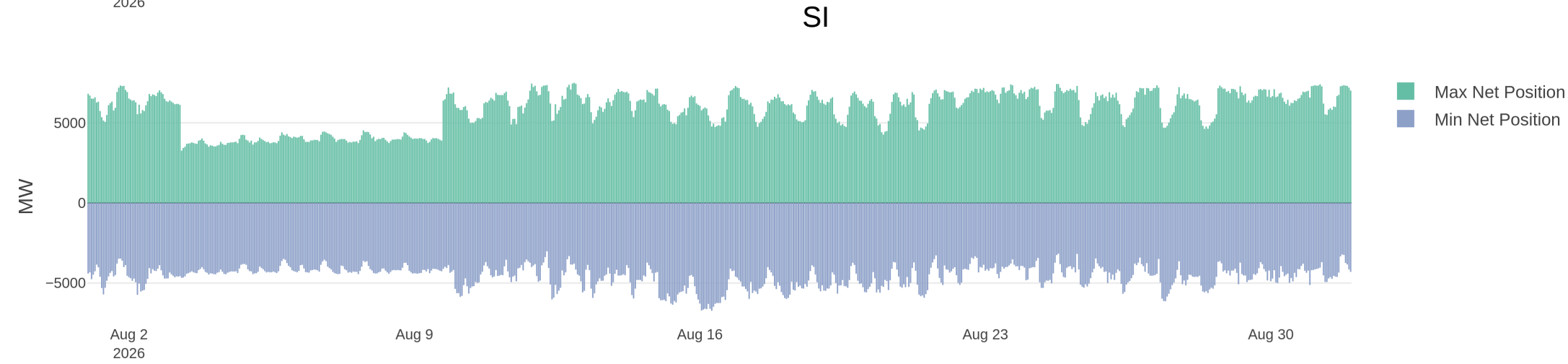
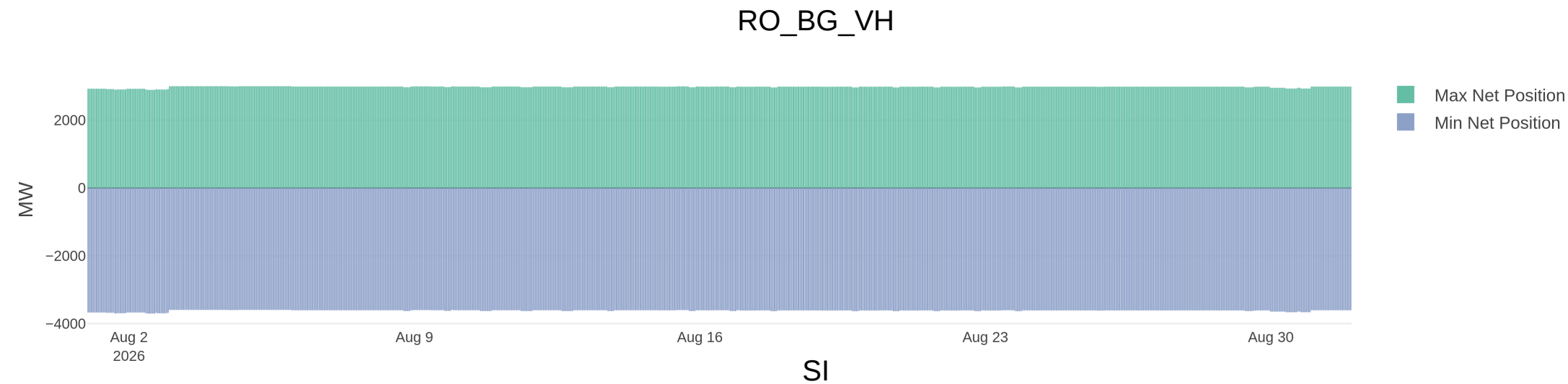
KPI 5: Min & max net positions per BZ hub



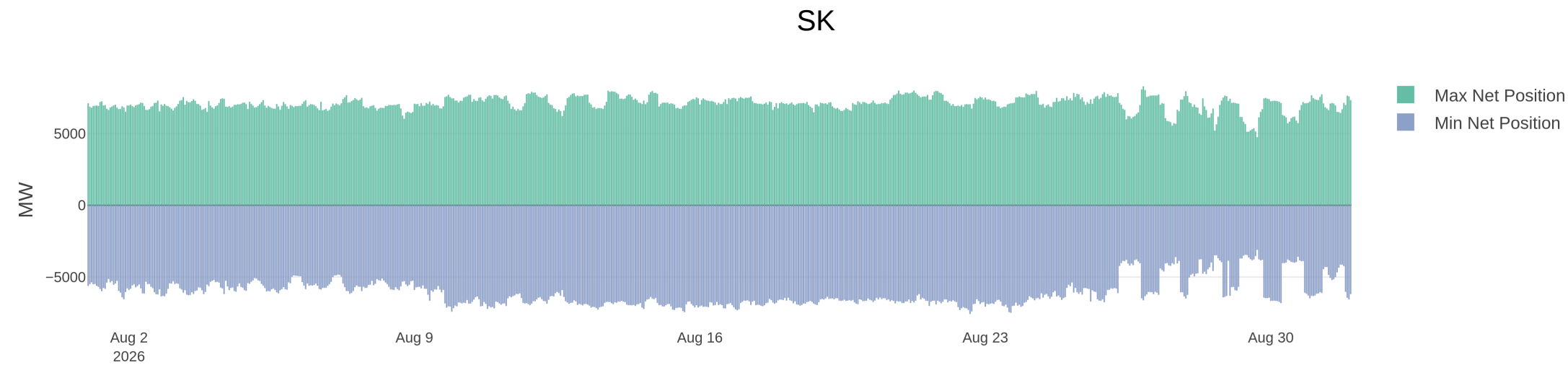
KPI 5: Min & max net positions per BZ hub



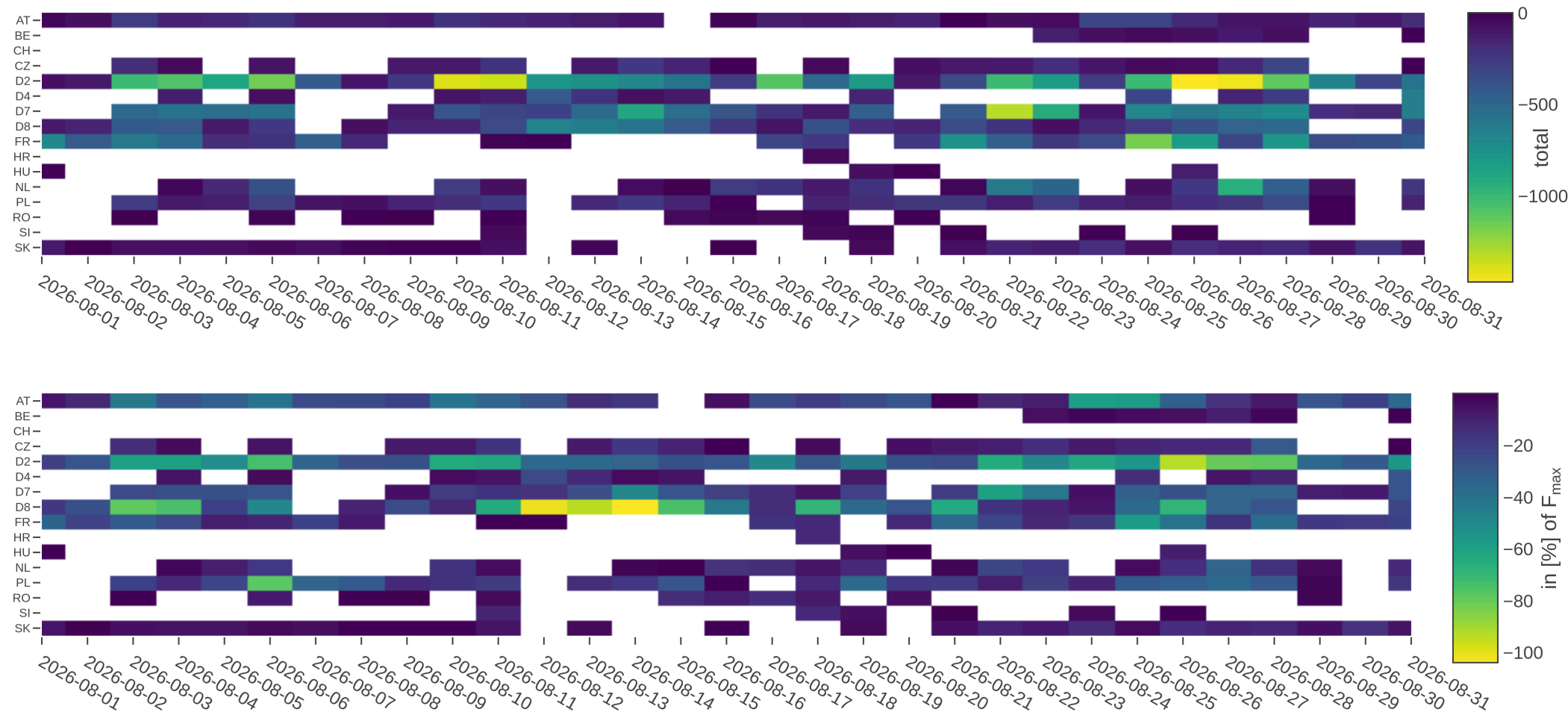
KPI 5: Min & max net positions per BZ hub



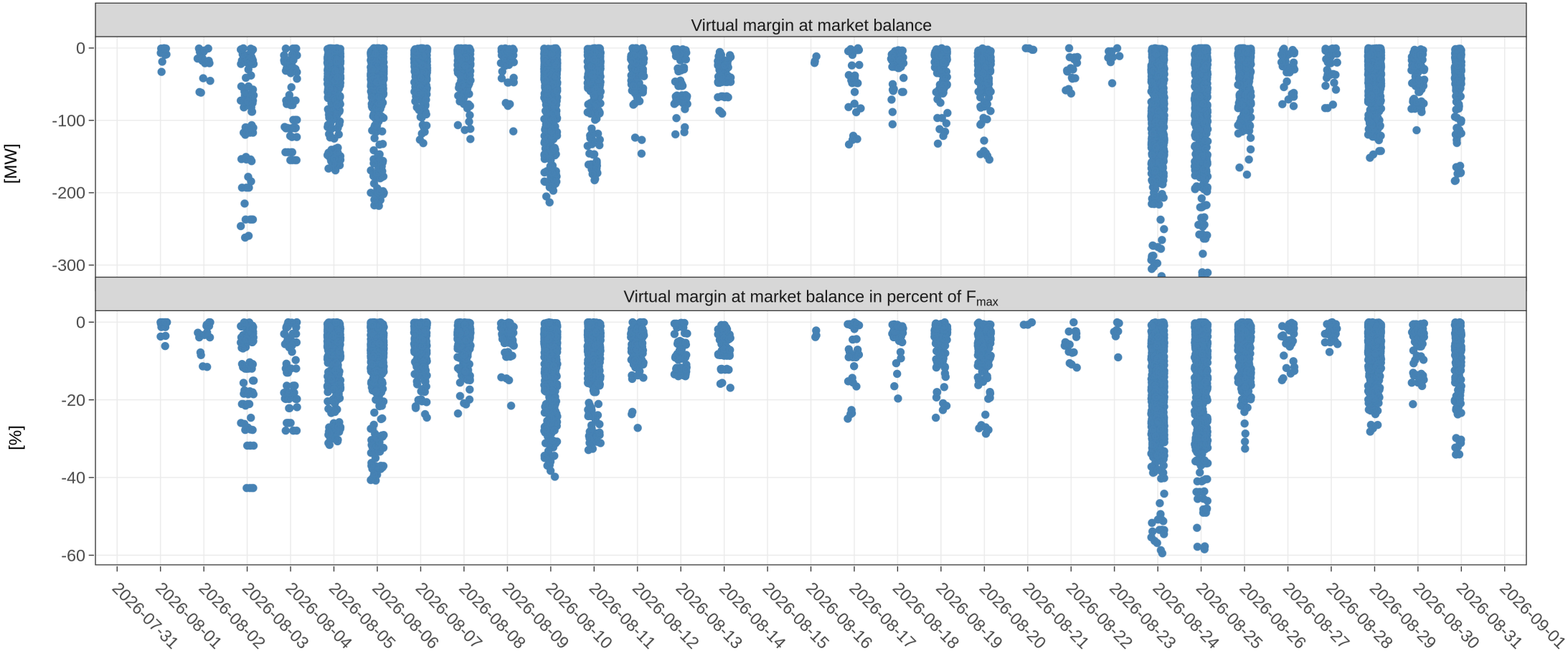
KPI 5: Min & max net positions per BZ hub



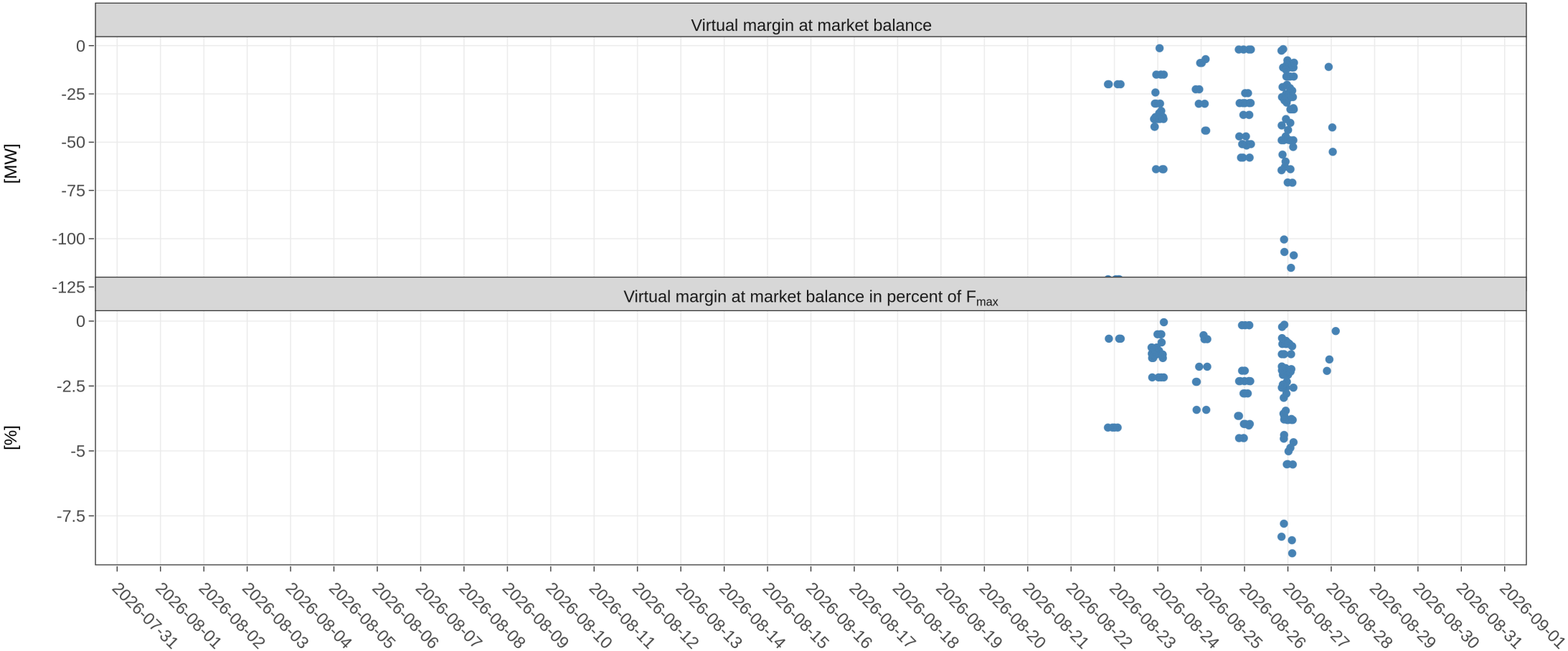
KPI 6a: Highest virtual margins at market balance for CORE TSOs



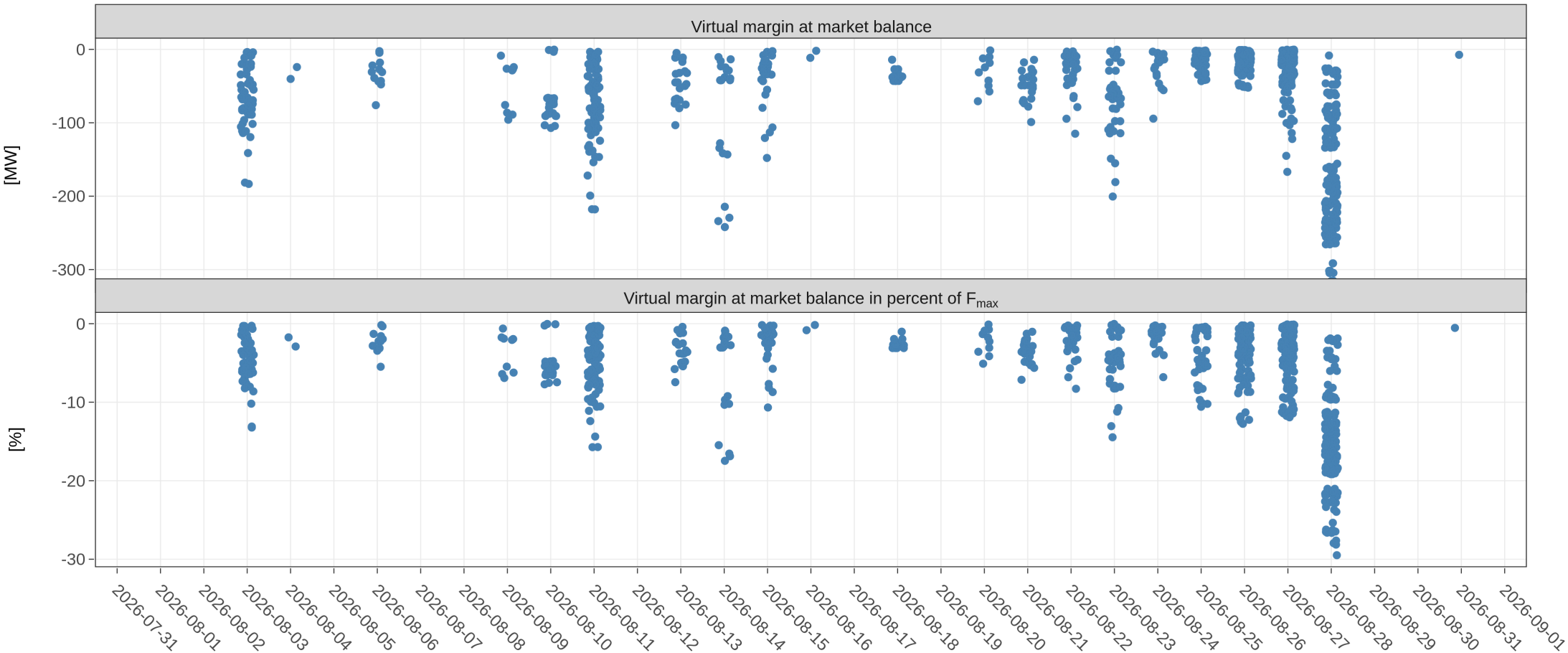
KPI 6b: Virtual margins at market balance AT



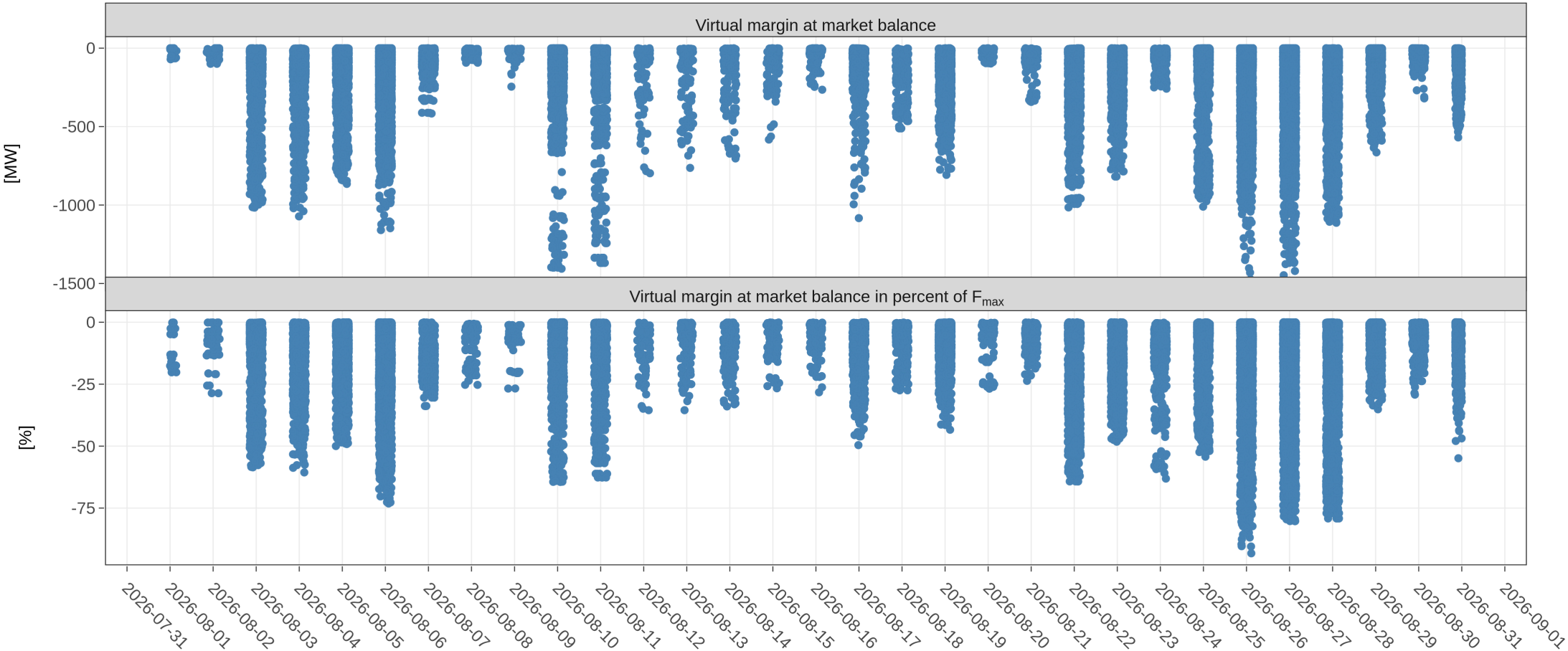
KPI 6b: Virtual margins at market balance BE



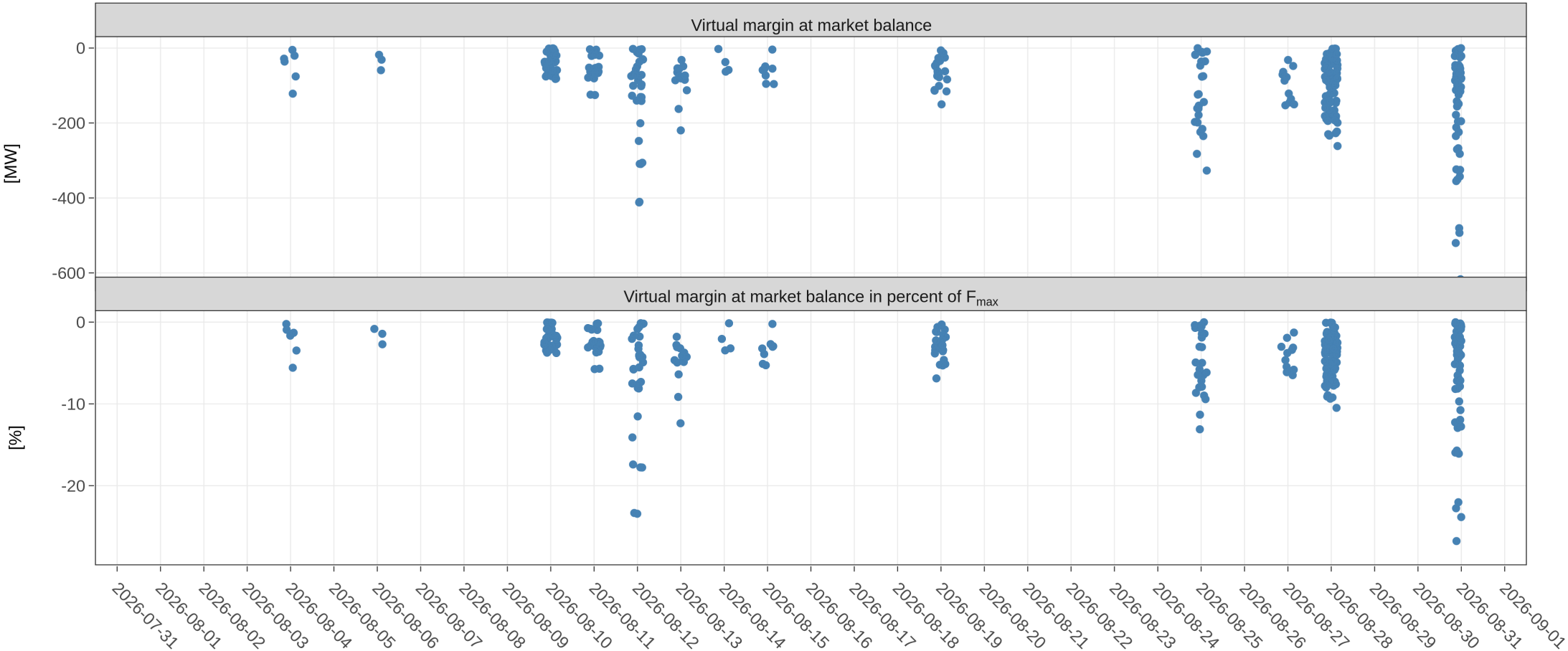
KPI 6b: Virtual margins at market balance CZ



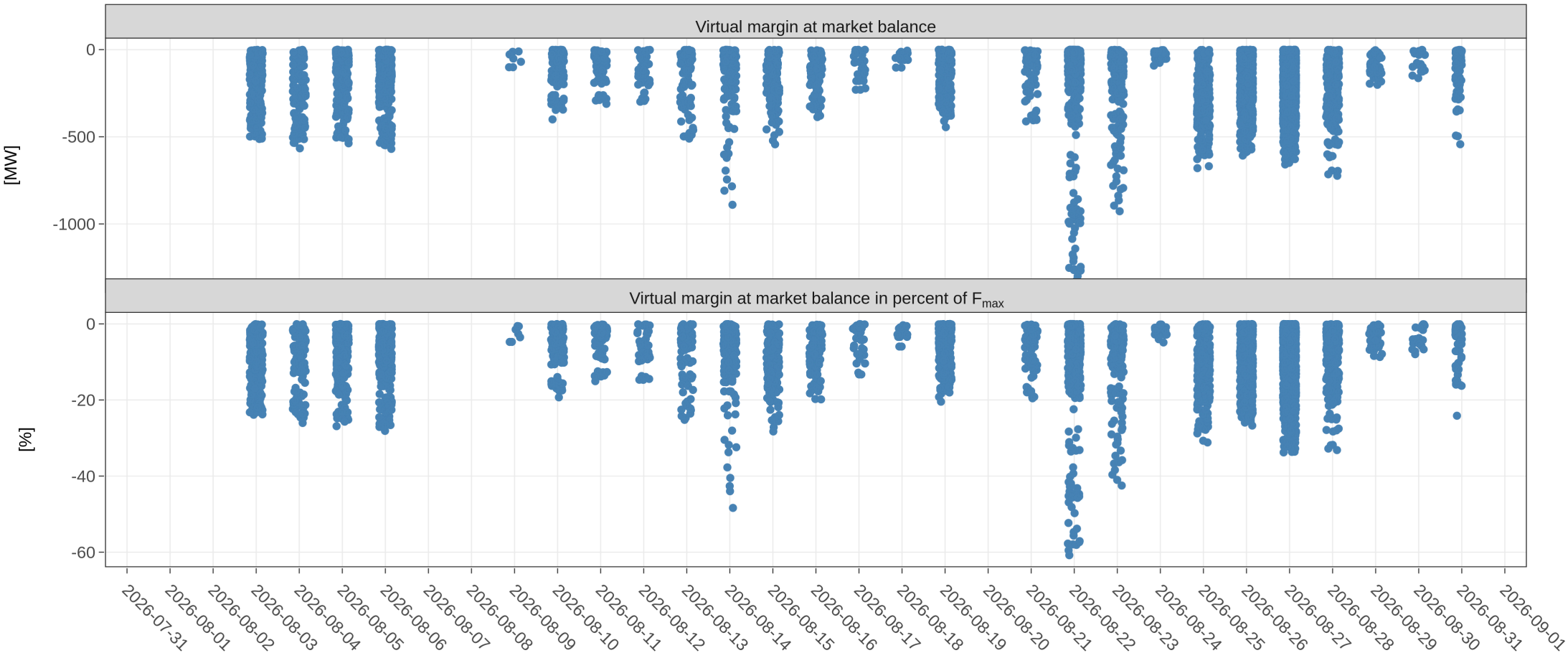
KPI 6b: Virtual margins at market balance D2



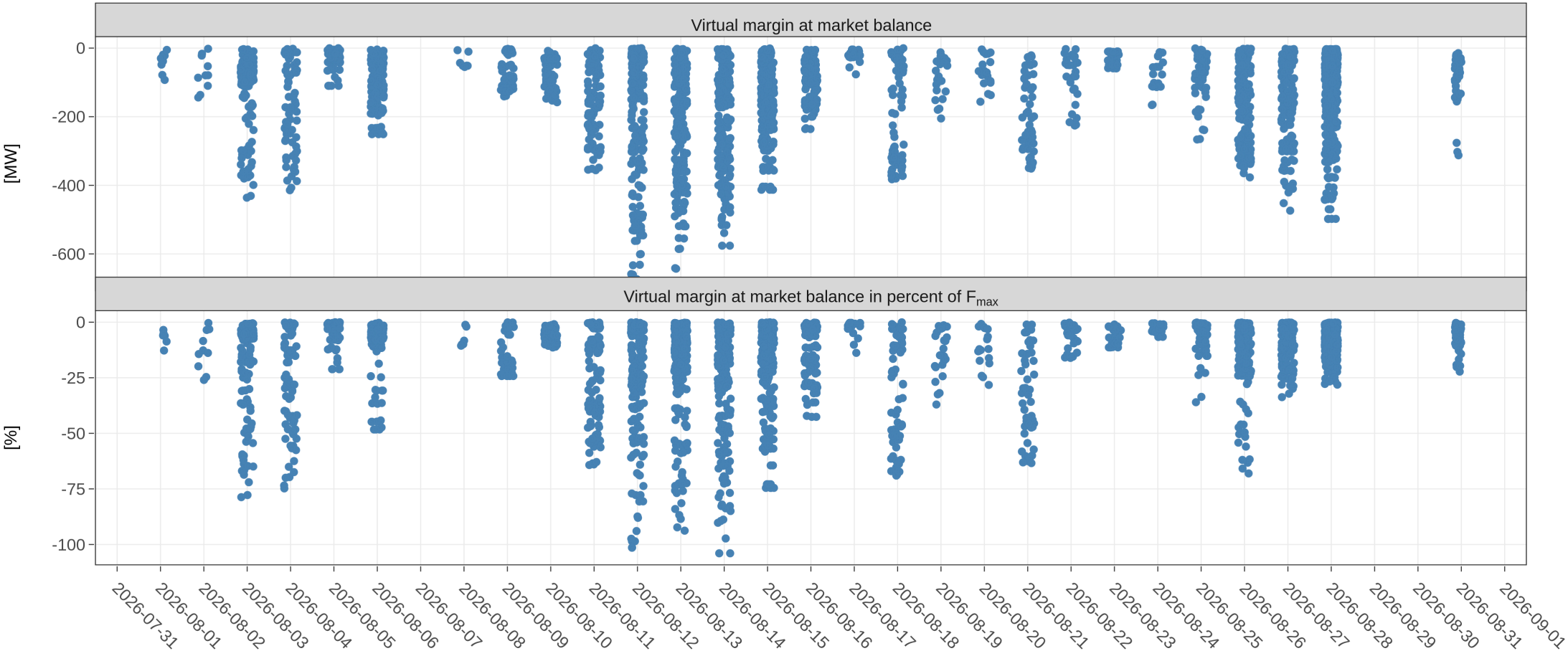
KPI 6b: Virtual margins at market balance D4



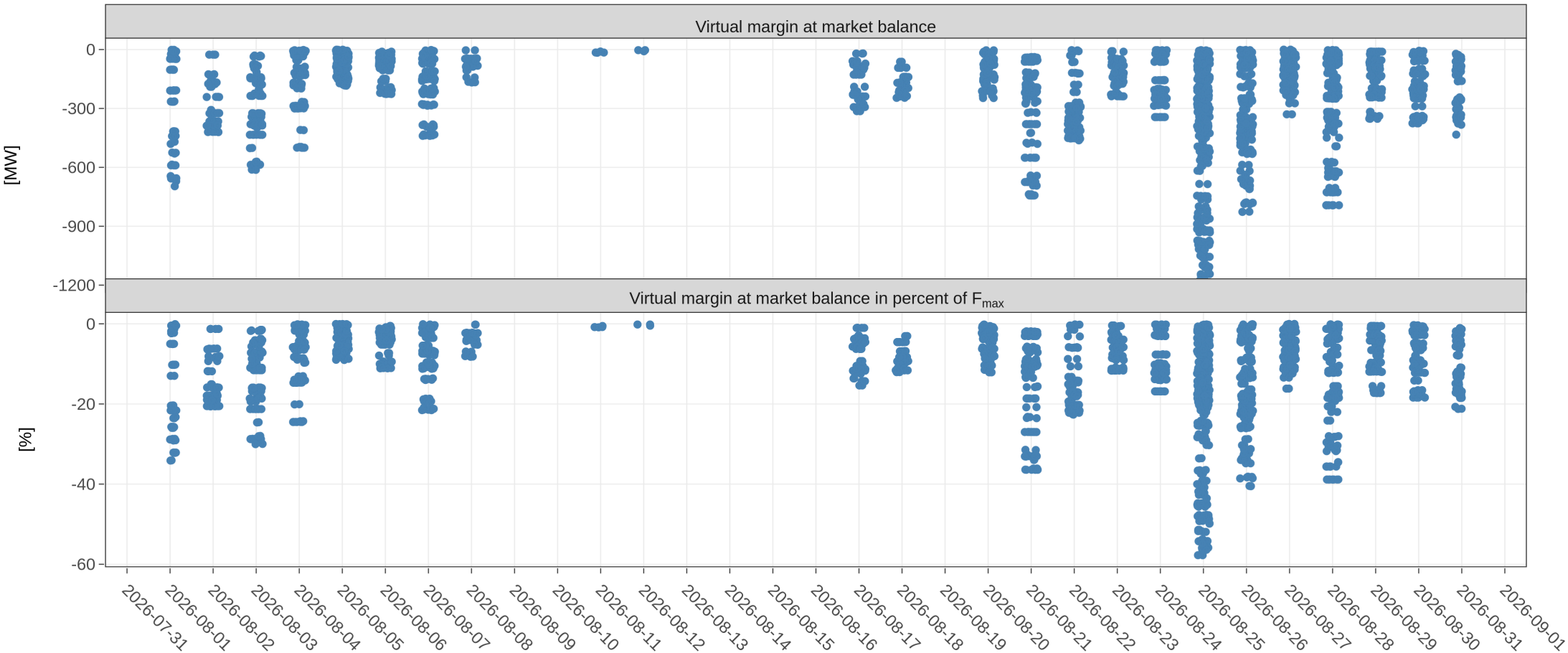
KPI 6b: Virtual margins at market balance D7



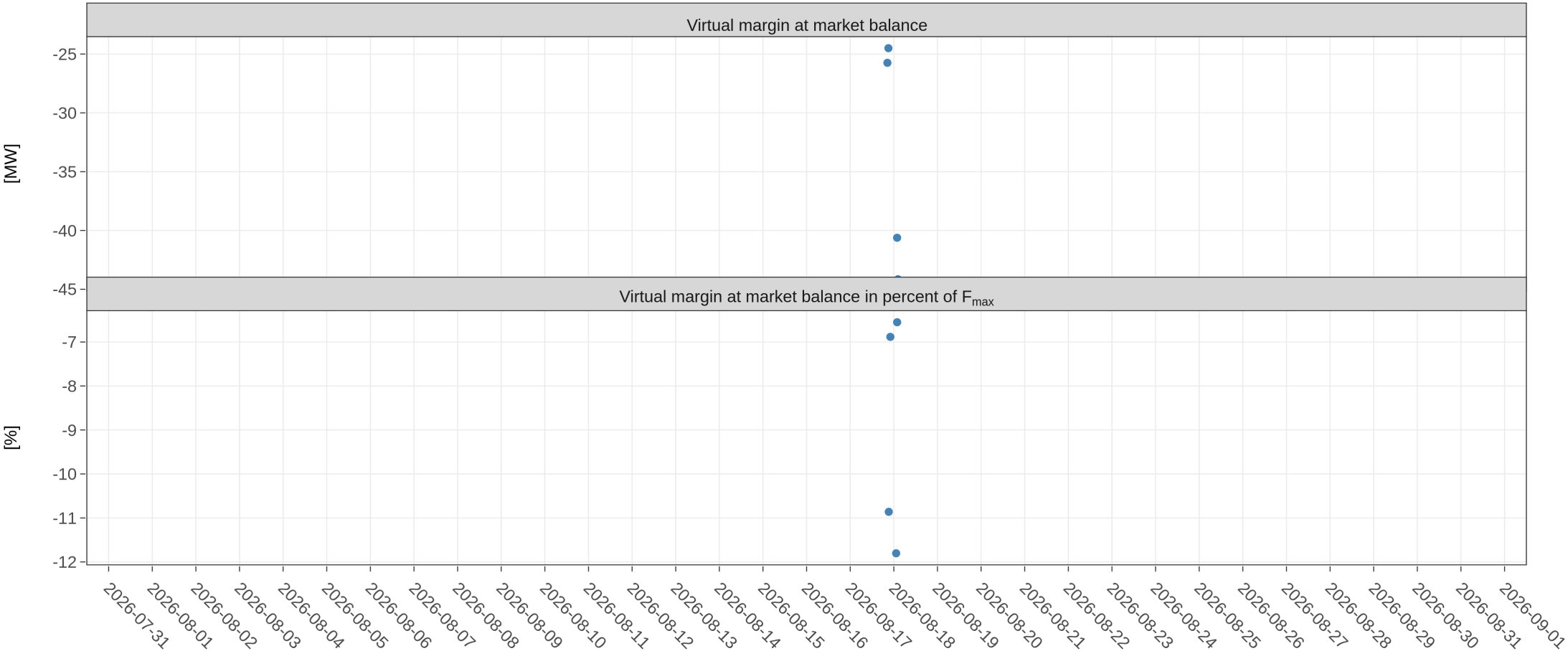
KPI 6b: Virtual margins at market balance D8



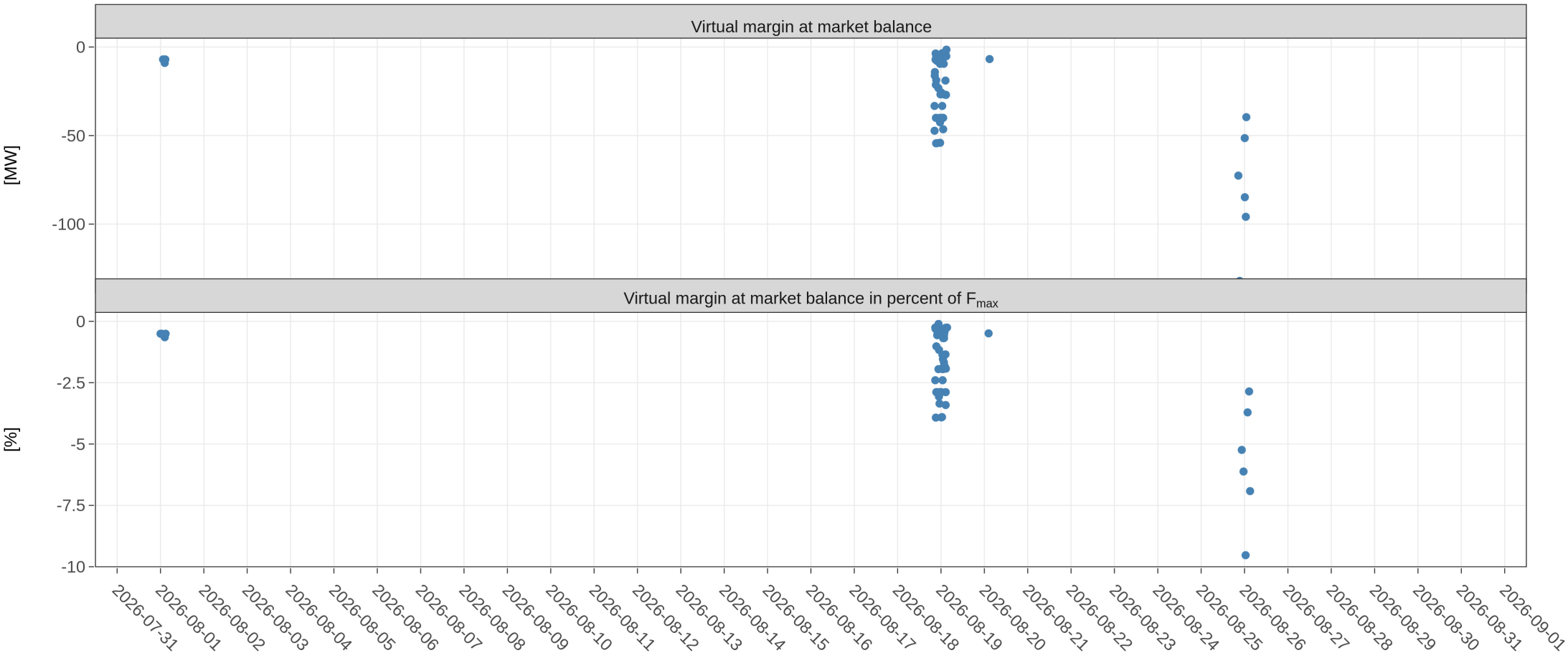
KPI 6b: Virtual margins at market balance FR



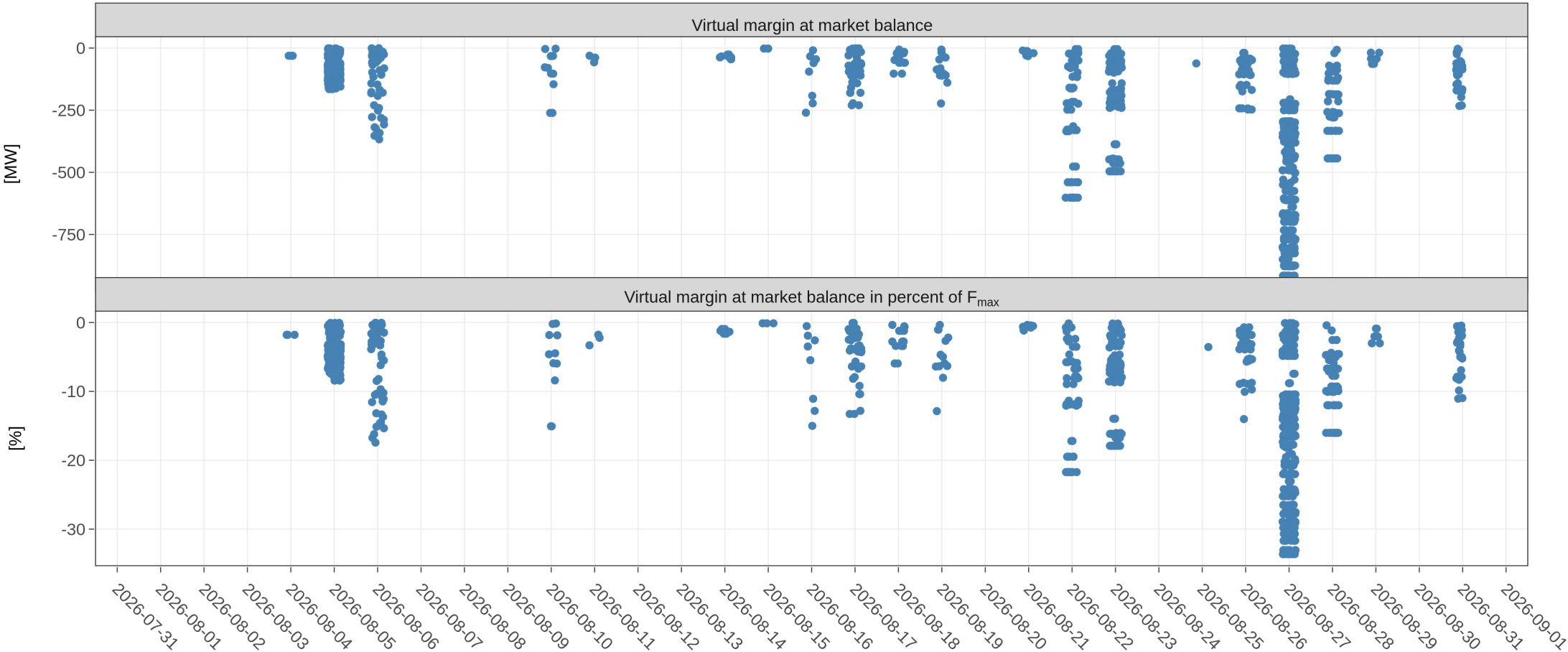
KPI 6b: Virtual margins at market balance HR



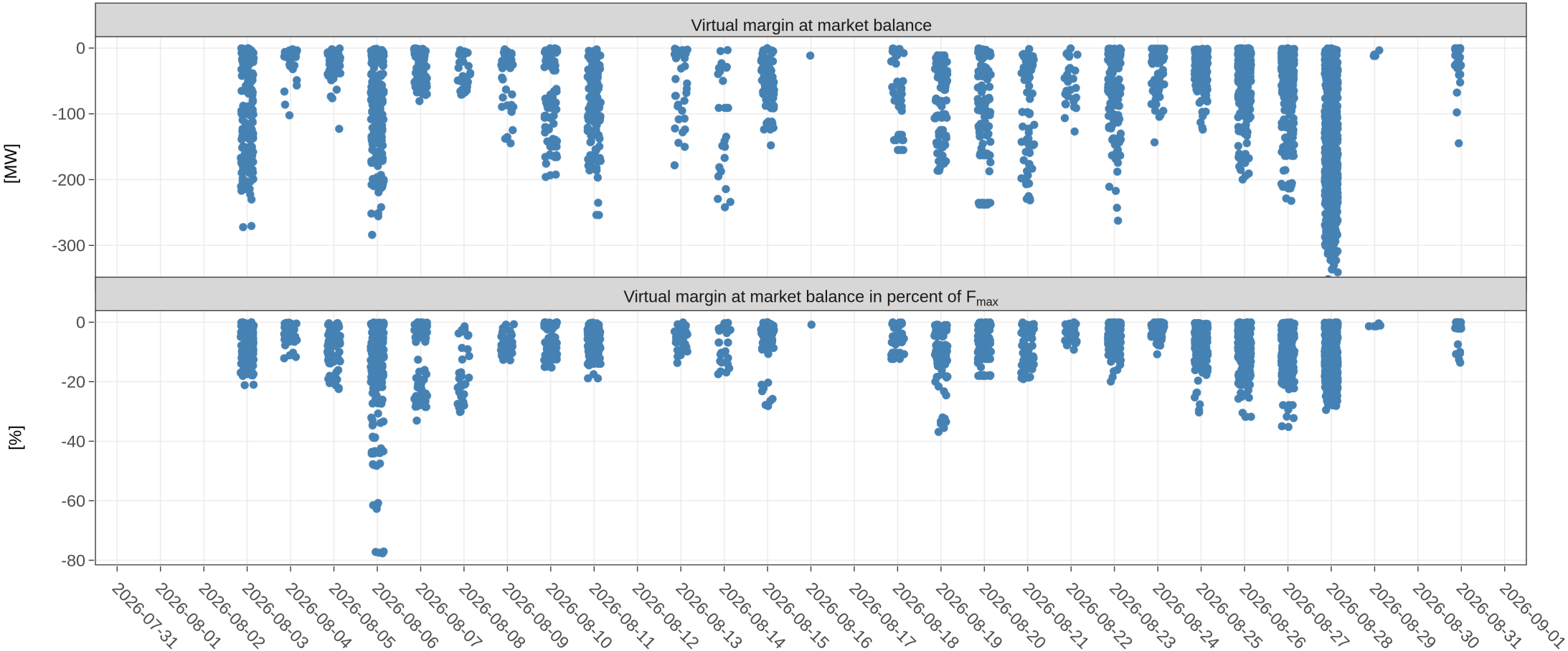
KPI 6b: Virtual margins at market balance HU



KPI 6b: Virtual margins at market balance NL



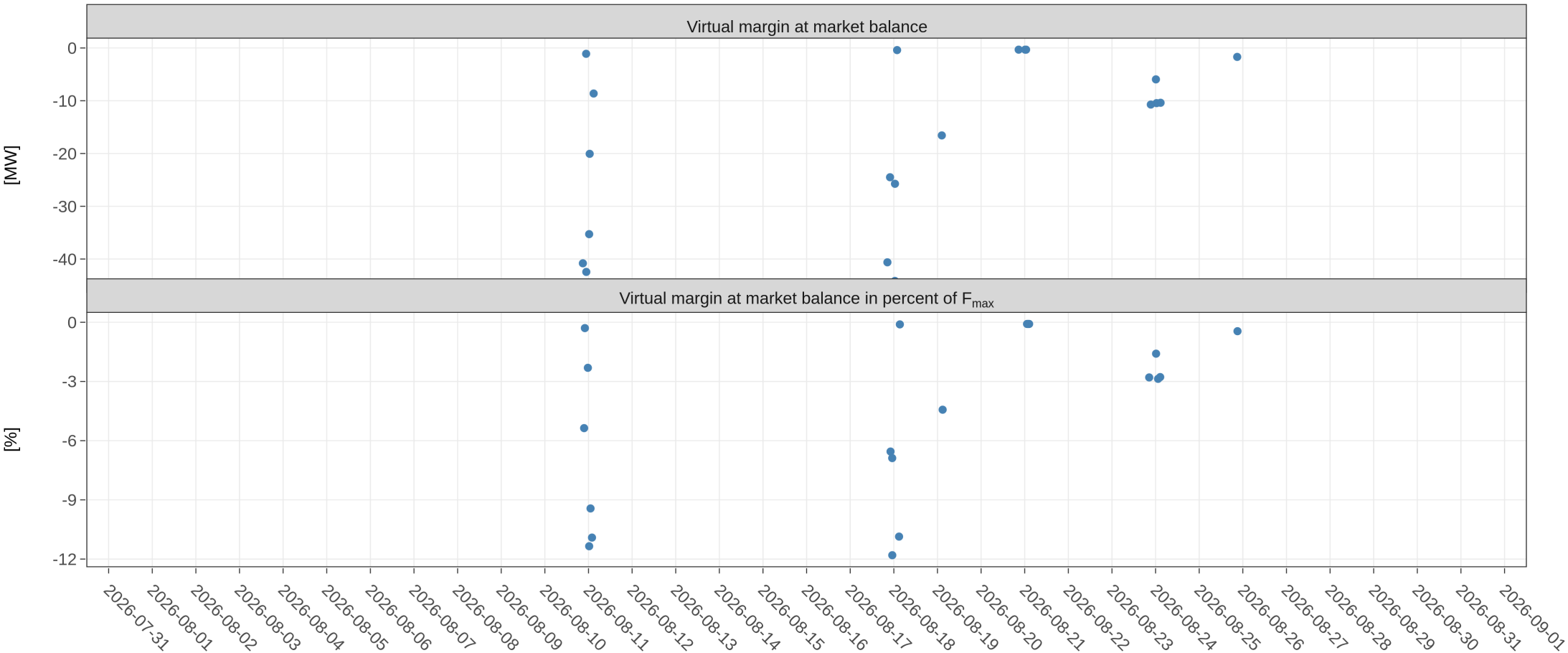
KPI 6b: Virtual margins at market balance PL



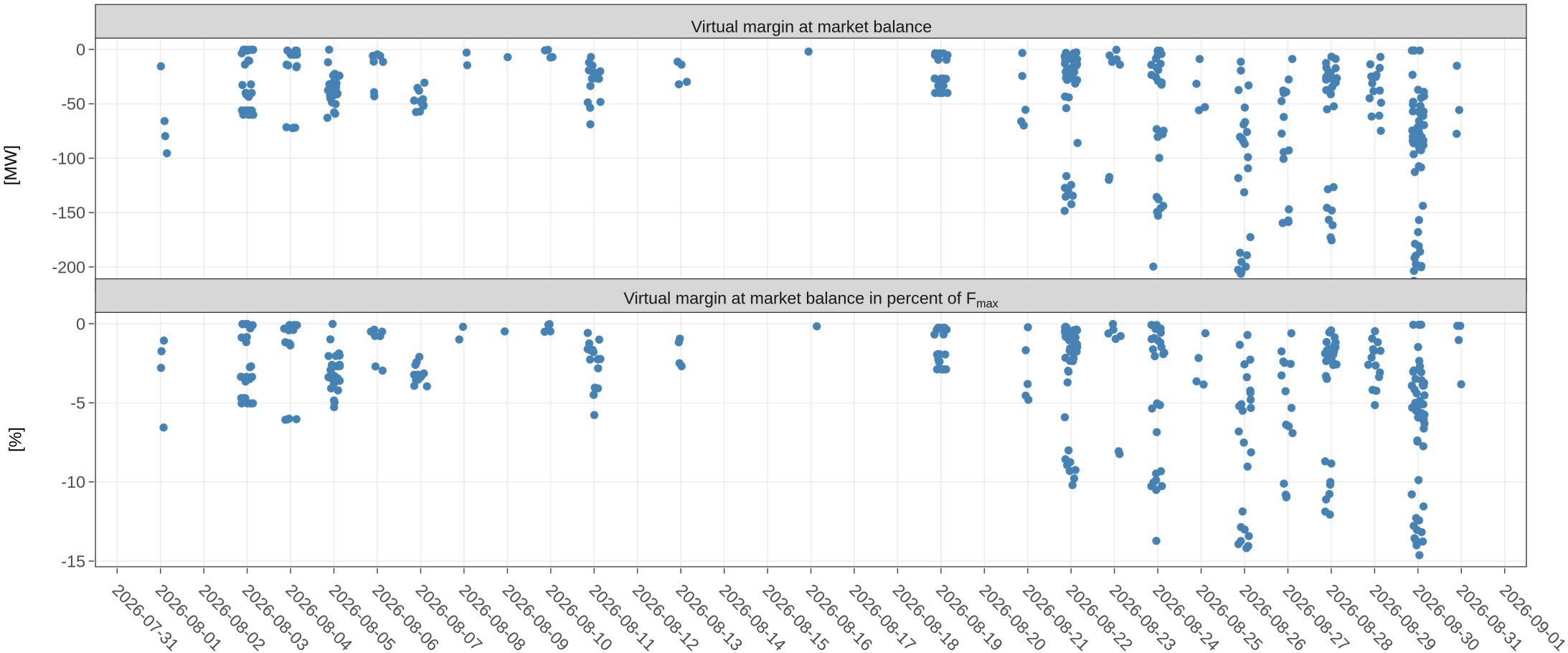
KPI 6b: Virtual margins at market balance RO



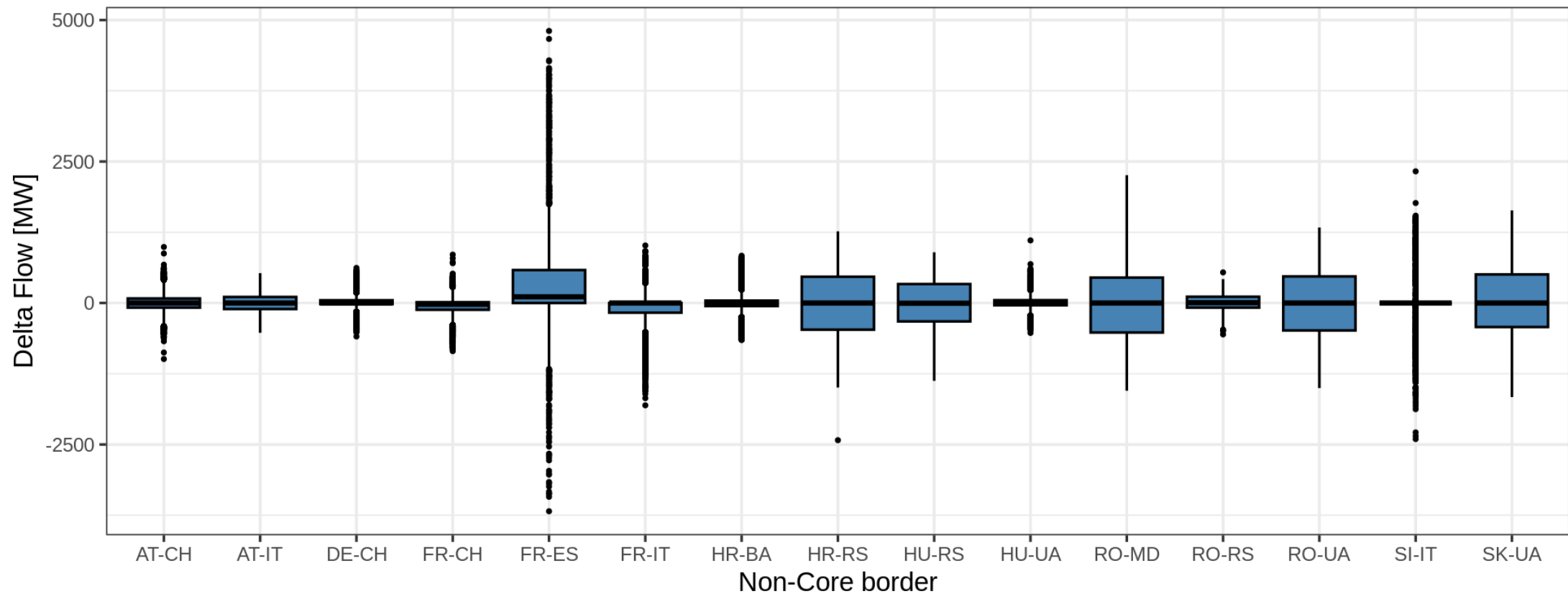
KPI 6b: Virtual margins at market balance SI



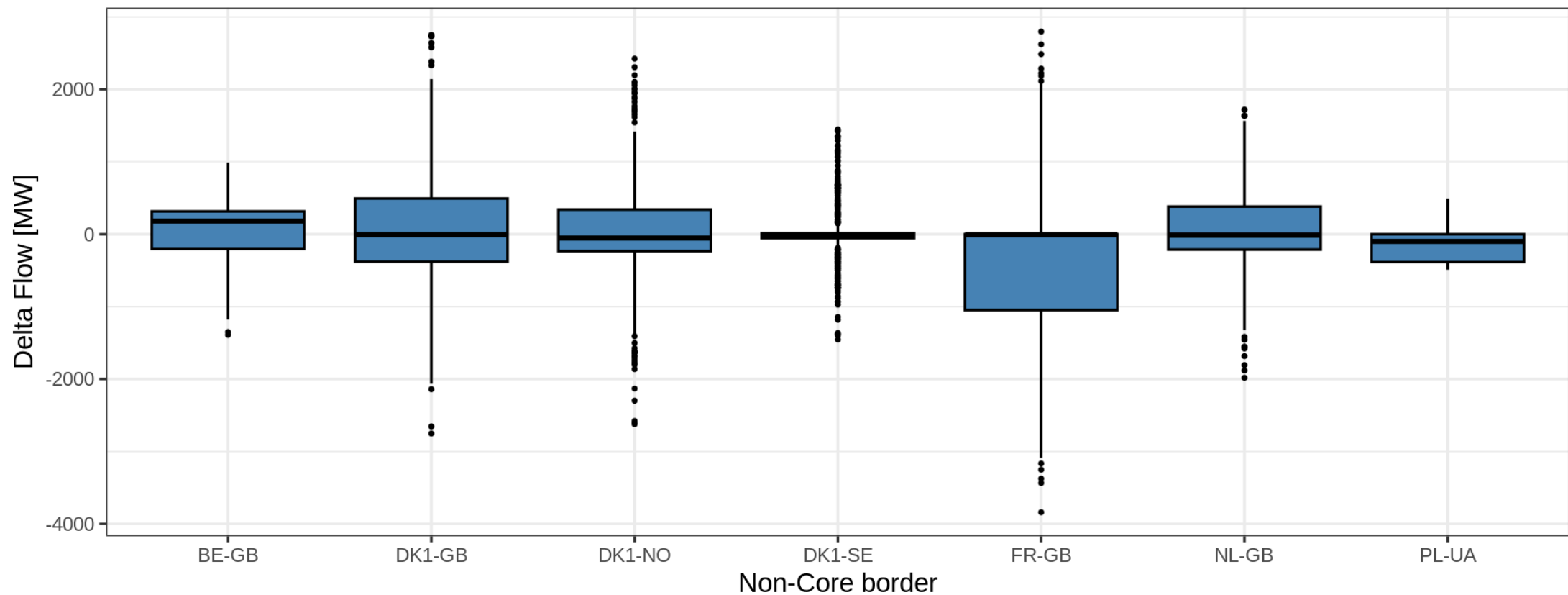
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



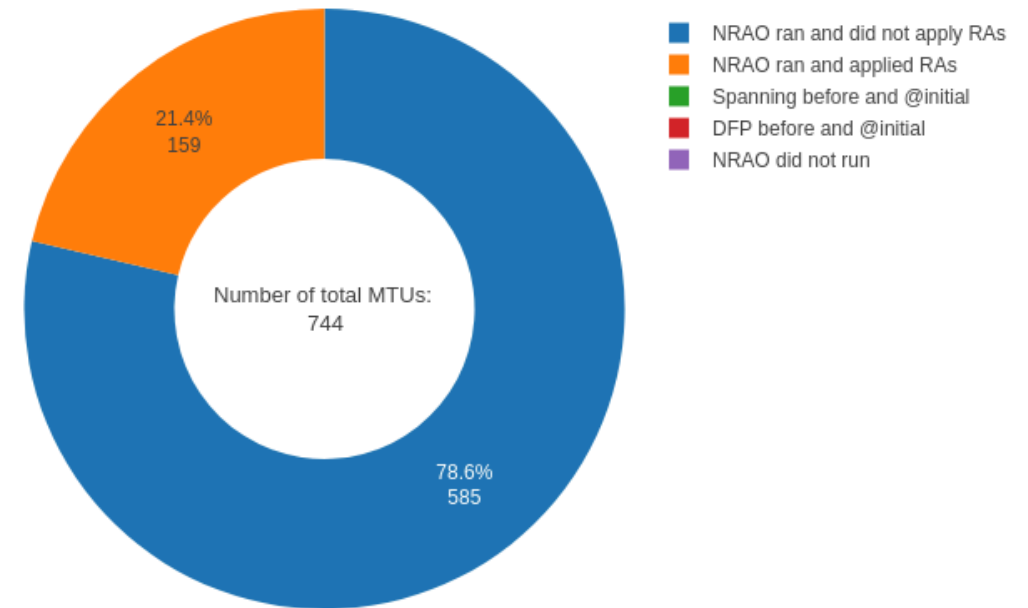
KPI 8: NRAO – Applied Remedial Action



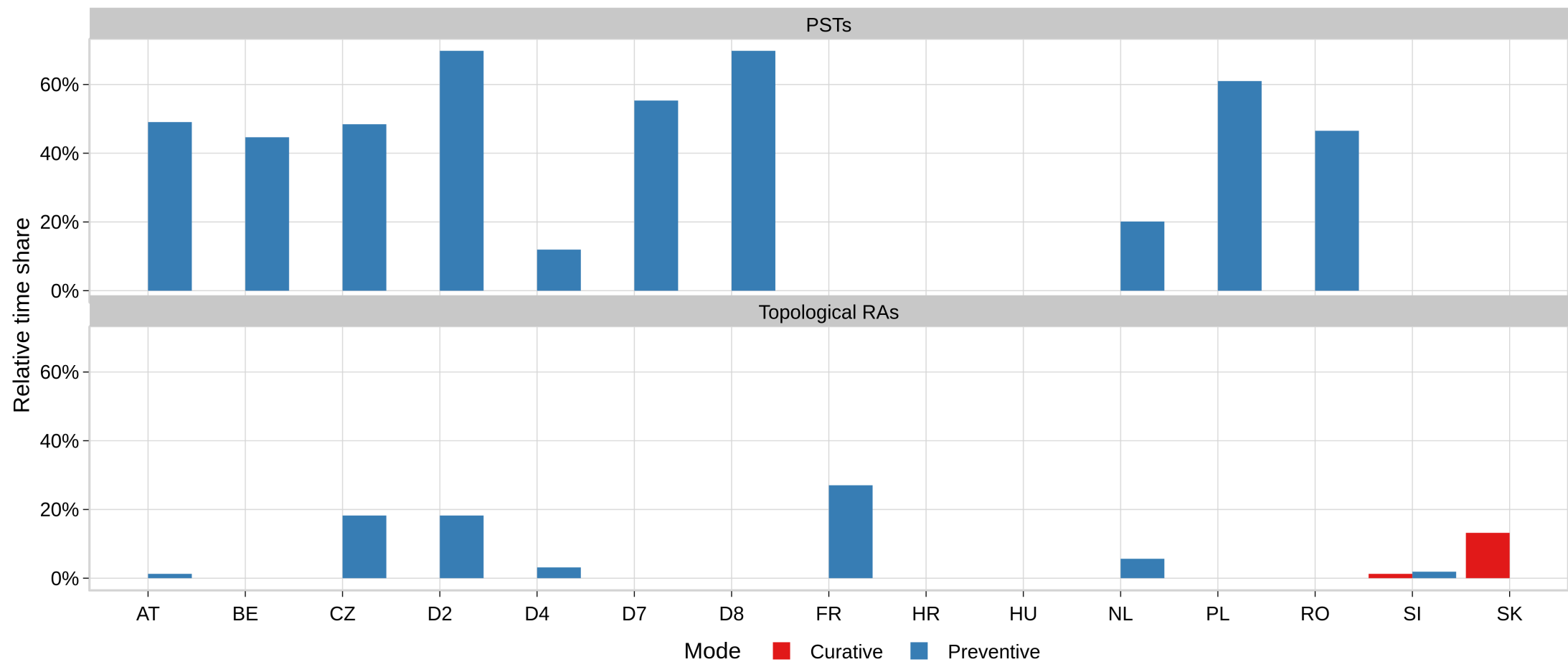
In the following plots, the relative time share relates to the hours labeled 'NRAO Ran and Applied RAs'.

Total MTUs: 744 hours

Category	Hours (%)
NRAO ran and did not apply RAs	585 hours (78.6%)
NRAO ran and applied RAs	159 hours (21.4%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

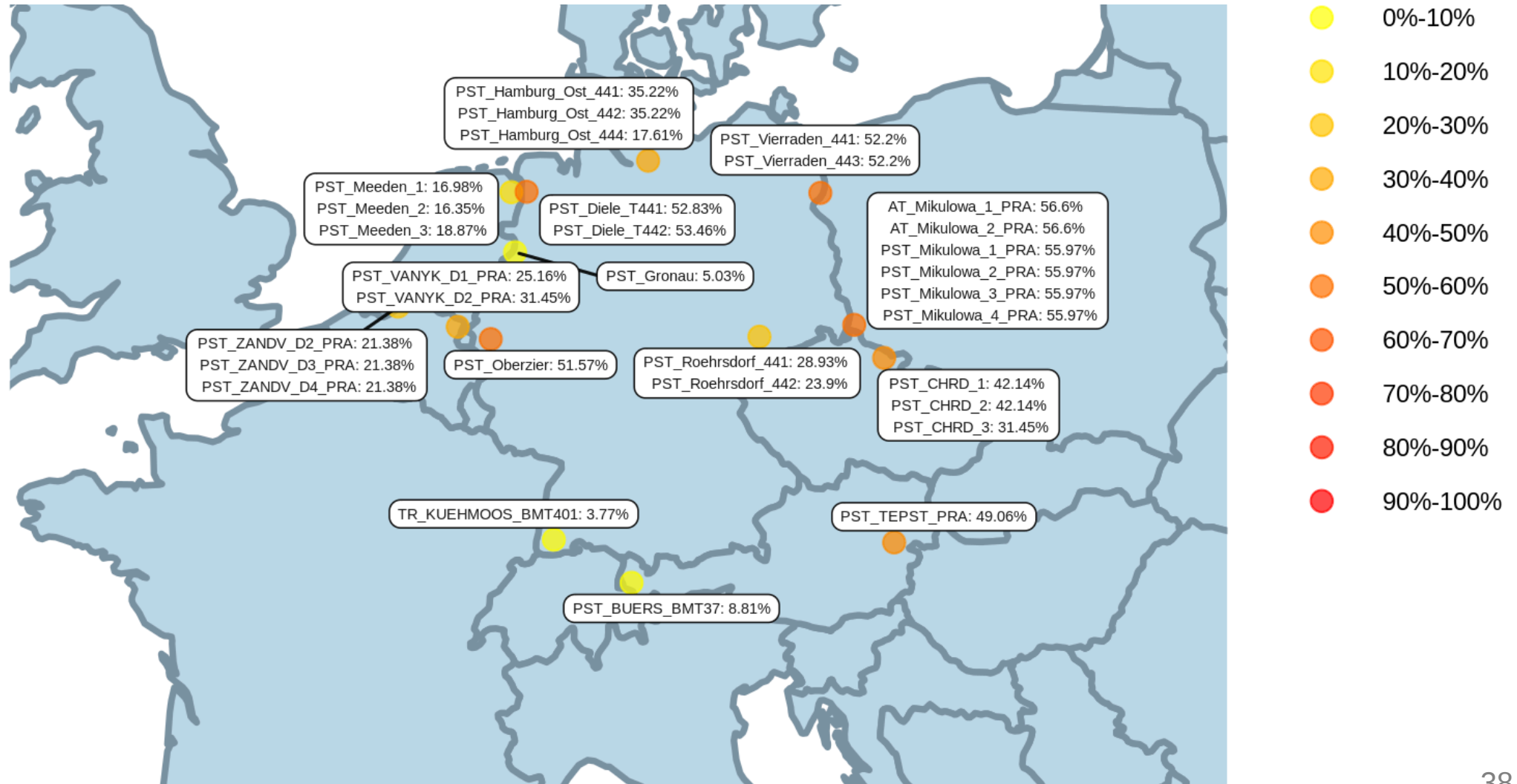


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



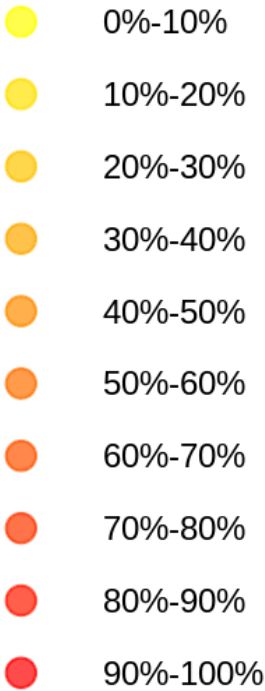
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

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



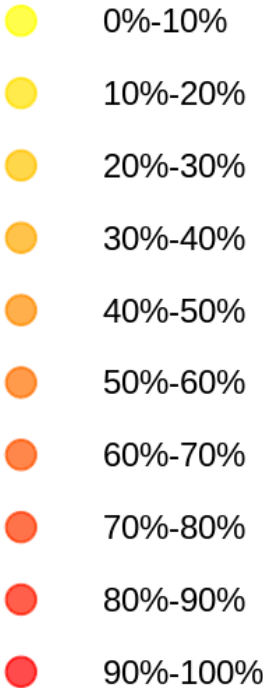
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

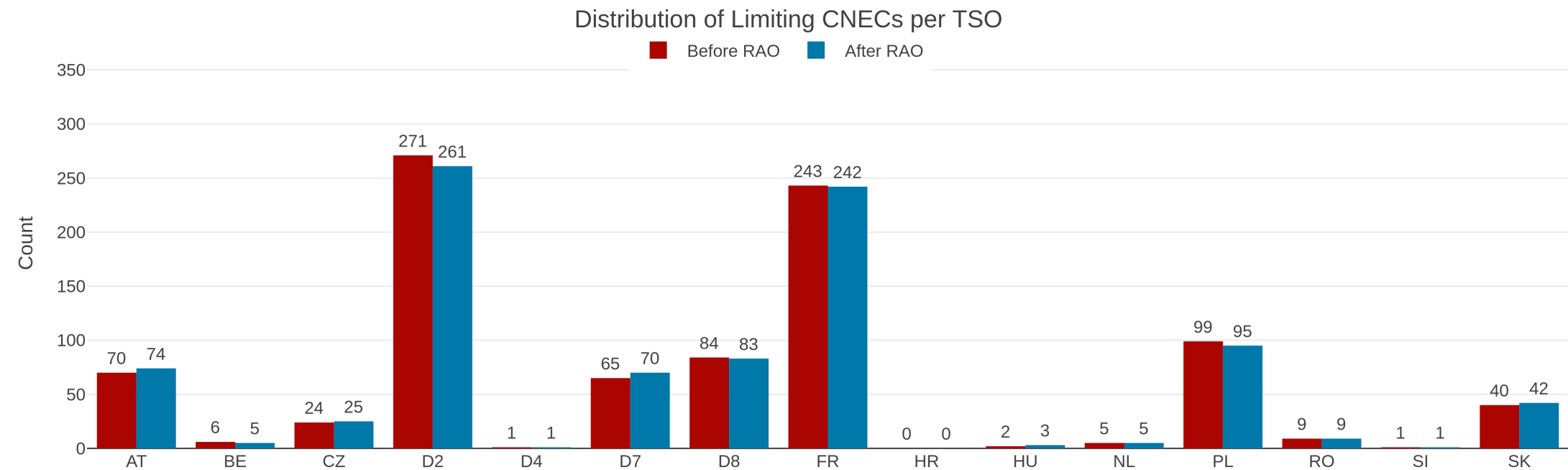
Relative Time Share of Applied Topological RAs in Curative Mode



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.

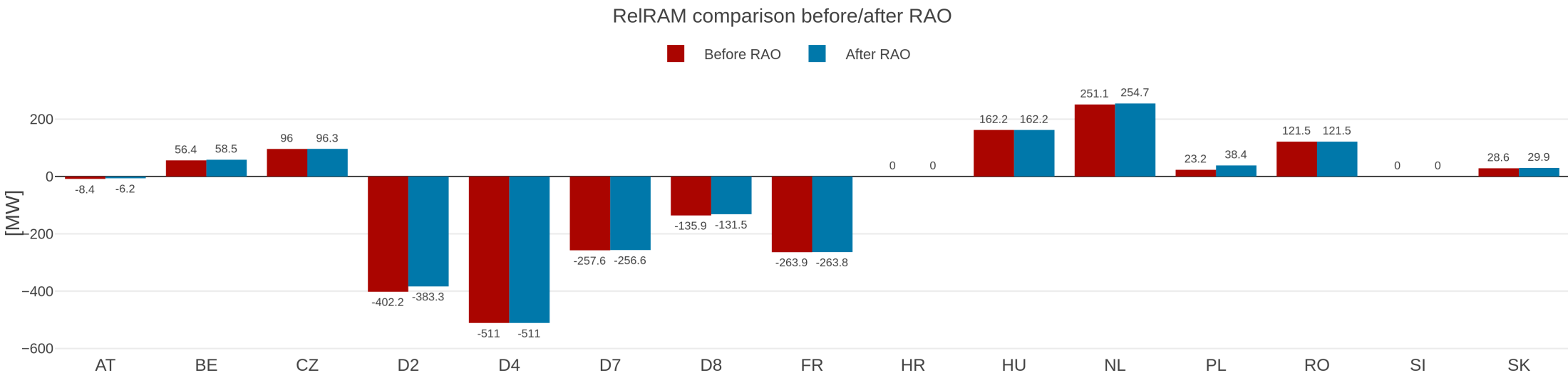
KPI 10: Average variation of relative RAM before and after NRAO



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
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	744	1488	101.01%	82.42%	126.69%	0.2069	0.948
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	744	1489	79.05%	59.51%	97.57%	0.2069	0.948
[SI-HU] Cirkovce - Heviz [DIR] [HU]	744	744	101.77%	84.27%	126.41%	0.2389	1.1053
[SI-HU] Cirkovce - Heviz [OPP] [HU]	744	744	78.25%	60.03%	95.67%	0.2389	1.1053
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	744	1252	99.38%	68.98%	137.17%	0.1823	0.5286
[BE-BE] Doel - Zandvliet 380.25 [OPP]	744	744	92.42%	21.99%	128.59%	0.3039	0.908
[SK-UA] V.Kapusany - Mukachevo (WPS) [OPP] [SK]	744	1271	88.07%	47.70%	118.75%	0.2789	1.0233
[HU-HU] Gonyu - Gyor [DIR]	744	1336	71.50%	55.03%	100.77%	0.3406	1.5711
[D8-PL] Mikulowa PST1 [DIR] [PL]	743	743	67.72%	35.83%	101.74%	0.3413	1.3474
[BE-BE] Doel - Zandvliet 380.25 [DIR]	741	741	87.36%	51.36%	141.49%	0.3039	0.908
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	741	824	90.55%	61.21%	131.25%	0.2789	1.0233
[RO-RO] Tantaraeni - Urechesti [OPP]	737	1574	75.36%	29.84%	107.31%	0.4342	0.8361
[CZ-SK] Nosovice - Varin [OPP] [CZ]	737	1470	98.56%	72.73%	127.43%	0.3169	1.3413
[AT-AT] Sarasdorf - Zurndorf 439A [OPP]	733	733	76.10%	52.17%	102.57%	0.3578	1.5979
[CZ-SK] Nosovice - Varin [DIR] [CZ]	729	1684	78.15%	57.38%	116.11%	0.3169	1.3413
[AT-HU] Zurndorf - Gyoer 439B [DIR] [AT]	726	1061	87.53%	59.45%	113.94%	0.3751	1.7071
[BE-BE] Achene - Gramme 380.10 [OPP]	724	3142	86.21%	60.04%	121.46%	0.357	0.8439
[RO-RO] TR Rosiori 400/220 1 [DIR]	717	717	72.17%	52.50%	92.08%	0.1328	0.3392
[NL-D7] Maasbracht - Oberzier SELFK WS [OPP] [D7]	717	1013	119.18%	76.33%	167.09%	0.2961	1.127
[RO-RO] PST Arad 400/220 3 [DIR]	717	1100	84.22%	66.00%	108.50%	0.1324	0.2528

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]	184	184	1473.79	24.91%	19.99%	41.99%	0.1993
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	142	142	1080.53	63.40%	25.56%	107.64%	0.2
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	123	135	1213.9	63.89%	26.24%	127.86%	0.173
[BE-BE] Doel - Zandvliet 380.25 [OPP]	122	122	734.84	79.40%	21.99%	119.03%	0.3012
[D2-D2] Altheim - Simbach 233/230 [DIR]	89	89	1474.53	66.15%	36.83%	98.10%	0.116
[D2-D2] Sottrum Transformer T421 [DIR] [D2]	81	81	541.35	71.30%	68.68%	82.03%	0.12
[BE-BE] Achene - Gramme 380.10 [DIR]	80	101	142.95	94.48%	69.90%	119.46%	0.3557
[CZ-SK] Nosovice - Varin [DIR] [CZ]	69	78	405.77	67.17%	57.97%	84.40%	0.2839
[SK-SK] V.Dur - Levice 1 [DIR]	68	68	514.15	46.62%	29.35%	68.52%	0.207
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	64	67	287.65	64.81%	53.80%	70.34%	0.3313
[D8-PL] Mikulowa PST1 [DIR] [PL]	62	62	1286.14	53.71%	35.83%	68.86%	0.3337
[CZ-SK] Nosovice - Varin [DIR] [SK]	55	55	647.75	66.43%	52.77%	84.98%	0.3518
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	55	55	748.31	63.65%	47.89%	87.93%	0.3313
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	50	54	77.41	89.90%	60.77%	117.03%	0.4427
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	49	51	320.48	65.66%	50.81%	88.34%	0.3386
[D2-D2] Altheim - Sittling 219 [OPP]	46	46	1290.78	57.23%	43.73%	75.39%	0.0762
[D8-D8] Guestrow - Guestrow 403 [OPP]	36	36	215.67	72.98%	69.04%	84.23%	0.2133
[D2-D2] Altheim - Simbach 234/230 [DIR]	36	36	1278.18	65.63%	38.51%	138.55%	0.1253
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	33	33	990.82	21.78%	19.99%	38.61%	0.1941
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	33	34	376.26	81.03%	66.54%	93.38%	0.242

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	511
AC < 0 MW	29
AC = 0 MW	260
AC > 0 MW	222

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-2264.15	3233.97
Min.	-10380.00	0.00
Max.	0.00	12307.00

