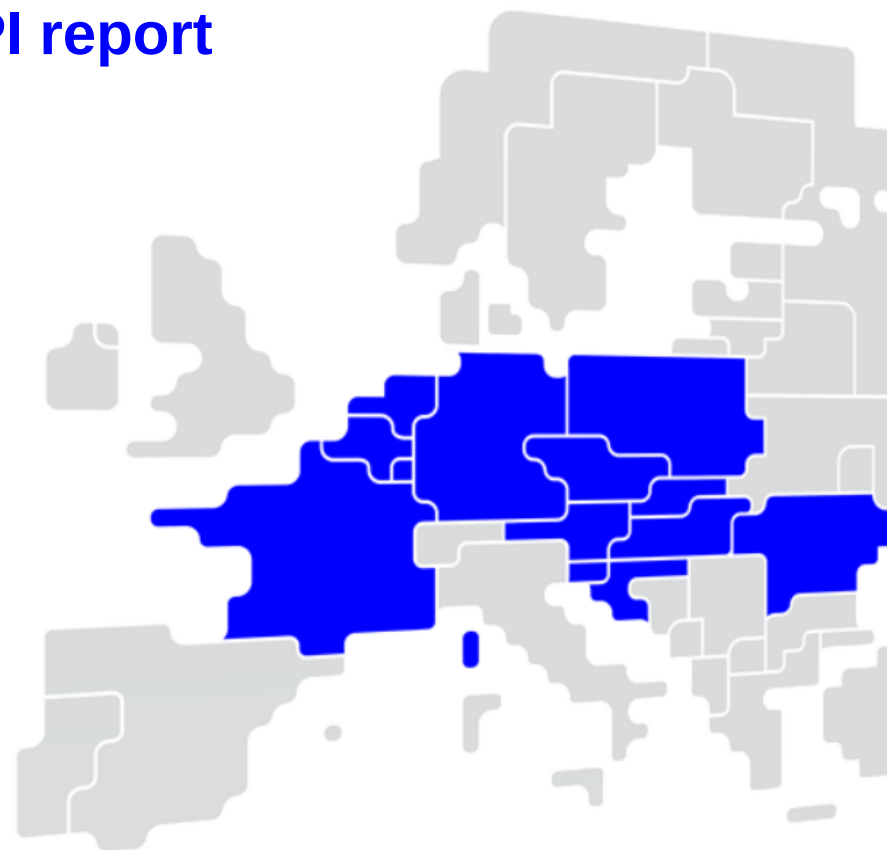




Core FB MC Operational KPI report

October 2024



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

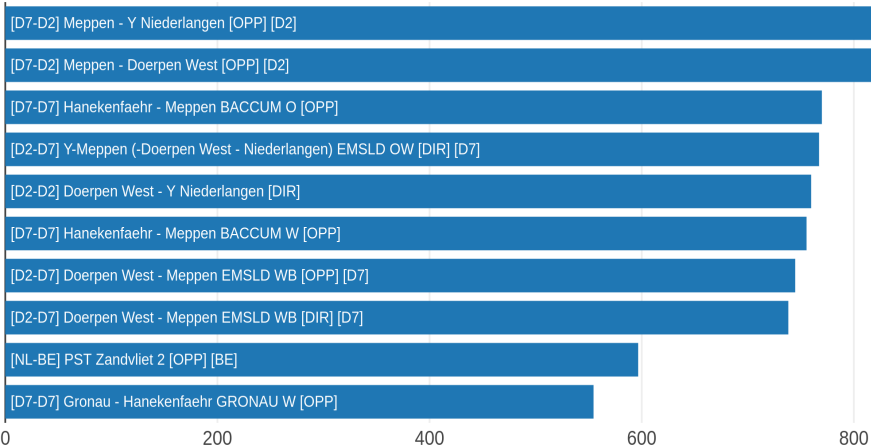
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

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-D2] Meppen - Y Niederlangen [OPP] [D2]	841.01	43.29%	30.91%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	819.64	42.20%	29.85%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	769.85	34.10%	22.11%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	767.22	32.56%	20.85%
[D2-D2] Doerpen West - Y Niederlangen [DIR]	759.75	39.11%	27.35%
[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	755.40	33.56%	21.71%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	744.71	31.67%	19.93%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	738.25	31.39%	20.02%
[NL-BE] PST Zandvliet 2 [OPP] [BE]	596.67	39.57%	0.16%
[D7-D7] Gronau - Hanekenfaehr GRONAU W [OPP]	554.59	24.93%	11.31%



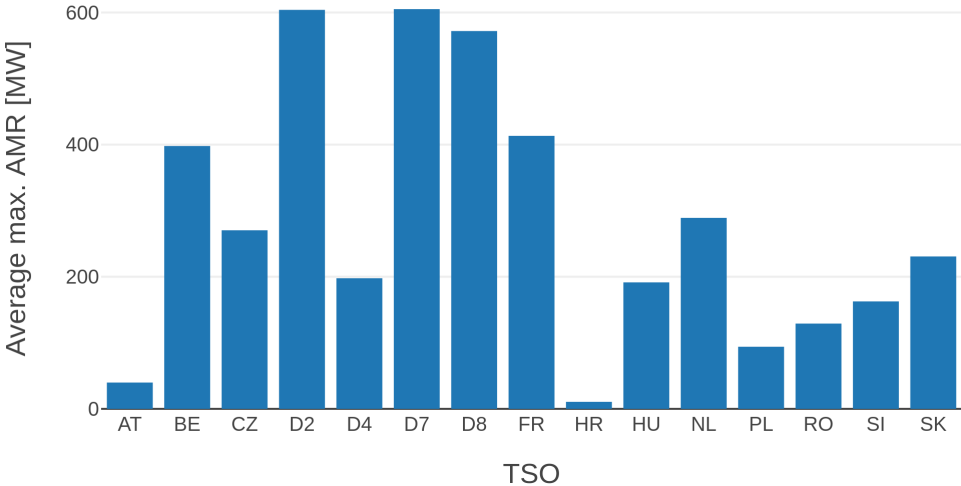
Average max. AMR [MW]

KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	39.84
BE	397.83
CZ	270.36
D2	603.95
D4	197.72
D7	605.11
D8	571.98
FR	413.30
HR	10.69
HU	191.49

TSO	Average maximum AMR per TSO
NL	289.13
PL	94.02
RO	129.07
SI	162.66
SK	230.78



KPI 3: Share of MTUs with intervention per TSO



Total BDs
31

Total MTUs
745

MTUs without IVA
142

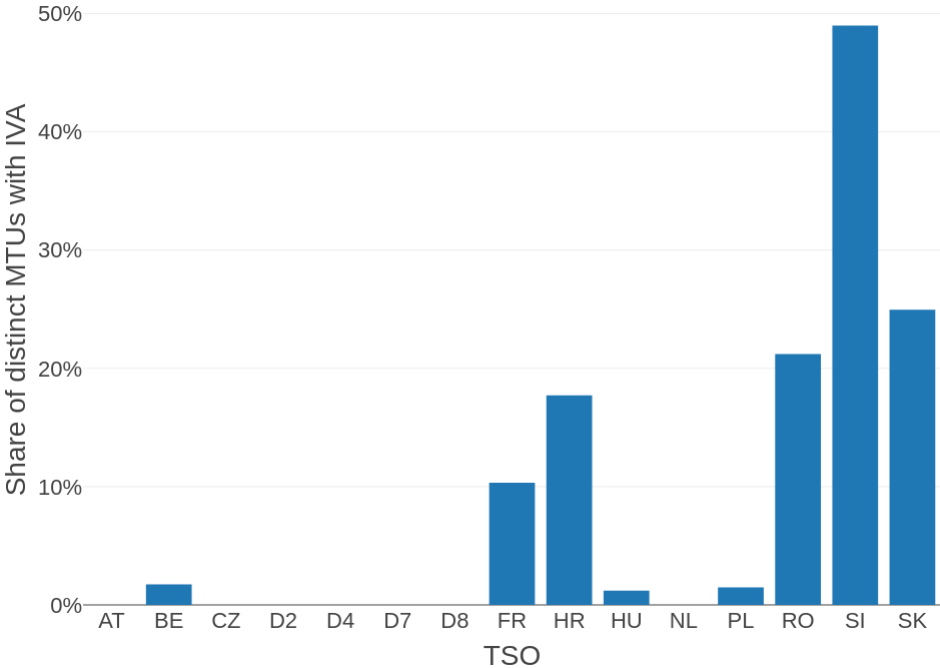
Share of distinct MTUs without IVA
19.06%

MTUs with IVA
603

Share of distinct MTUs with IVA
80.9%

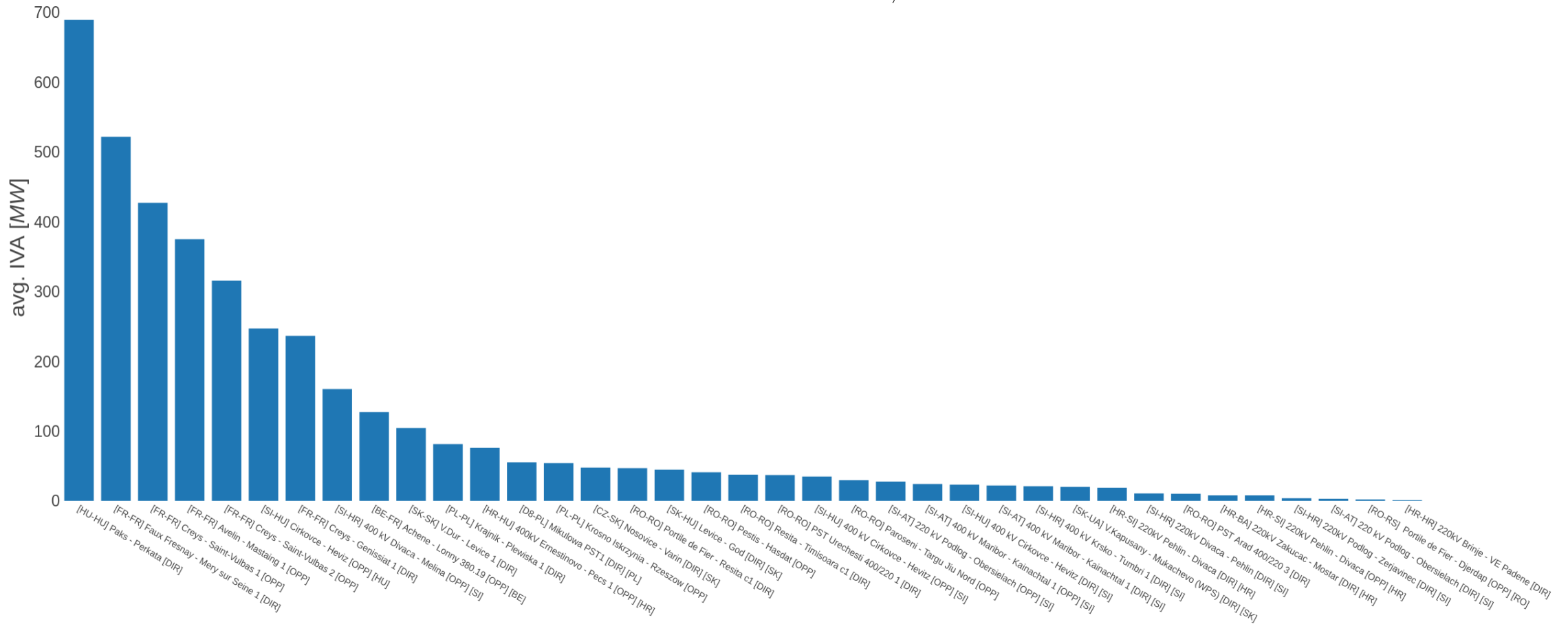
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.00%	0
BE	1.74%	13
CZ	0.00%	0
D2	0.00%	0
D4	0.00%	0
D7	0.00%	0
D8	0.00%	0
FR	10.34%	77
HR	17.72%	132
HU	1.21%	9

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
NL	0.00%	0
PL	1.48%	11
RO	21.21%	158
SI	48.99%	365
SK	24.97%	186



A map of Europe with the Central European region highlighted in green. This region includes countries such as Poland, Czech Republic, Slovakia, Austria, Hungary, and parts of Germany, France, and the Balkans.

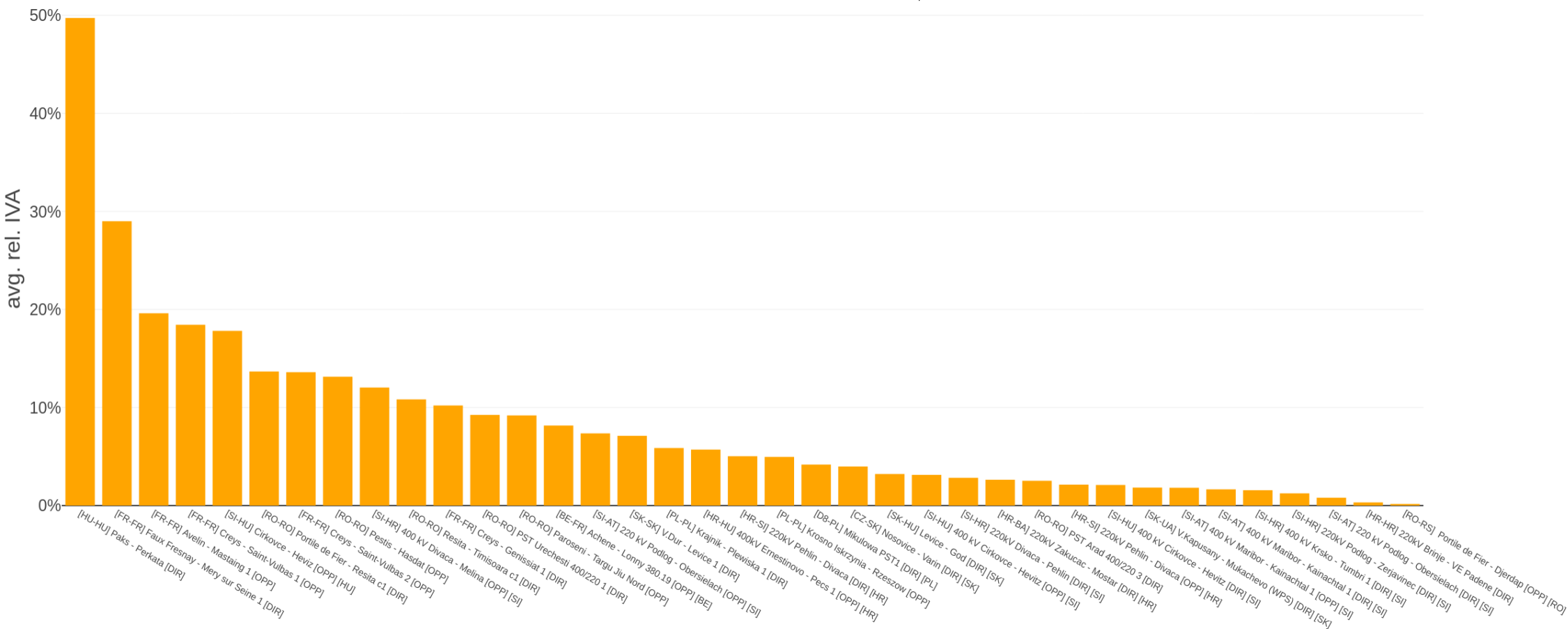
$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]$$



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



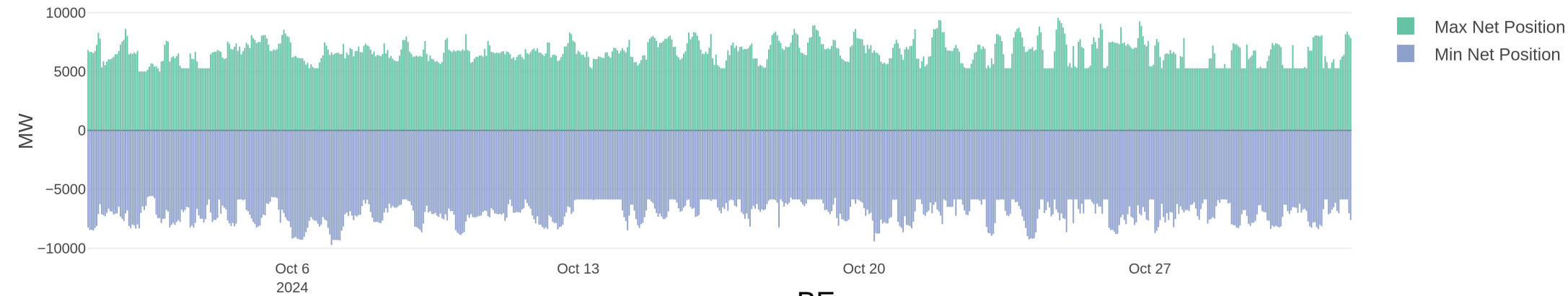
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{maxCNEC, MTU}[IVA_{CNEC, MTU} > 0]}$$



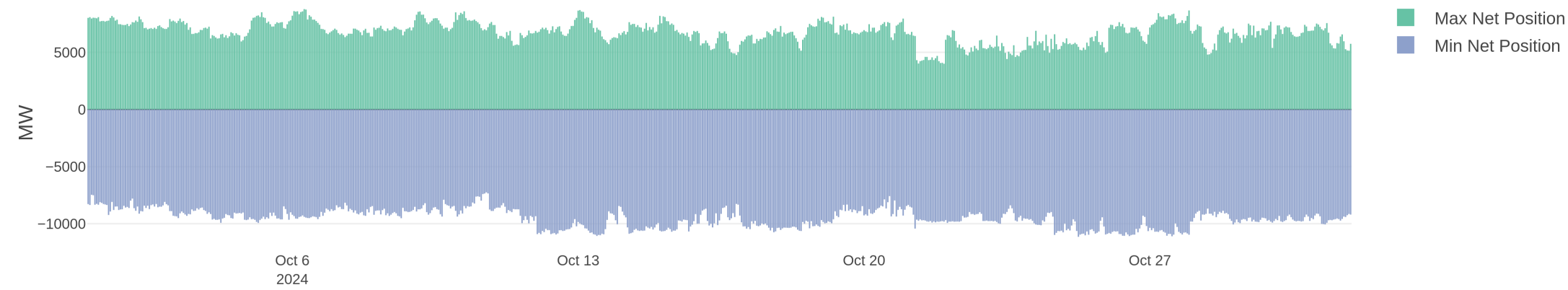
KPI 5: Min & max net positions per BZ hub



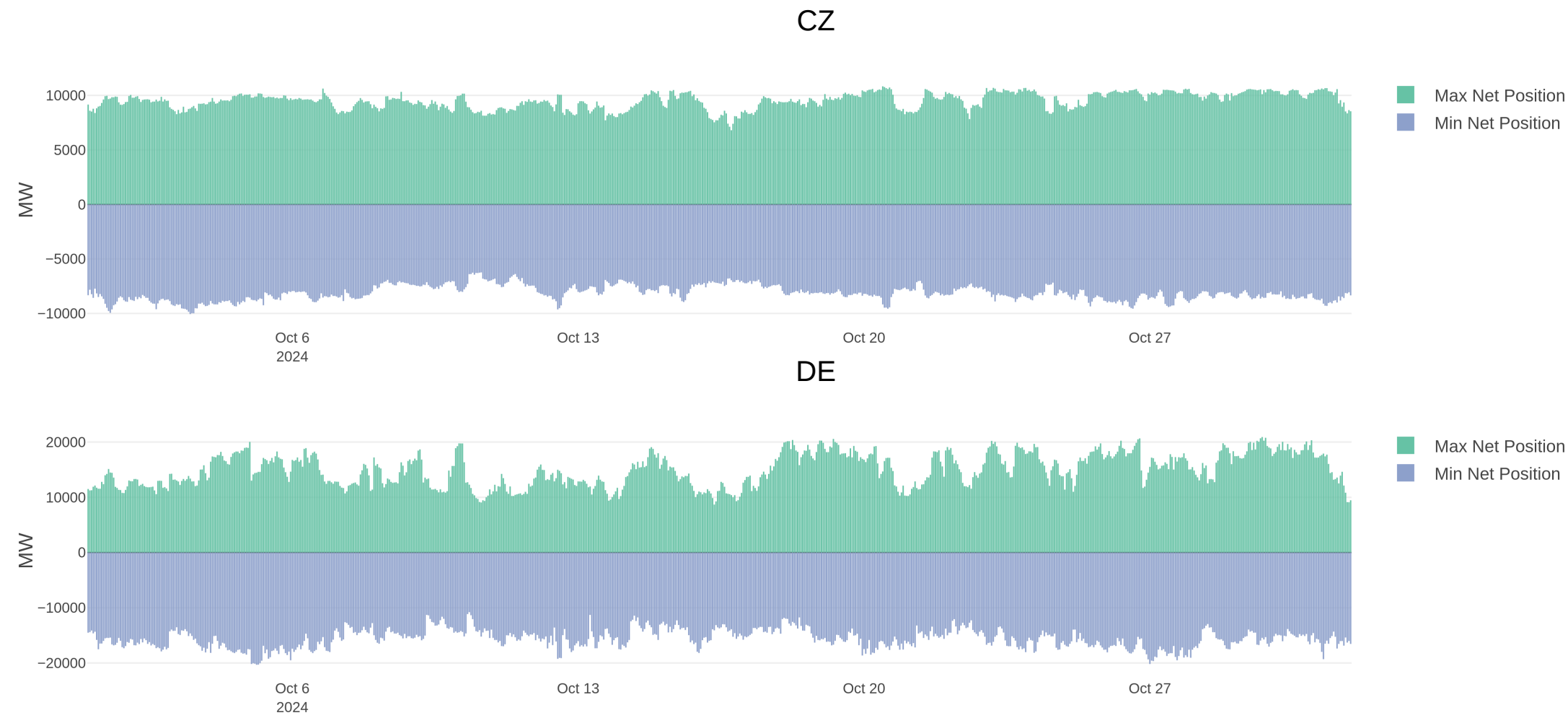
AT



BE



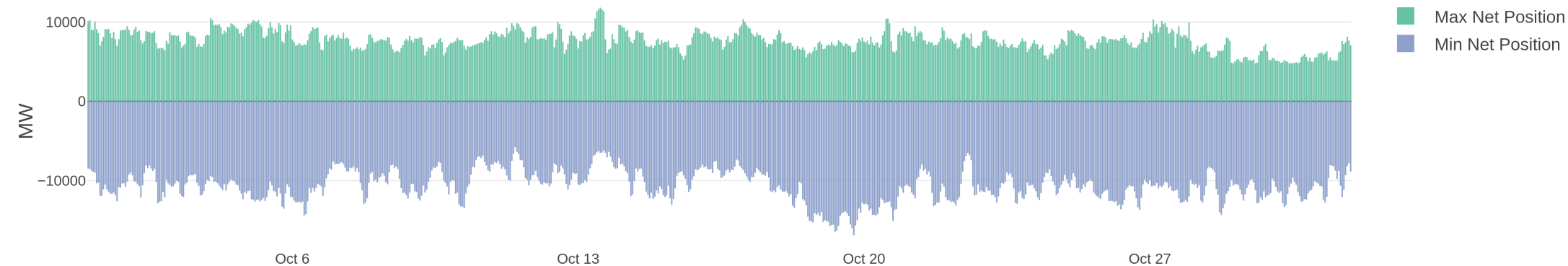
KPI 5: Min & max net positions per BZ hub



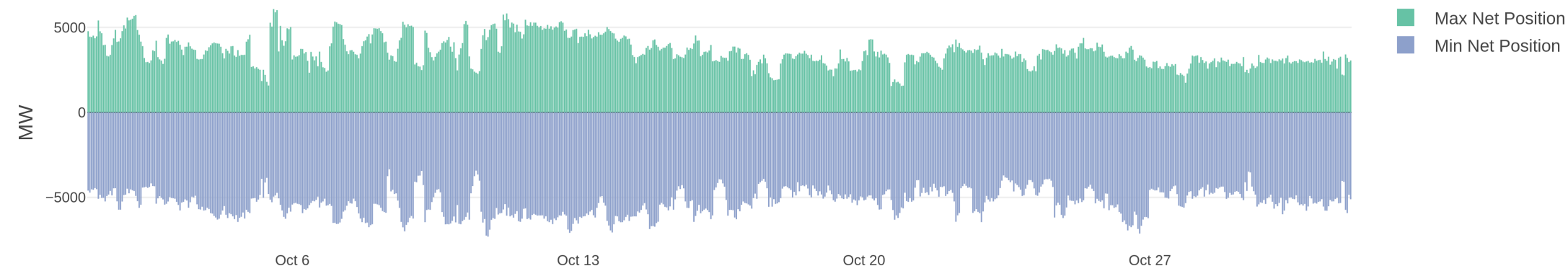
KPI 5: Min & max net positions per BZ hub



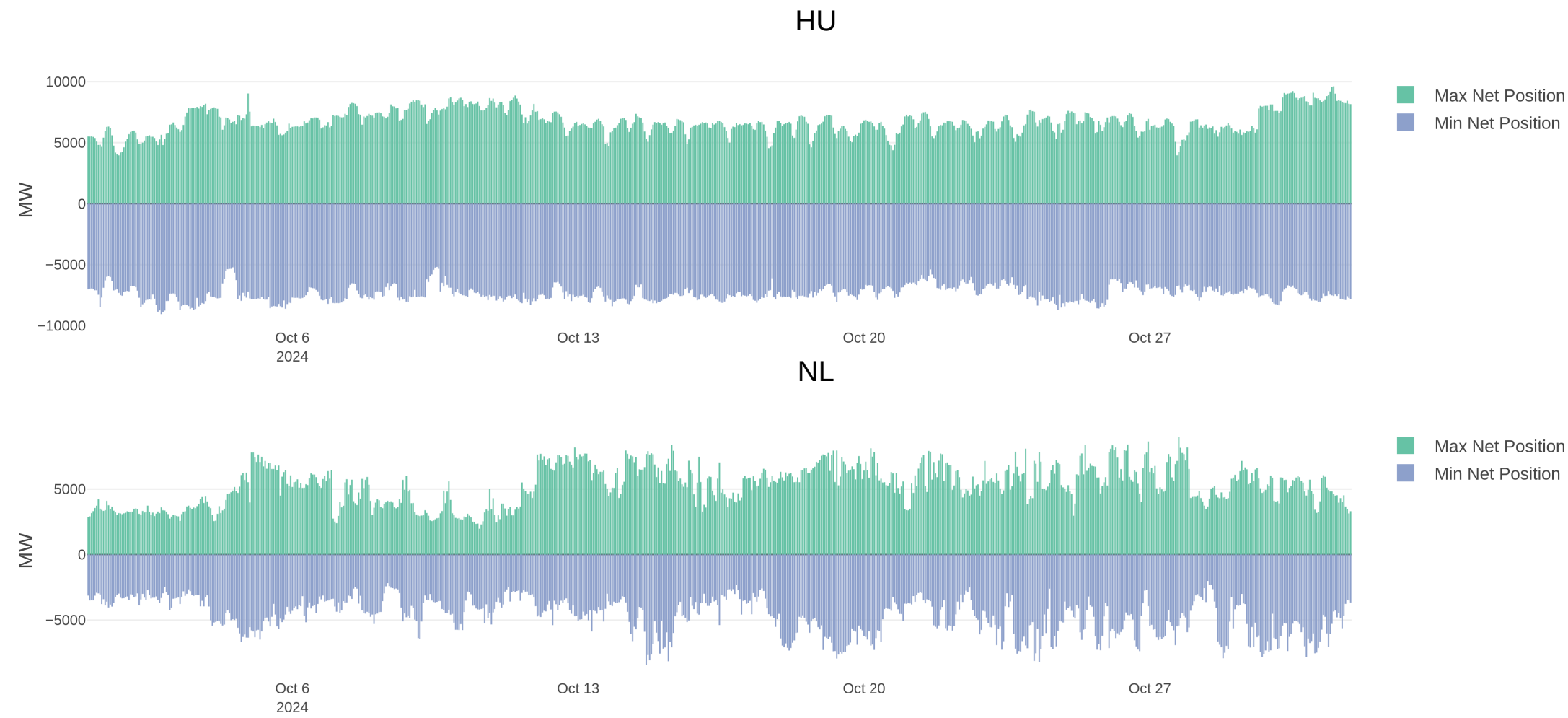
FR



HR



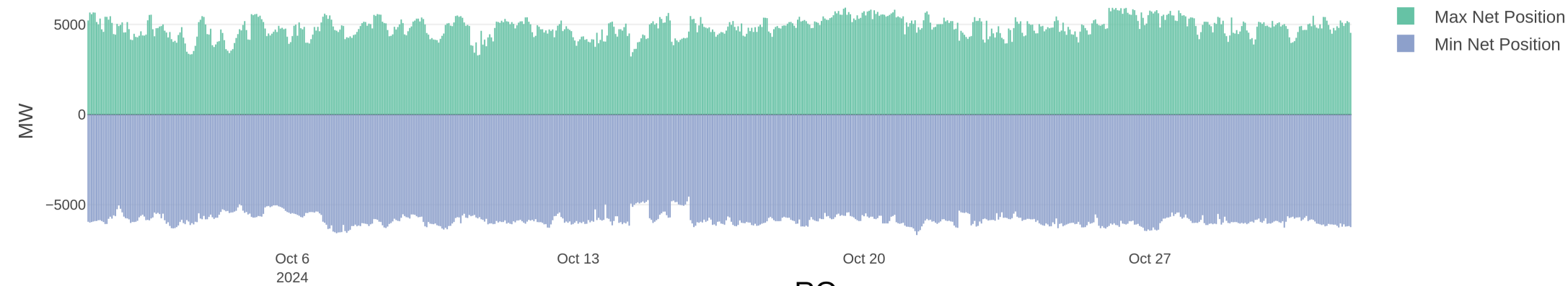
KPI 5: Min & max net positions per BZ hub



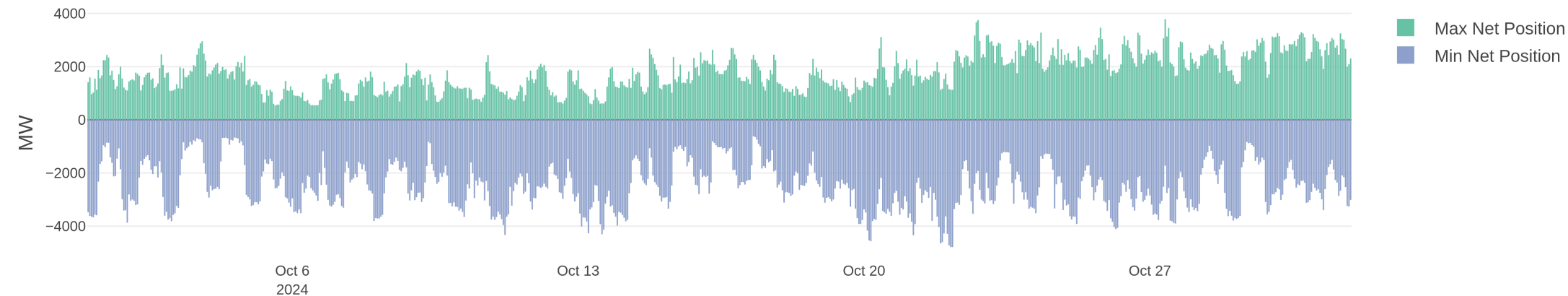
KPI 5: Min & max net positions per BZ hub



PL



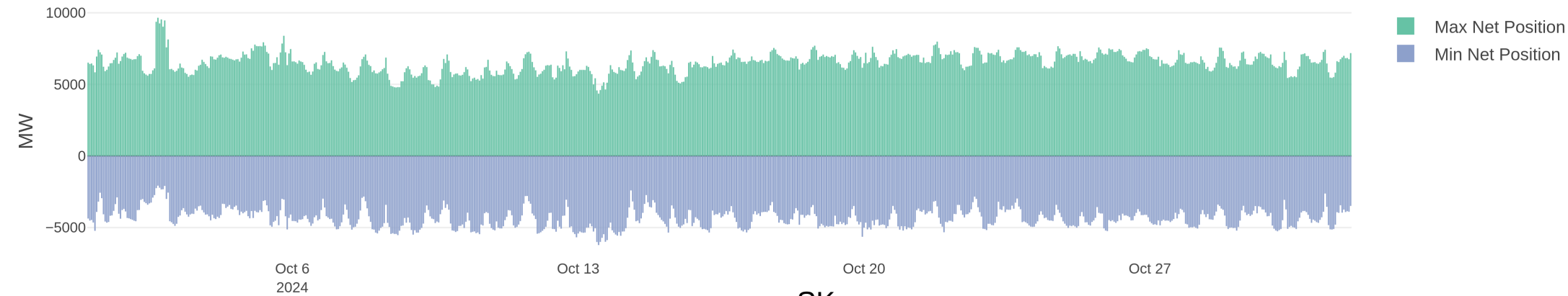
RO



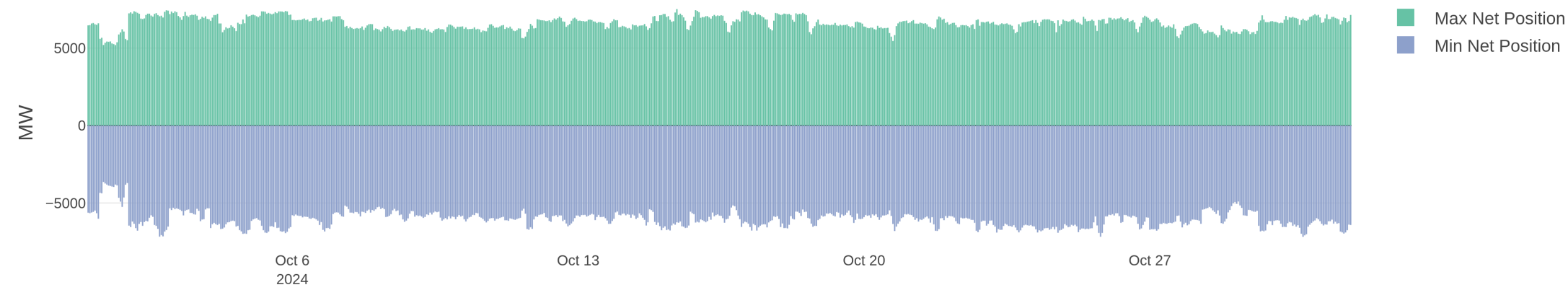
KPI 5: Min & max net positions per BZ hub



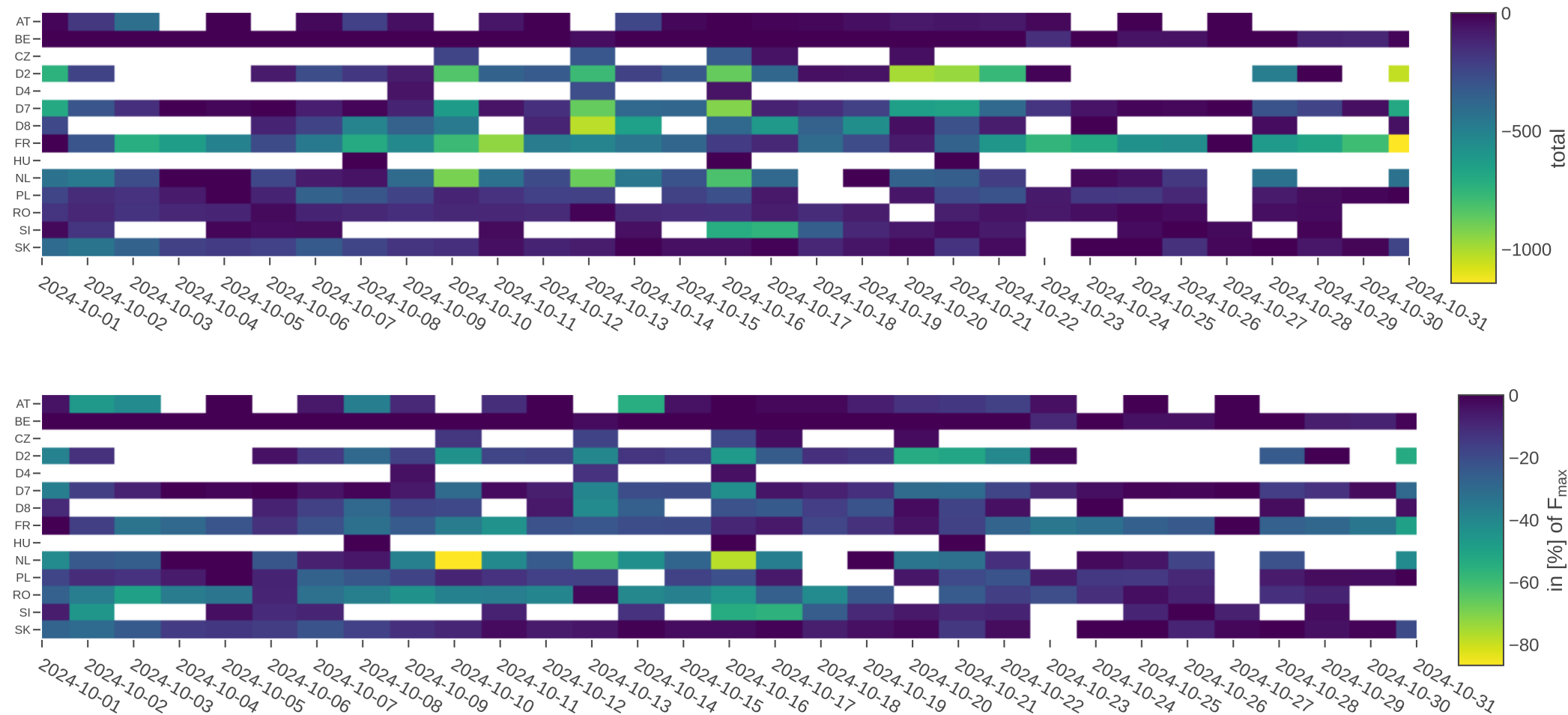
SI



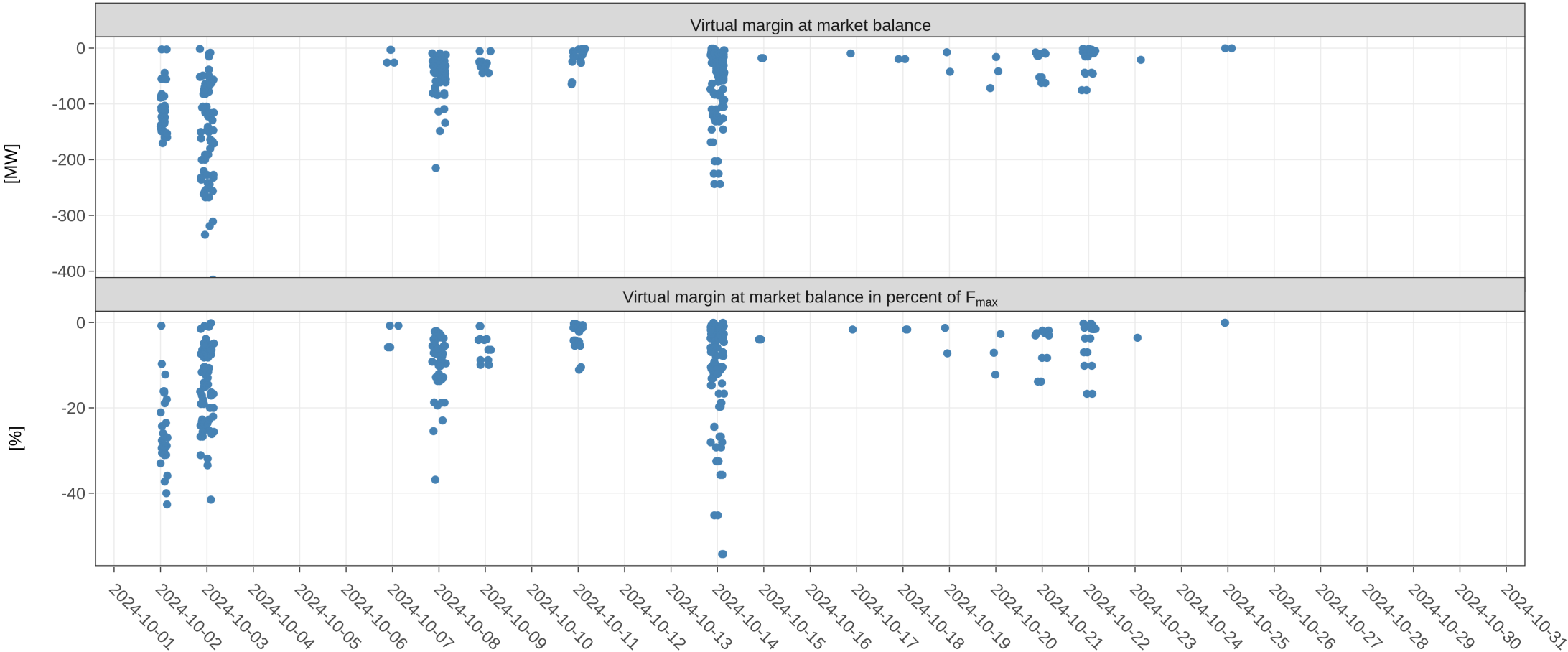
SK



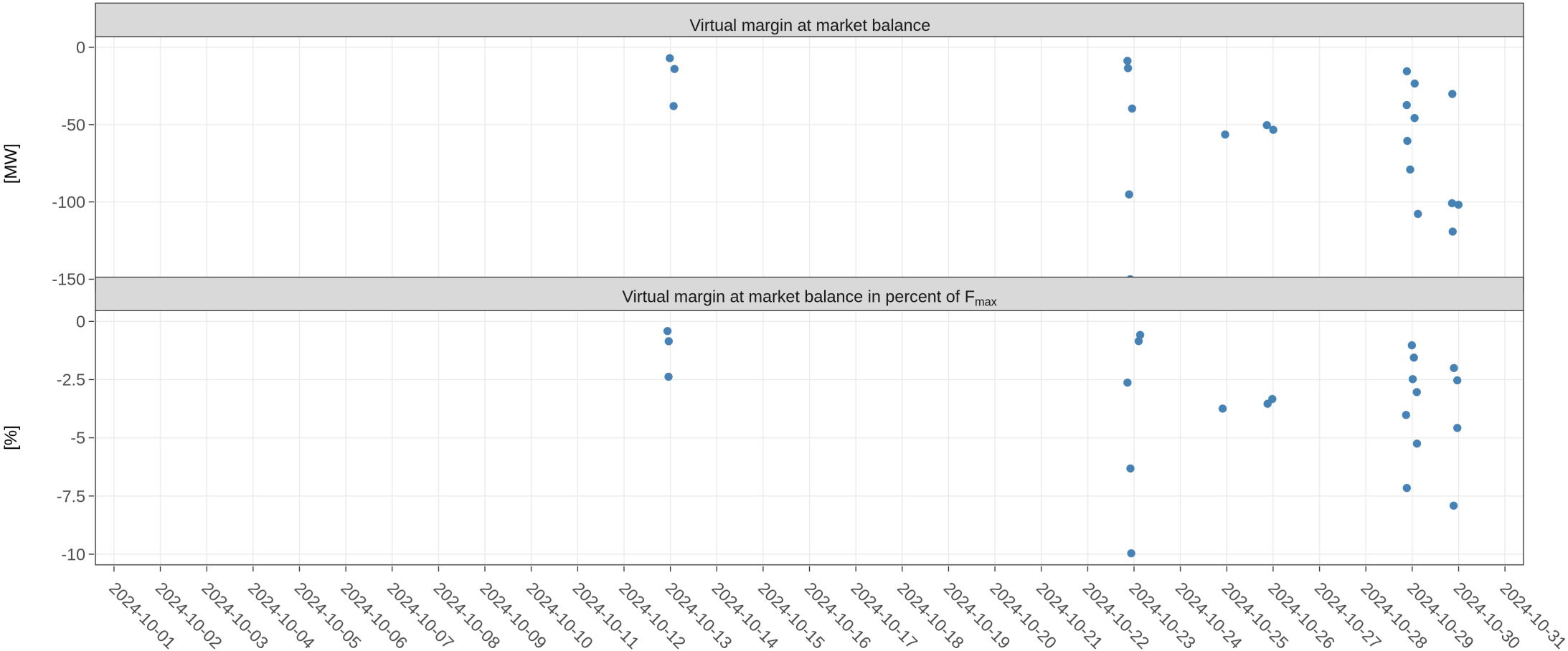
KPI 6a: Highest virtual margins at market balance for CORE TSOs



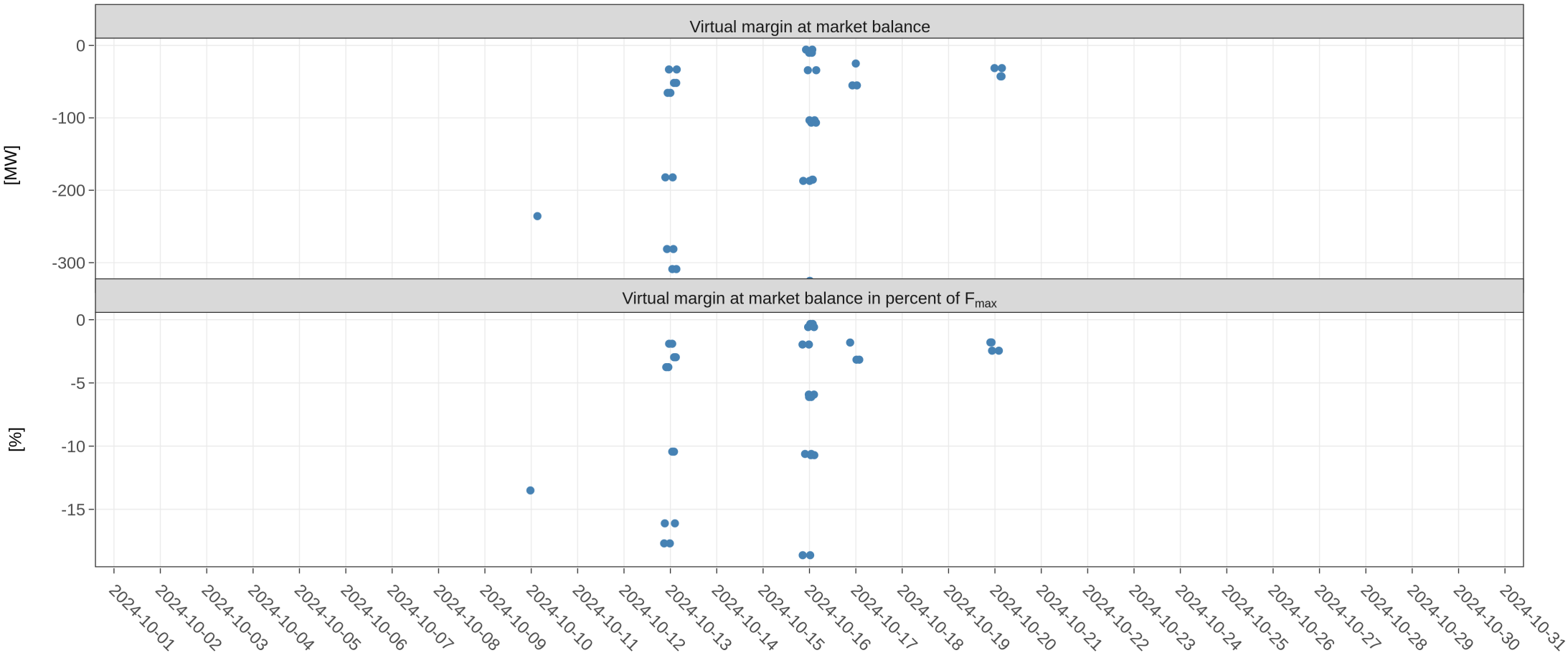
KPI 6b: Virtual margins at market balance AT



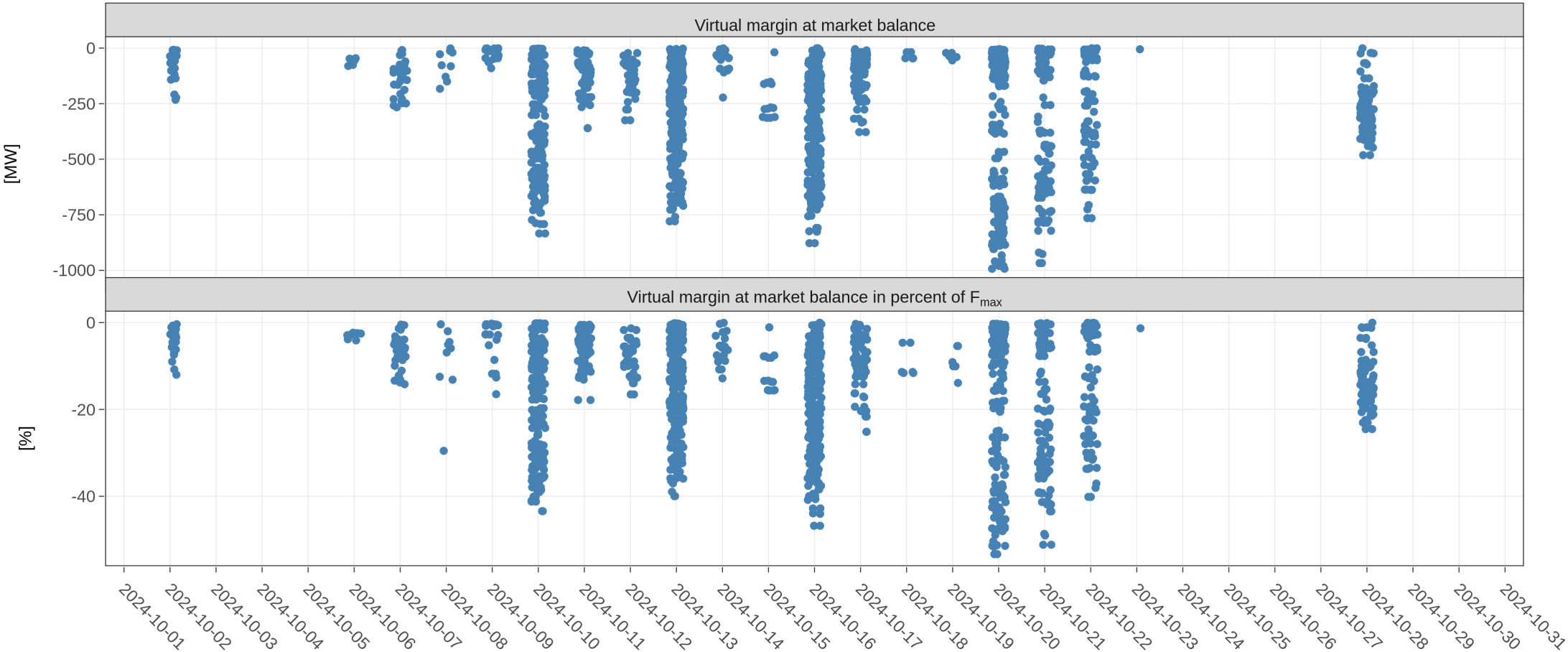
KPI 6b: Virtual margins at market balance BE



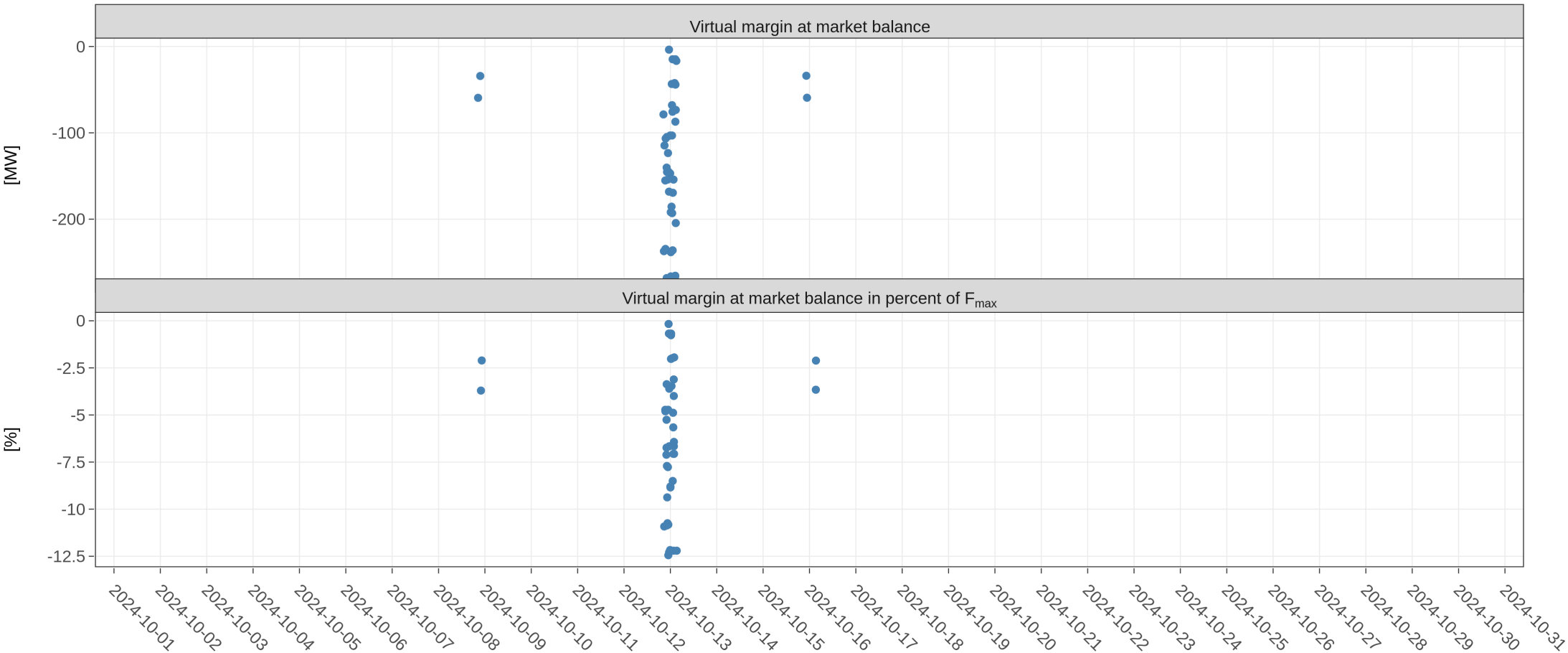
KPI 6b: Virtual margins at market balance CZ



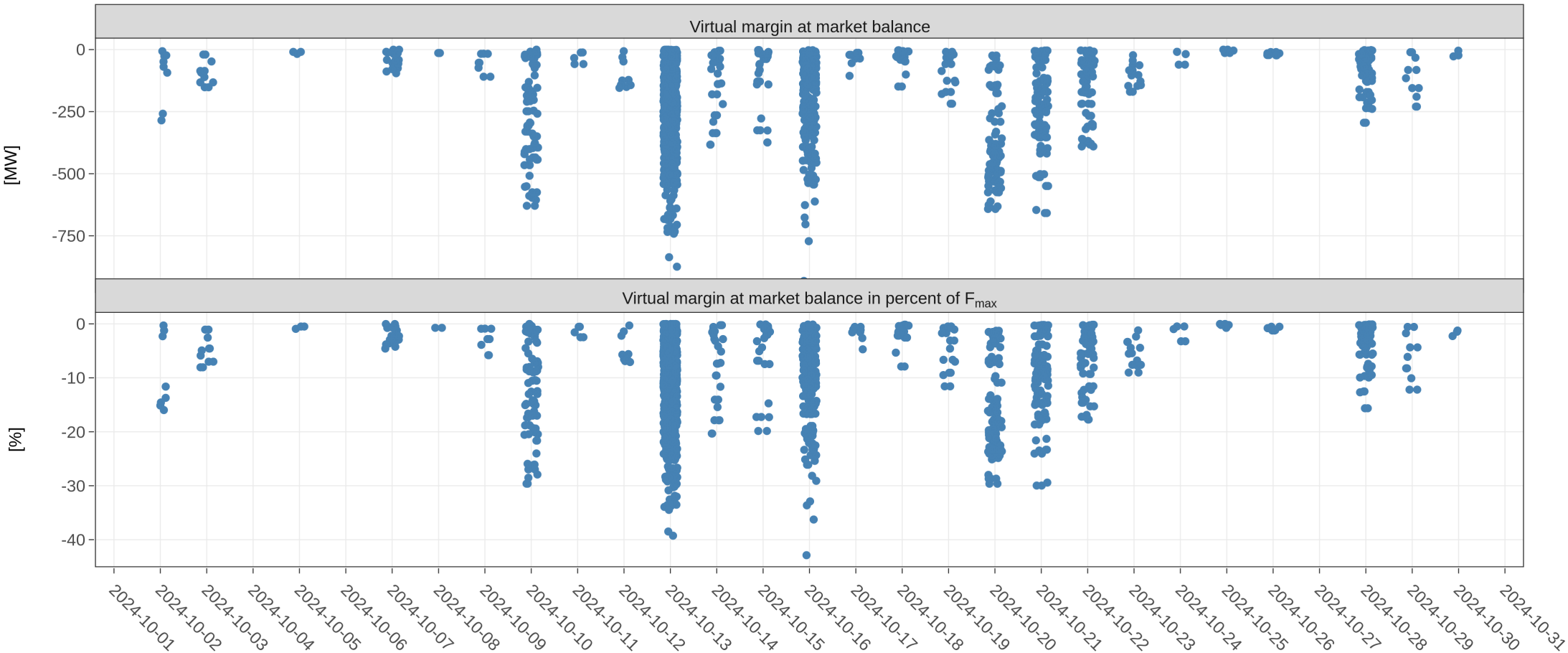
KPI 6b: Virtual margins at market balance D2



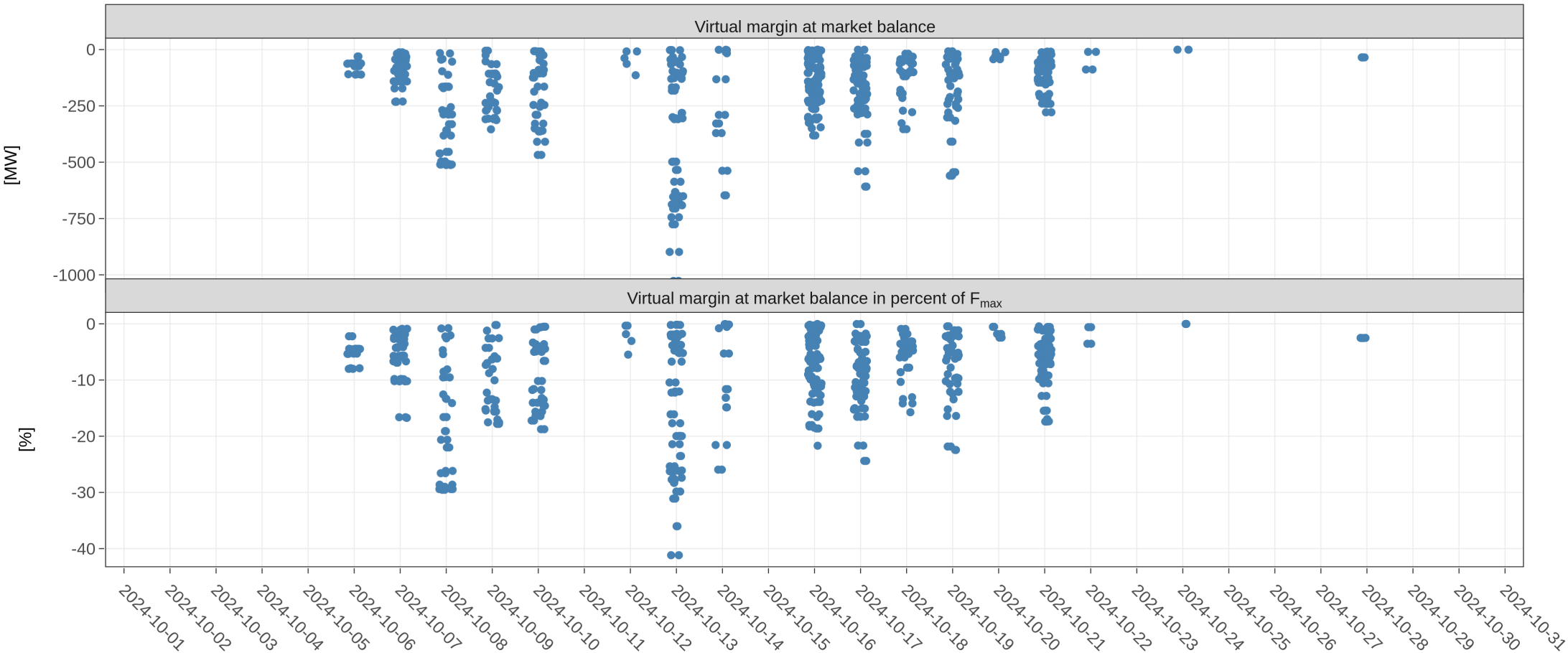
KPI 6b: Virtual margins at market balance D4



KPI 6b: Virtual margins at market balance D7



KPI 6b: Virtual margins at market balance D8



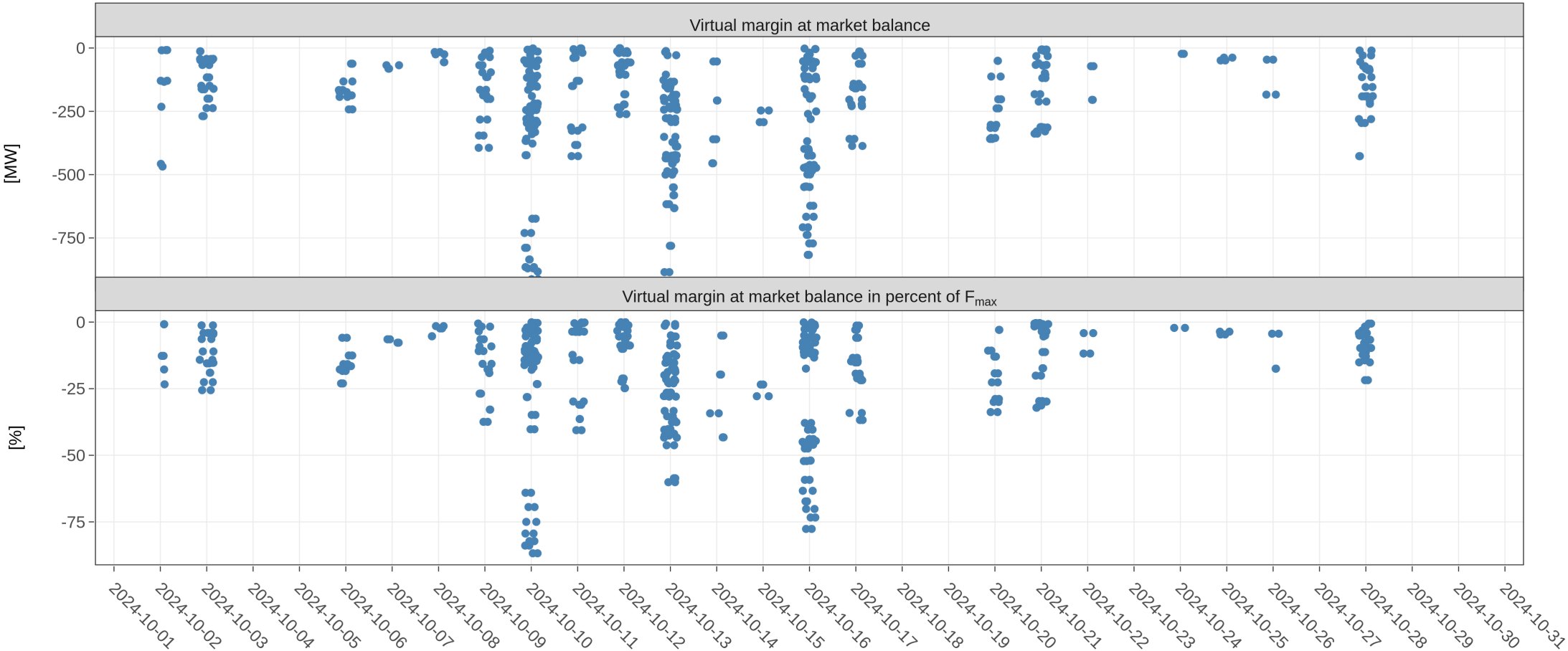
KPI 6b: Virtual margins at market balance FR



KPI 6b: Virtual margins at market balance HU



KPI 6b: Virtual margins at market balance NL



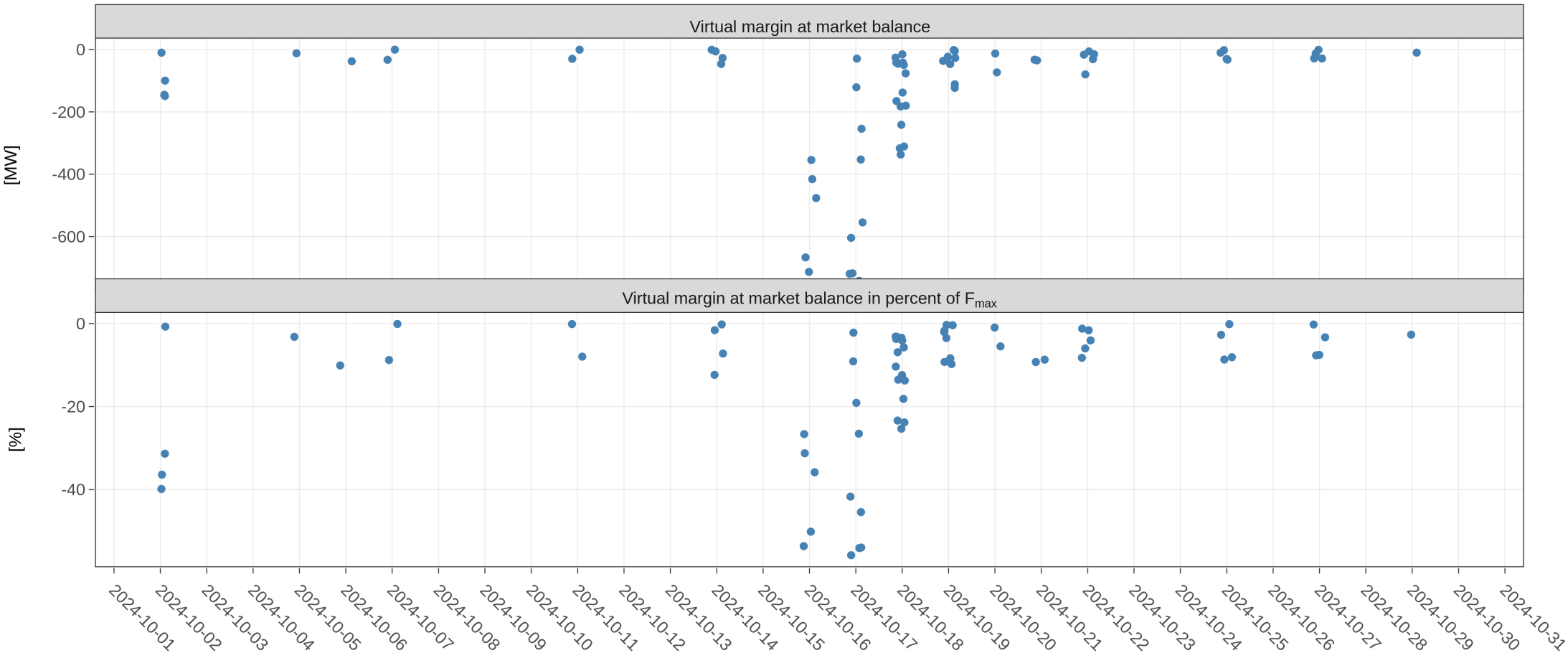
KPI 6b: Virtual margins at market balance PL



KPI 6b: Virtual margins at market balance RO



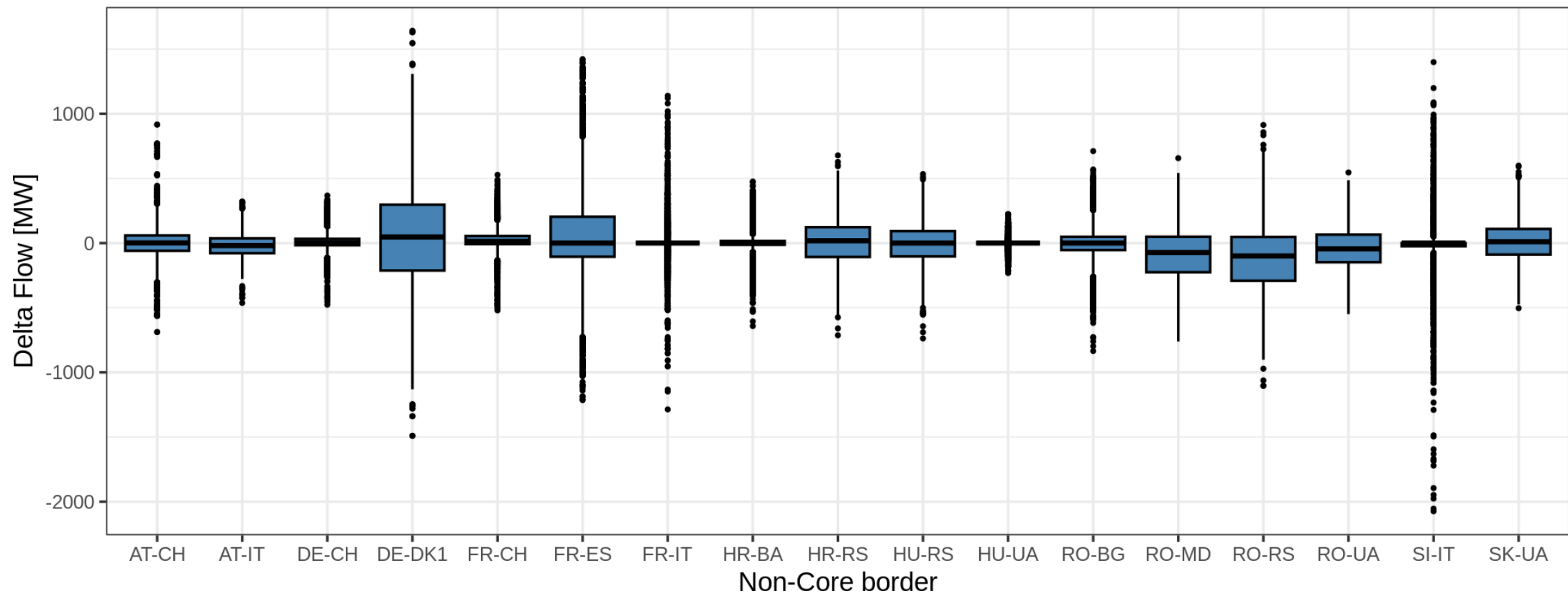
KPI 6b: Virtual margins at market balance SI



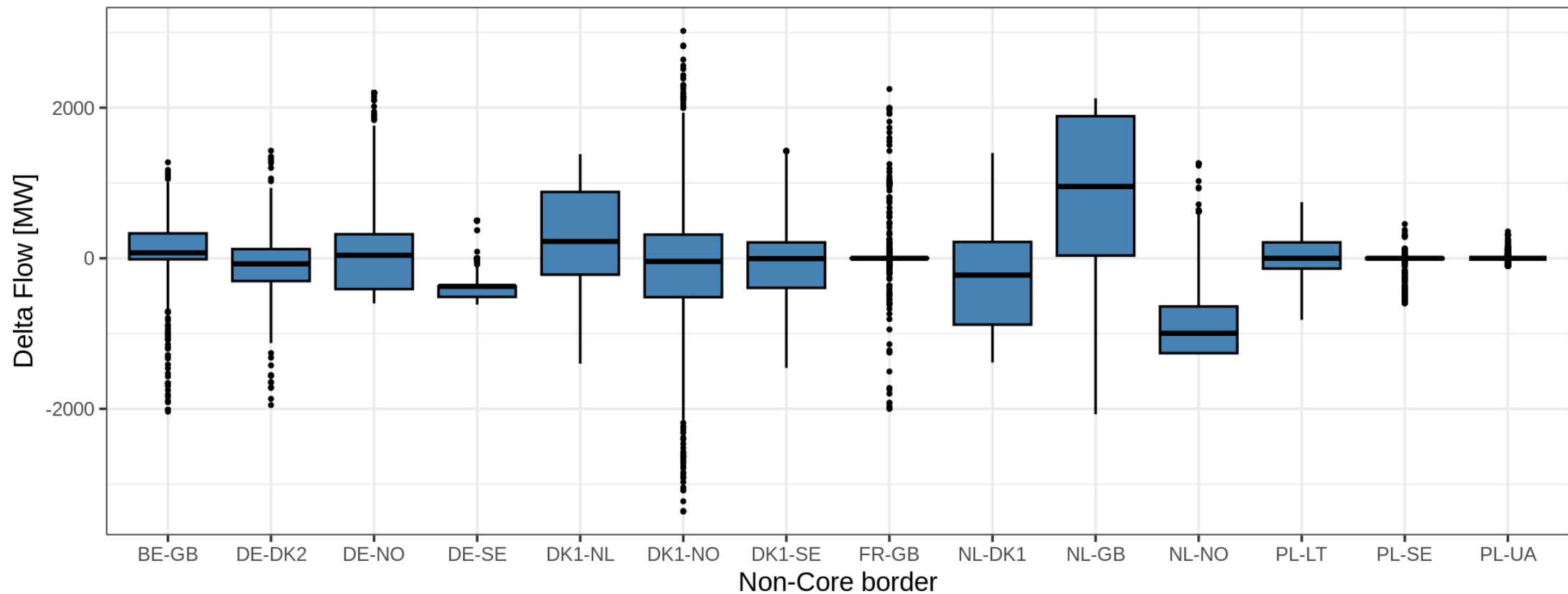
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



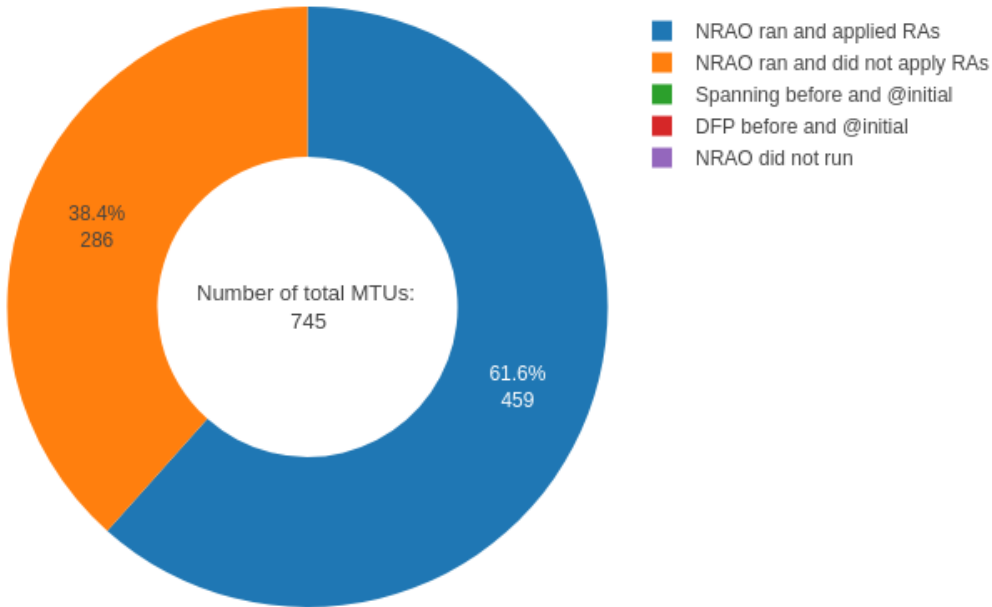
KPI 8: NRAO – Applied Remedial Action



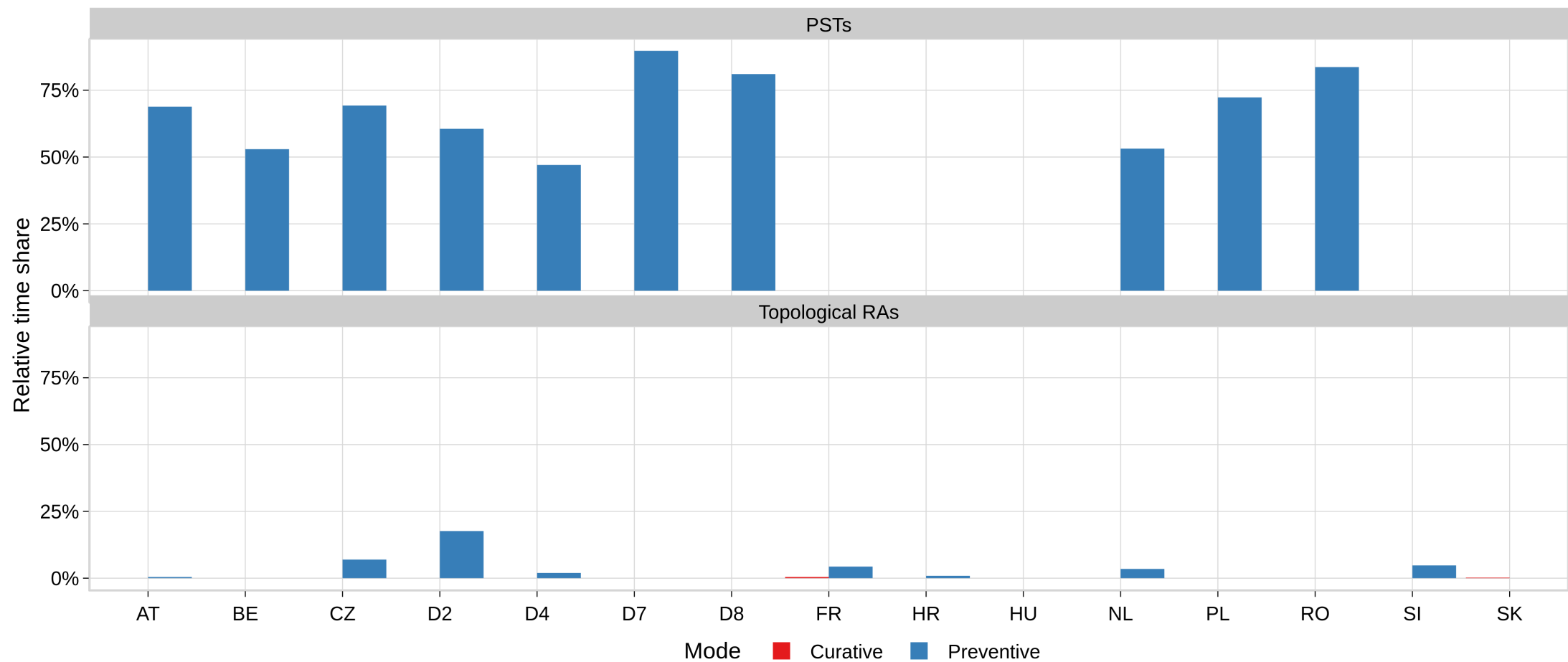
In the following plots, the relative time share relates to the hours labeled ‘NRAO Ran and Applied RAs’.

Total MTUs: 745 hours

Category	Hours (%)
NRAO ran and applied RAs	459 hours (61.6%)
NRAO ran and did not apply RAs	286 hours (38.4%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

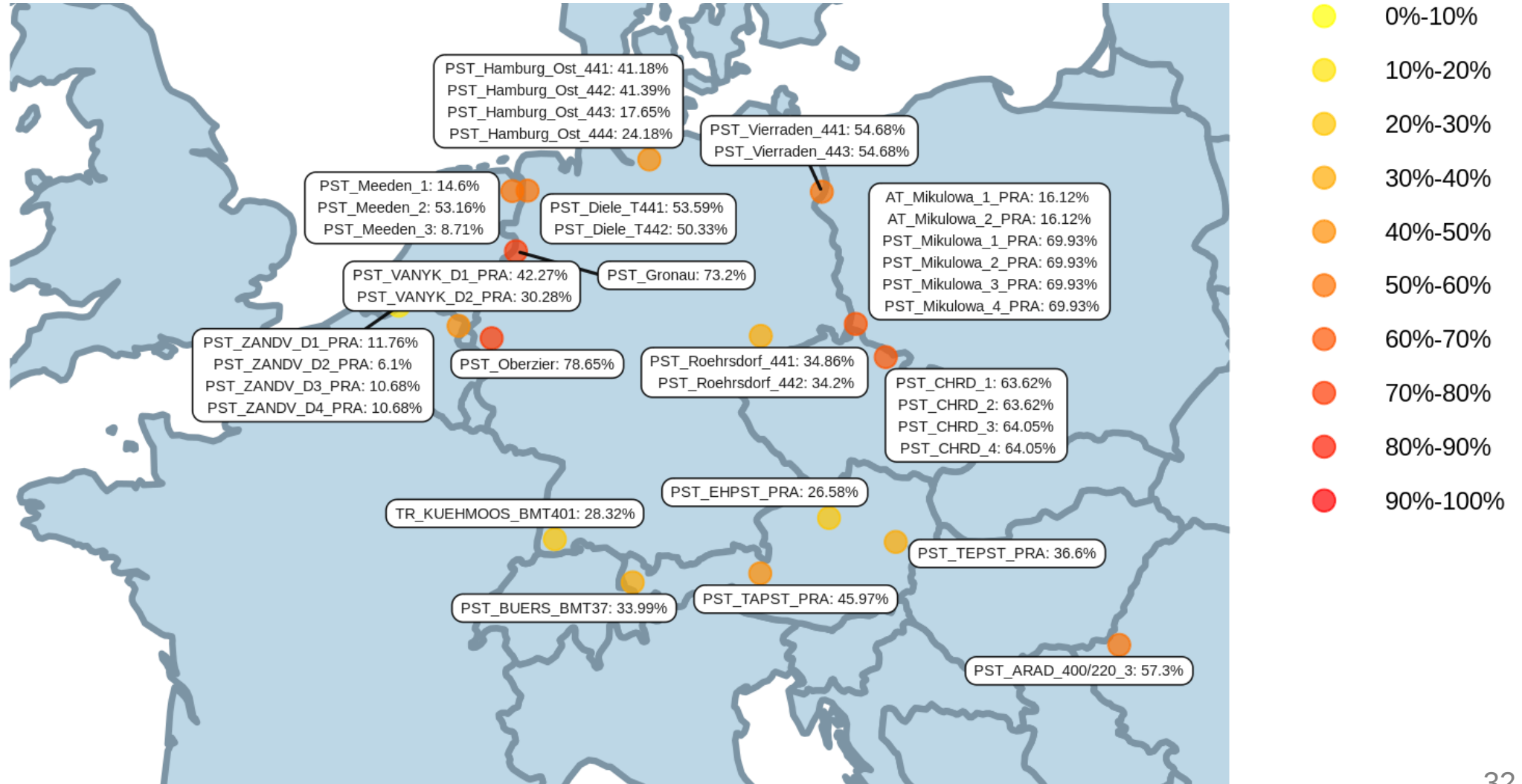


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



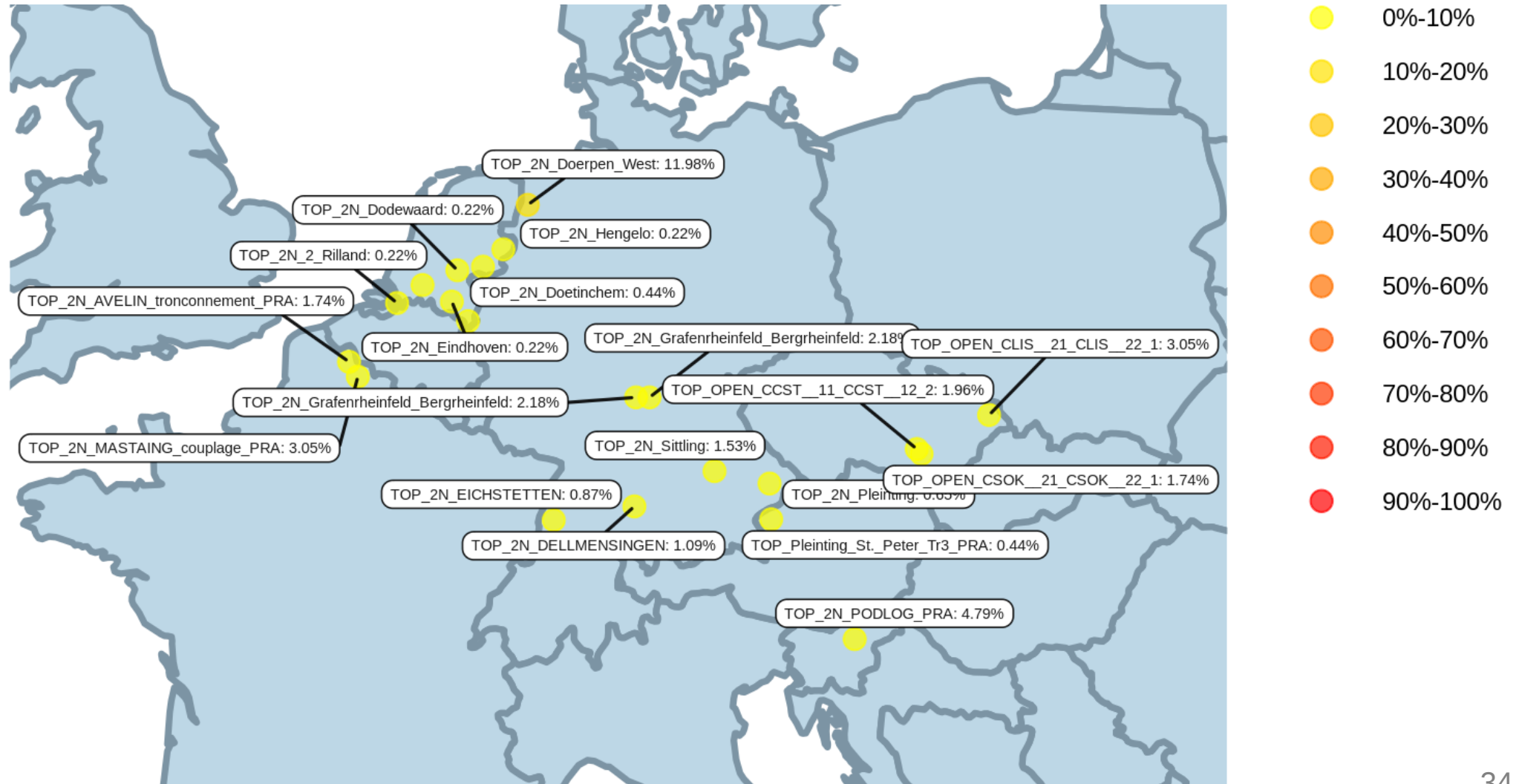
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



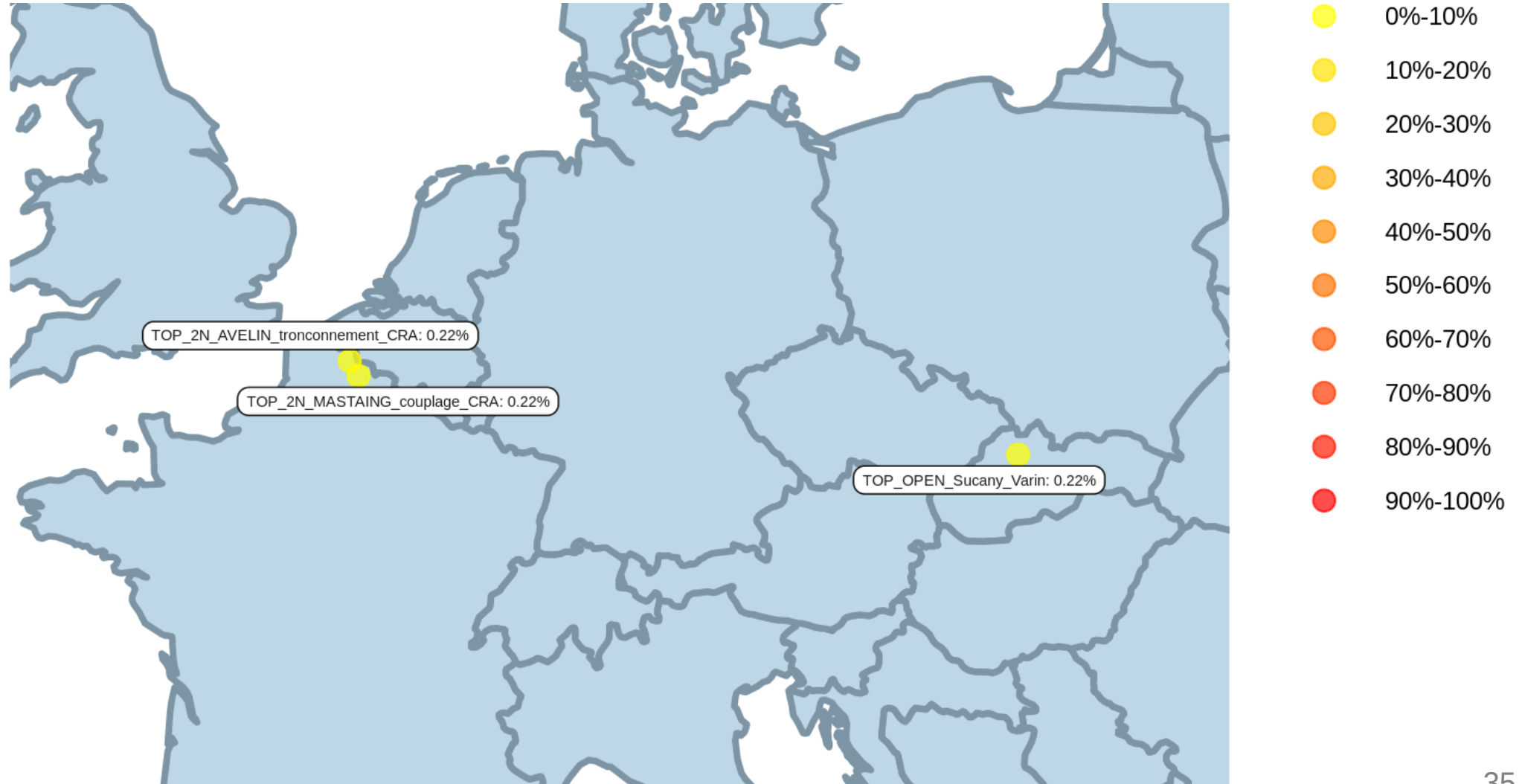
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

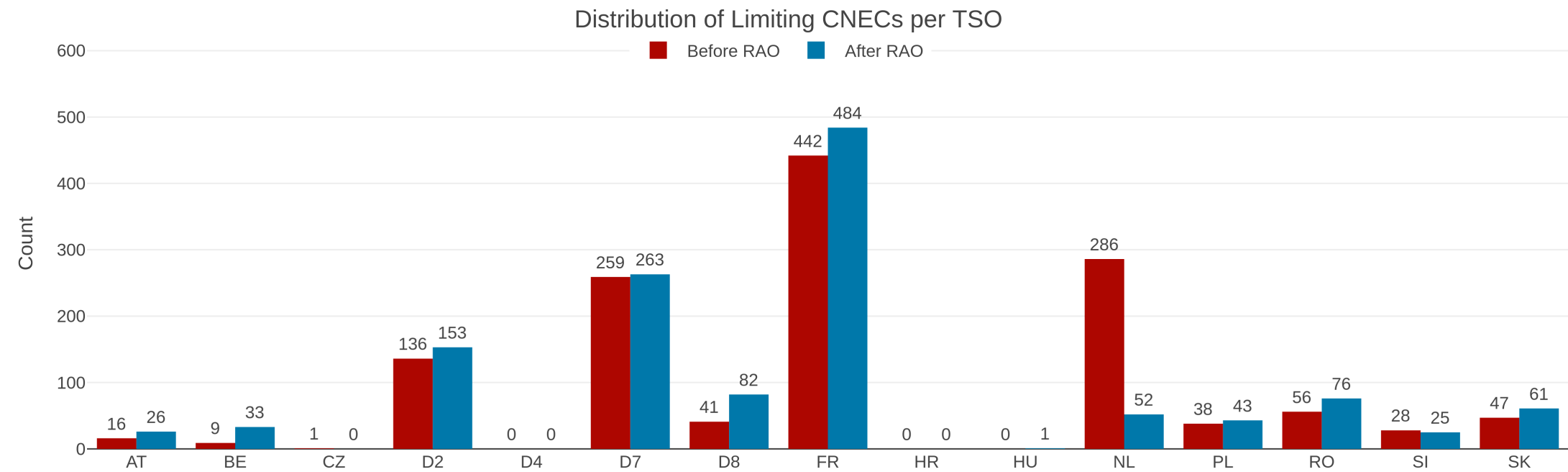
Relative Time Share of Applied Topological RAs in Curative Mode



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.

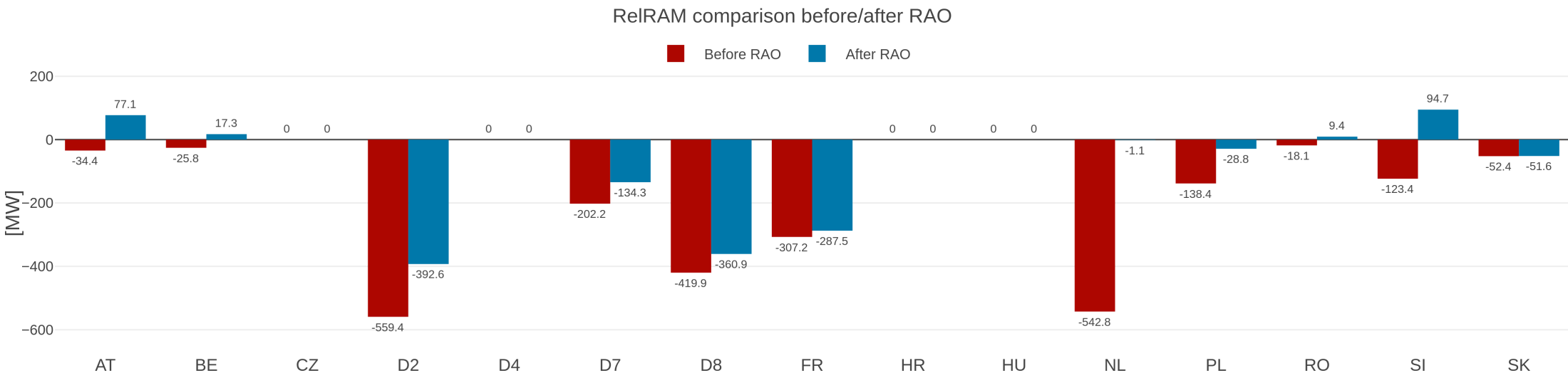
KPI 10: Average variation of relative RAM before and after NRAO



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
[HU-HU] Gonyu - Gyor [DIR]	745	1818	72.35%	42.50%	108.87%	0.3028	1.5599
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	745	776	45.98%	20.05%	74.60%	0.2202	0.5525
[CZ-SK] Nosovice - Varin [OPP] [CZ]	745	1260	103.00%	72.48%	127.68%	0.339	1.3313
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	745	1489	95.32%	71.51%	134.72%	0.255	1.1143
[SK-SK] V.Dur - Levice 1 [DIR]	742	742	46.28%	19.59%	60.36%	0.1826	0.7348
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	741	742	74.91%	29.96%	104.14%	0.2391	0.8361
[FR-D7] Vigy - Ens Dorf VIGY2 S [DIR] [D7]	736	736	42.41%	19.90%	109.93%	0.2435	0.5961
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	735	1466	84.70%	45.27%	106.67%	0.255	1.1143
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	729	817	80.62%	19.90%	135.90%	0.1606	0.6181
[NL-NL] MEE DRT2 [DIR] [NL]	723	723	50.76%	19.96%	140.40%	0.2864	0.6608
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	722	1832	62.45%	21.49%	140.30%	0.1755	0.5496
[HU-HU] Gonyu - Gyor [OPP]	719	1056	110.86%	67.39%	177.20%	0.2886	1.5599
[AT-HU] Zurndorf - Gyoer 439B [DIR] [AT]	717	1970	89.76%	62.48%	114.72%	0.359	1.4555
[D8-PL] Mikulowa PST1 [DIR] [PL]	716	716	52.86%	32.58%	85.91%	0.381	1.364
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	704	1204	124.25%	93.05%	167.11%	0.219	0.5457
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	702	702	66.29%	36.31%	90.30%	0.2751	1.1165
[CZ-SK] Nosovice - Varin [DIR] [CZ]	700	1078	75.62%	51.17%	101.26%	0.339	1.3313
[CZ-SK] Nosovice - Varin [OPP] [SK]	700	1408	101.80%	72.73%	128.52%	0.3533	1.3422
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	696	1243	55.36%	38.89%	86.94%	0.3697	1.2801
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	693	1093	109.19%	32.34%	209.75%	0.1755	0.5424

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-D7] Vigy - Enseldorf VIGY2 S [DIR] [D7]	354	354	782.96	35.38%	19.90%	77.44%	0.2344
[D8-PL] Mikulowa PST1 [DIR] [PL]	139	139	706	49.44%	36.36%	74.70%	0.3701
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	125	127	205.61	94.44%	71.42%	123.45%	0.2824
[NL-NL] MEE DRT2 [DIR] [NL]	121	121	447.87	27.77%	19.96%	74.71%	0.2555
[FR-FR] Creys - Genissiat 1 [DIR]	98	98	467.34	28.00%	19.98%	44.44%	0.173
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	72	72	510.43	59.21%	29.96%	83.00%	0.2338
[FR-FR] Creys - Saint-Vulbas 2 [OPP]	64	64	720.41	33.94%	23.31%	44.95%	0.1505
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	39	39	765.82	44.38%	23.25%	72.46%	0.1441
[CZ-SK] Nosovice - Varin [DIR] [SK]	37	37	276.2	59.97%	49.50%	72.73%	0.3952
[RO-RO] Resita - Timisoara c1 [DIR]	29	29	729.18	35.28%	20.35%	54.55%	0.1286
[RO-RO] Portile de Fier - Resita c1 [DIR]	22	22	877.2	29.47%	19.76%	55.46%	0.1212
[AT-D2] St. Peter 2 - Pleinting 258 [DIR] [AT]	22	23	529.9	48.29%	22.77%	81.20%	0.1605
[AT-AT] Strass - Thaur 273B [DIR]	22	22	534.4	44.93%	19.60%	79.03%	0.098
[RO-RO] Paroseni - Targu Jiu Nord [OPP]	21	21	940.08	28.03%	20.19%	45.19%	0.1443
[RO-RS] Portile de Fier - Djerdap [OPP] [RO]	19	19	197.72	46.39%	21.70%	82.70%	0.4204
[RO-RO] PST Arad 400/220 3 [DIR]	19	19	873.39	47.05%	22.50%	90.75%	0.2063
[D8-D8] Vierraden - Vierraden PST441 [DIR]	18	18	499.91	40.54%	33.33%	53.90%	0.2868
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	16	16	164.08	32.86%	19.80%	90.90%	0.2548
[D2-D2] Altheim - Sittling 219 [DIR]	15	15	765.61	55.23%	44.64%	74.45%	0.099
[SK-SK] V.Dur - Levice 1 [DIR]	15	15	456.28	38.37%	19.59%	46.25%	0.169

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	217
AC < 0 MW	121
AC = 0 MW	83
AC > 0 MW	13

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-1903.32	3489.36
Min.	-9244.00	0.00
Max.	0.00	12481.00

