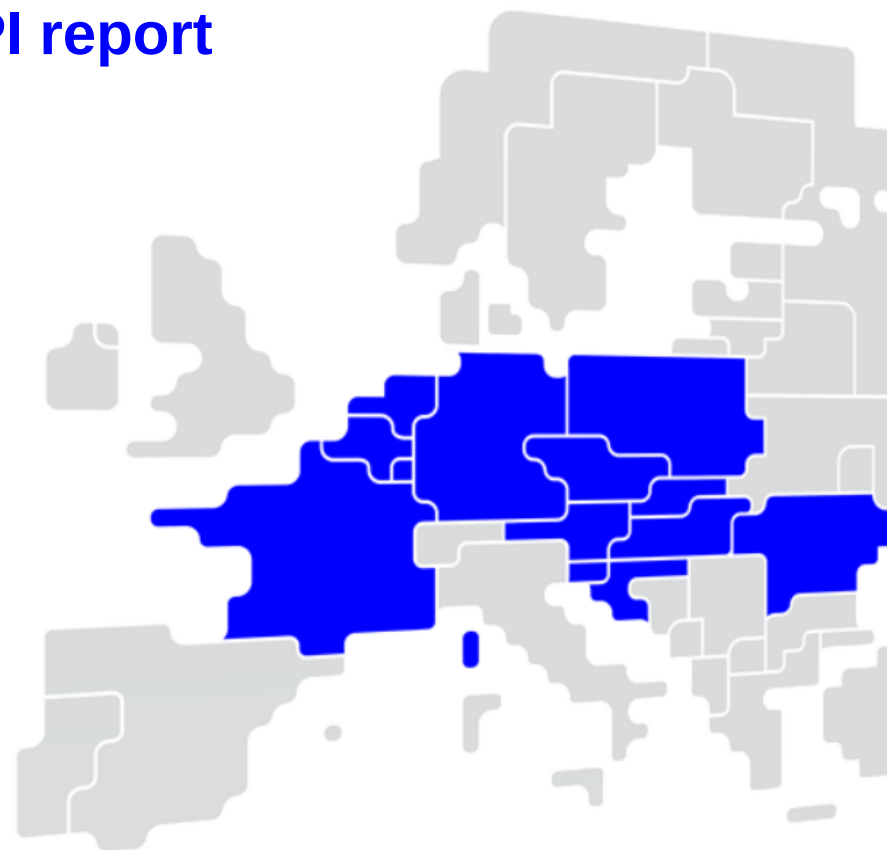




Core FB MC Operational KPI report

November 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

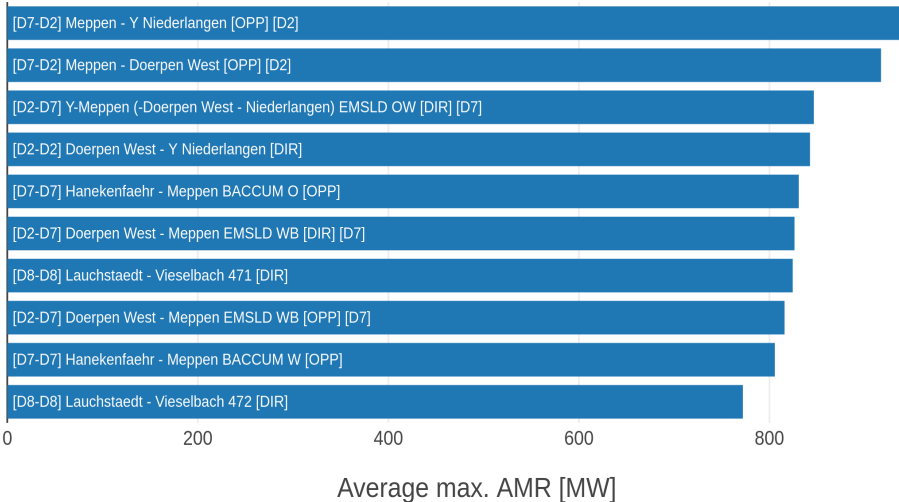
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

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]	936.37	46.81%	32.05%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	917.15	45.84%	31.39%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	846.62	35.93%	23.41%
[D2-D2] Doerpen West - Y Niederlangen [DIR]	842.60	42.14%	28.09%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	830.83	34.67%	21.76%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	826.32	35.07%	22.70%
[D8-D8] Lauchstaedt - Vieselbach 471 [DIR]	824.43	33.06%	18.18%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	815.86	34.63%	22.27%
[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	805.70	33.78%	20.93%
[D8-D8] Lauchstaedt - Vieselbach 472 [DIR]	772.12	30.96%	18.53%

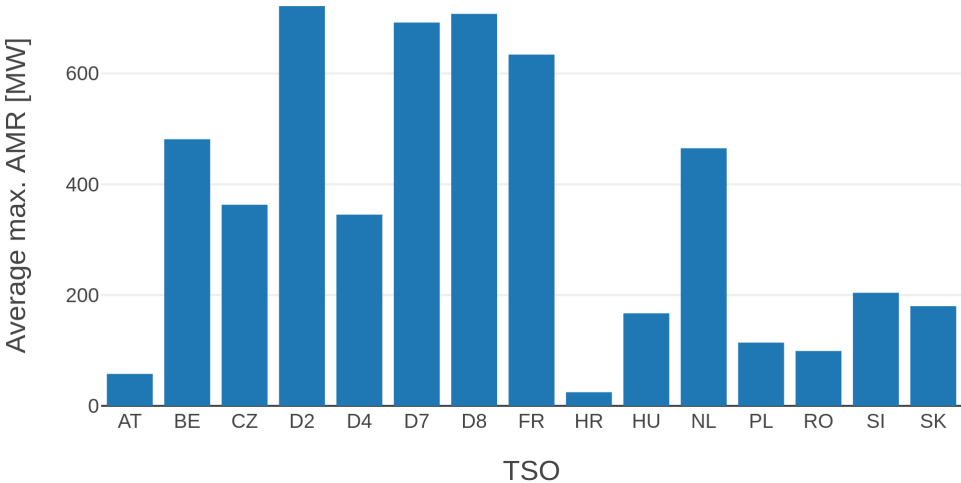


KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	57.64
BE	481.35
CZ	362.96
D2	721.60
D4	345.18
D7	692.10
D8	707.59
FR	634.04
HR	24.59
HU	167.06

TSO	Average maximum AMR per TSO
NL	465.08
PL	114.19
RO	99.10
SI	204.23
SK	179.84



KPI 3: Share of MTUs with intervention per TSO



Total BDs

30

Total MTUs

720

MTUs without IVA

180

Share of distinct
MTUs without IVA

25%

MTUs with IVA

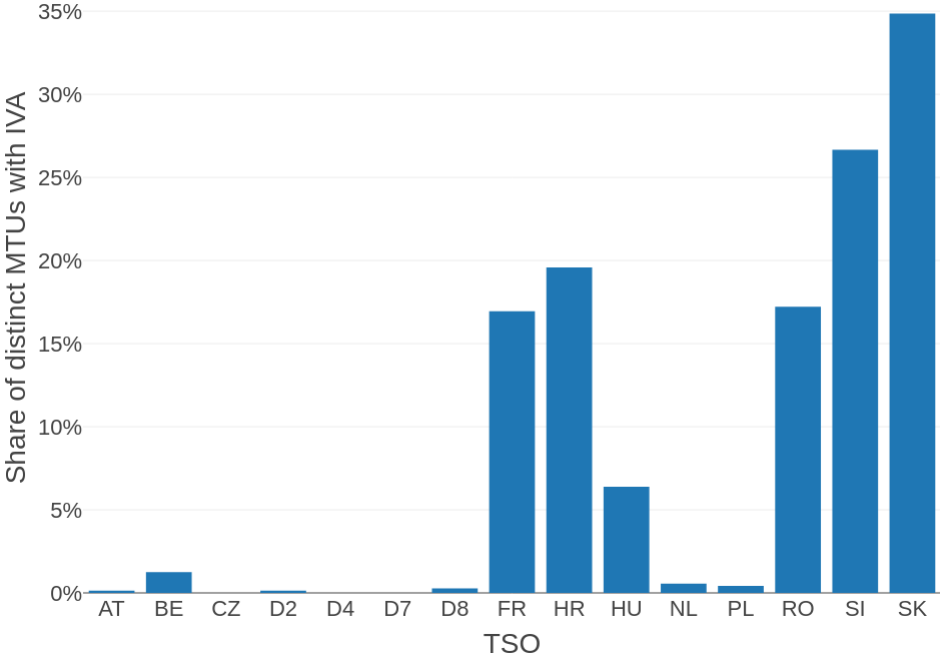
540

Share of distinct
MTUs with IVA

75%

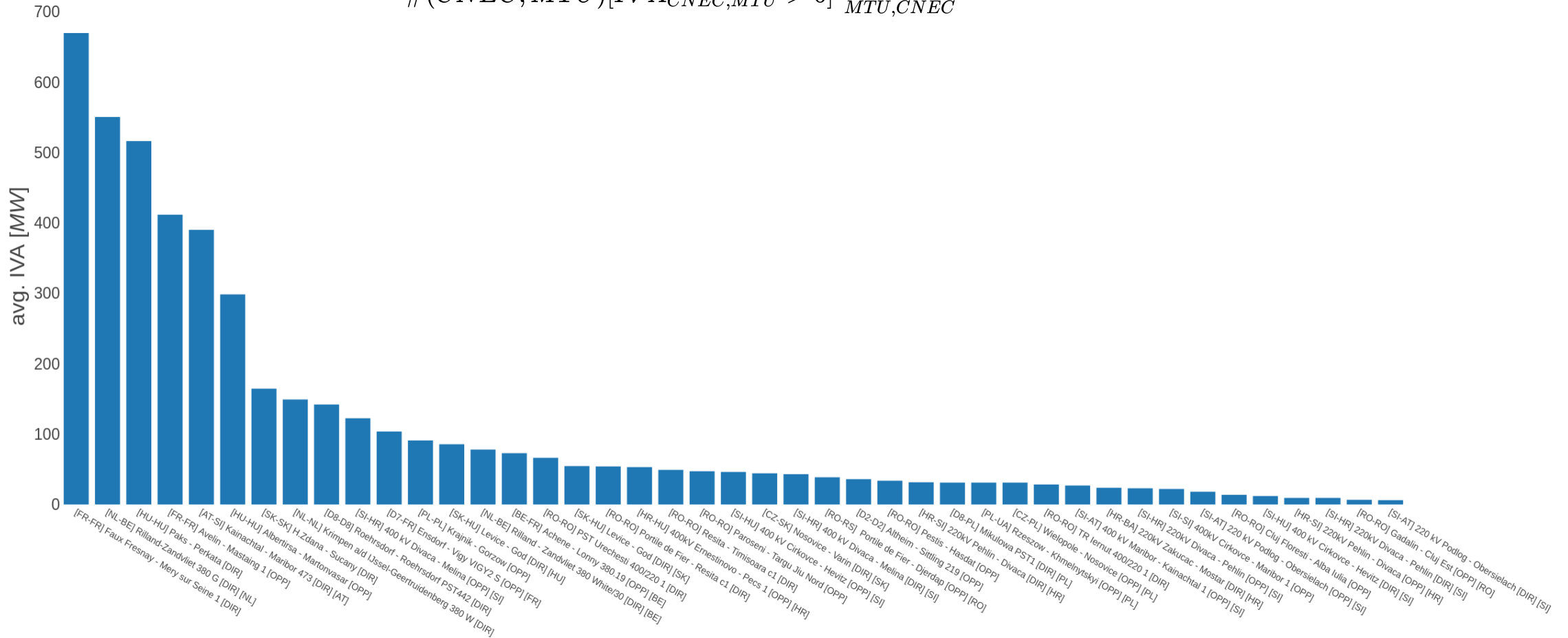
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.14%	1
BE	1.25%	9
CZ	0.00%	0
D2	0.14%	1
D4	0.00%	0
D7	0.00%	0
D8	0.28%	2
FR	16.94%	122
HR	19.58%	141
HU	6.39%	46

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
NL	0.56%	4
PL	0.42%	3
RO	17.22%	124
SI	26.67%	192
SK	34.86%	251

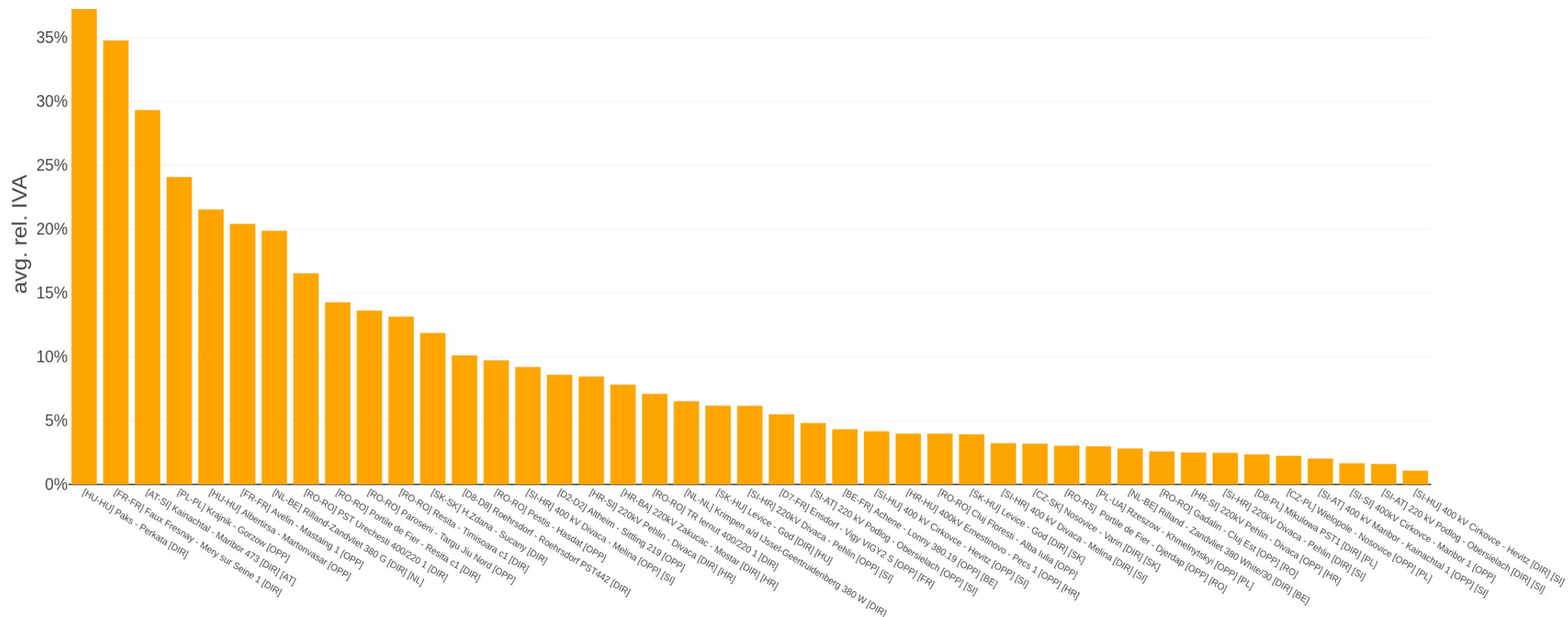


A map of Europe with the countries of Central Europe highlighted in green. These countries include Poland, Czech Republic, Slovakia, Austria, Hungary, and parts of Germany, France, and the Benelux region.

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



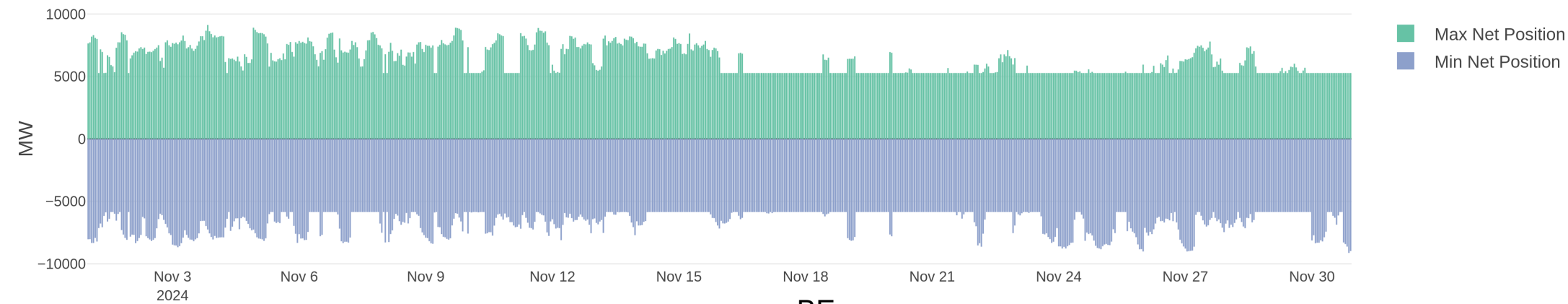
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{maxCNEC, MTU}[IVA_{CNEC, MTU} > 0]}$$



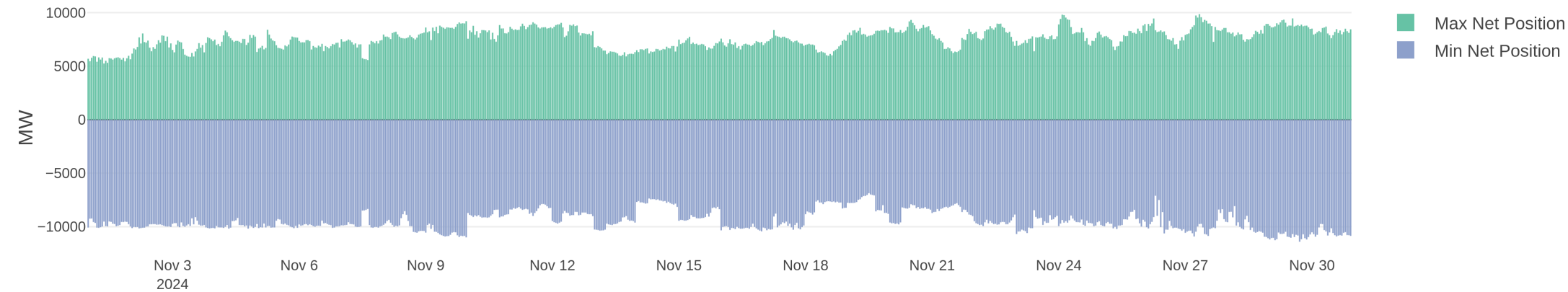
KPI 5: Min & max net positions per BZ hub



AT



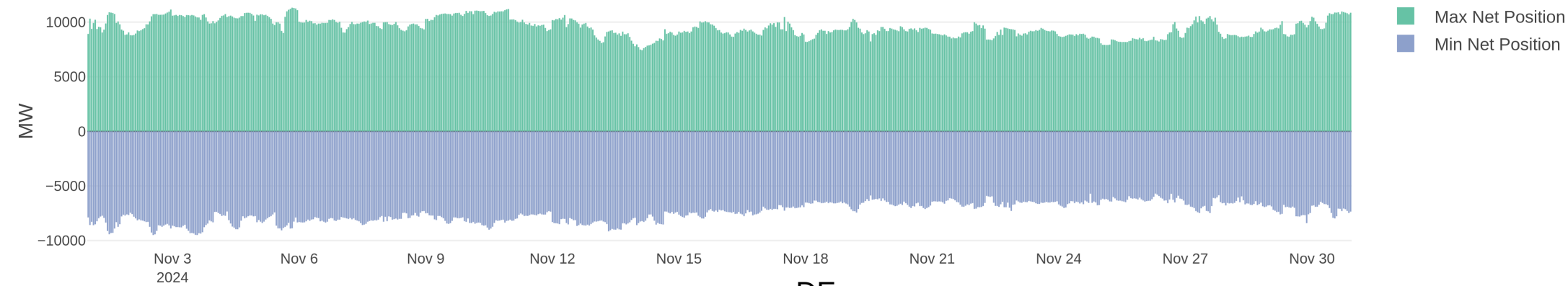
BE



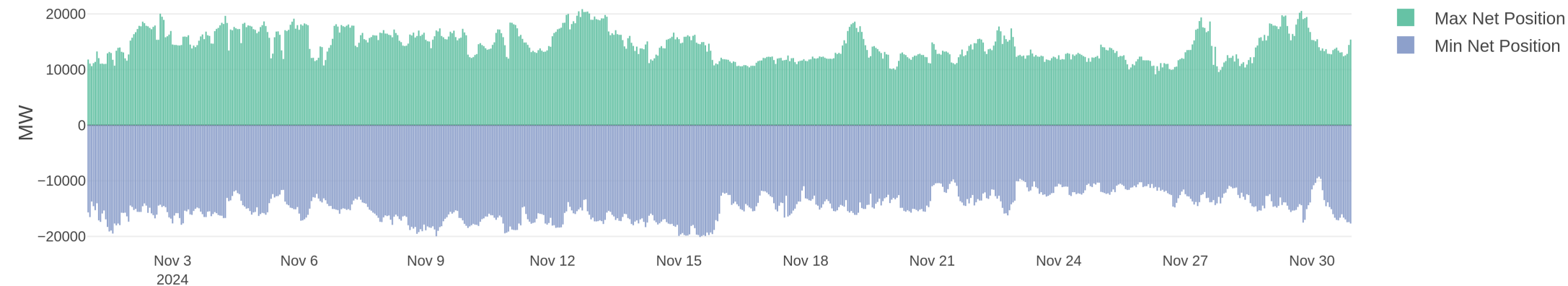
KPI 5: Min & max net positions per BZ hub



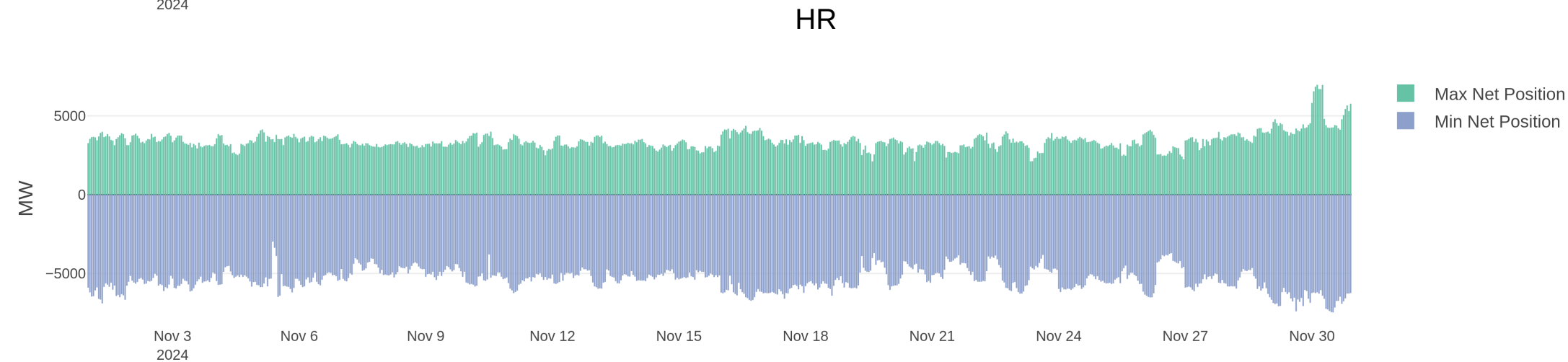
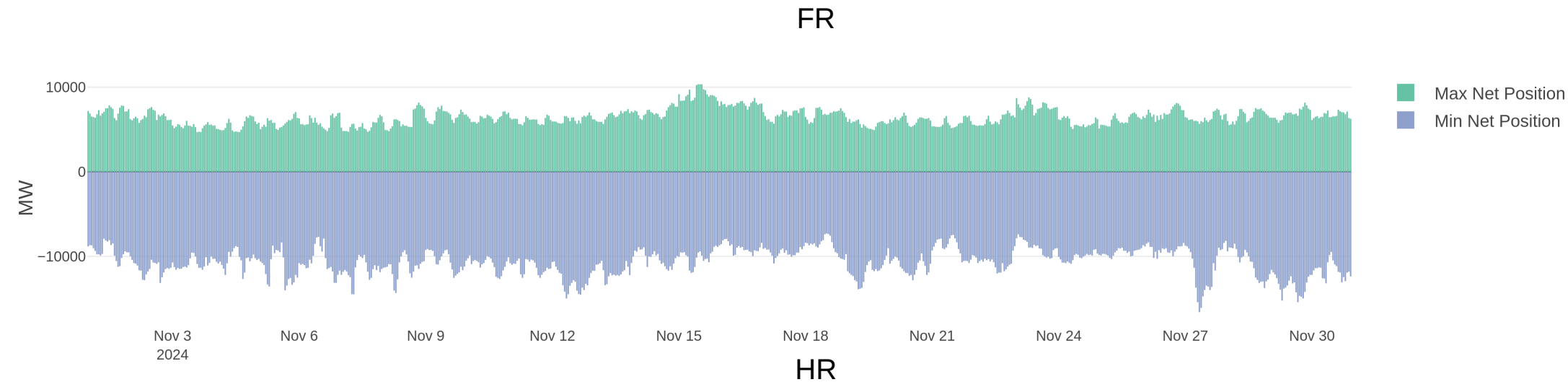
CZ



DE



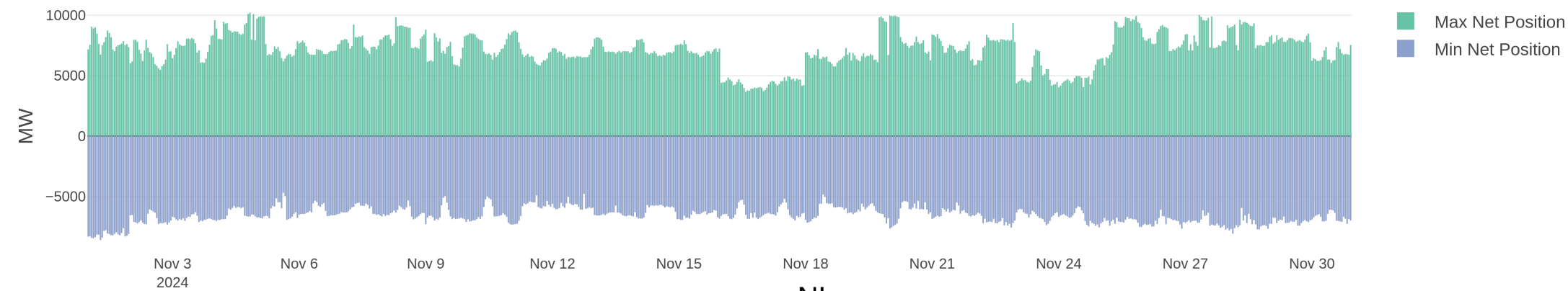
KPI 5: Min & max net positions per BZ hub



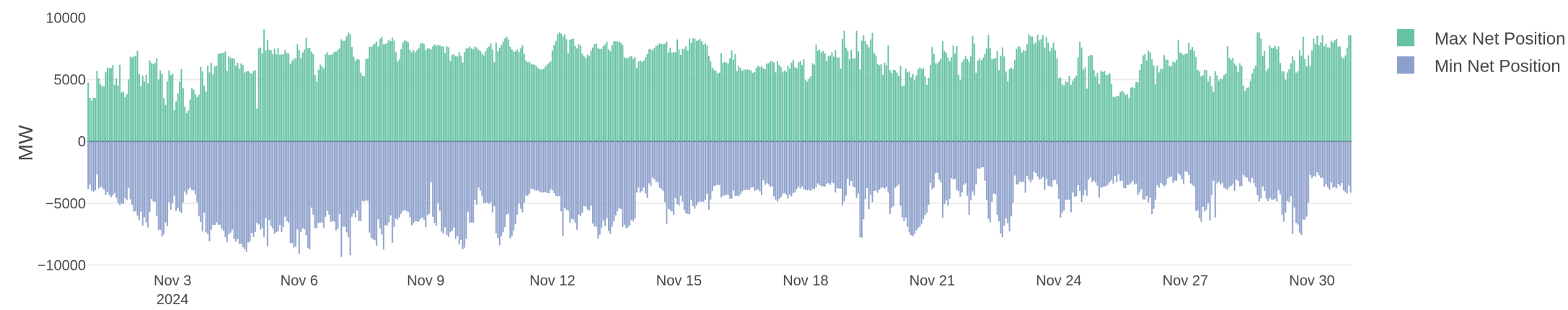
KPI 5: Min & max net positions per BZ hub



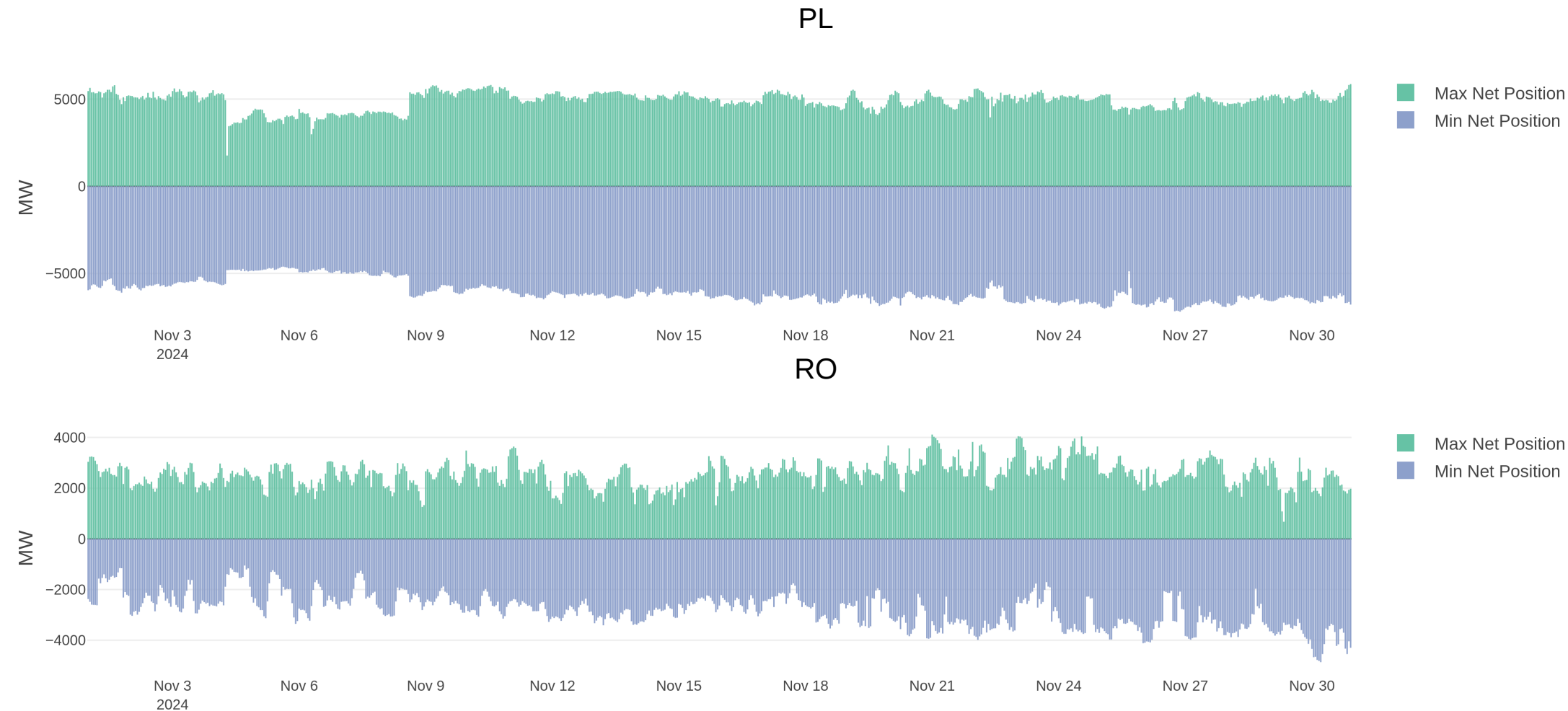
HU



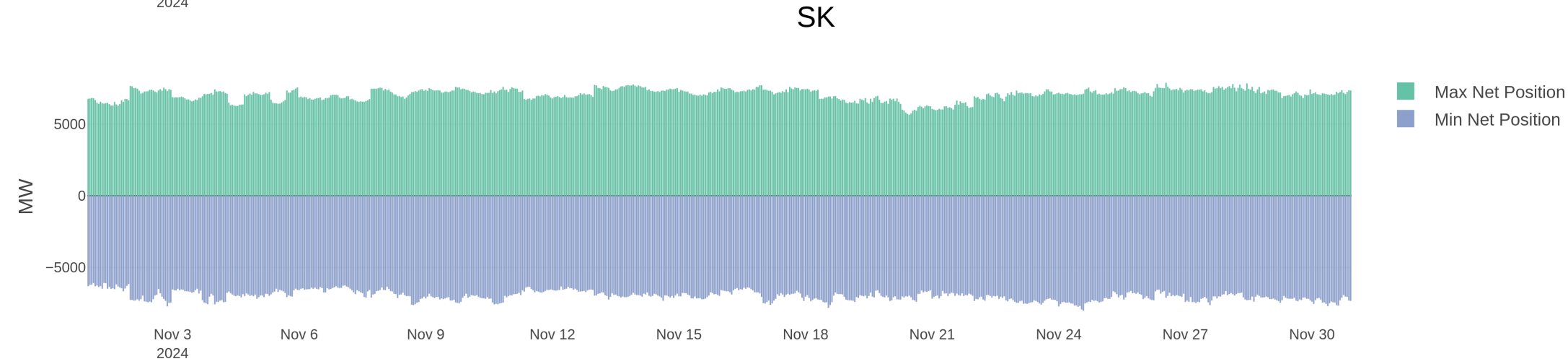
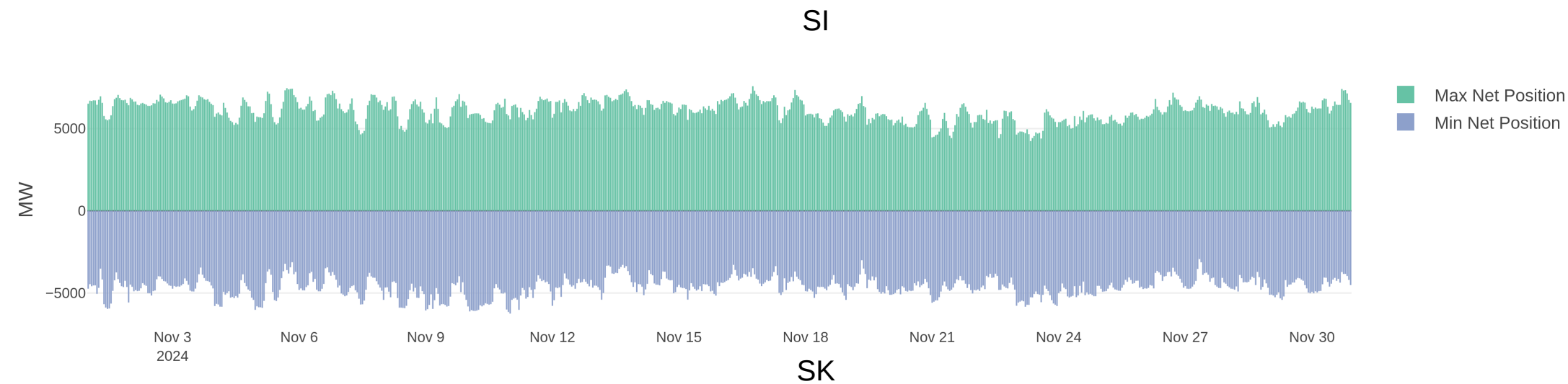
NL



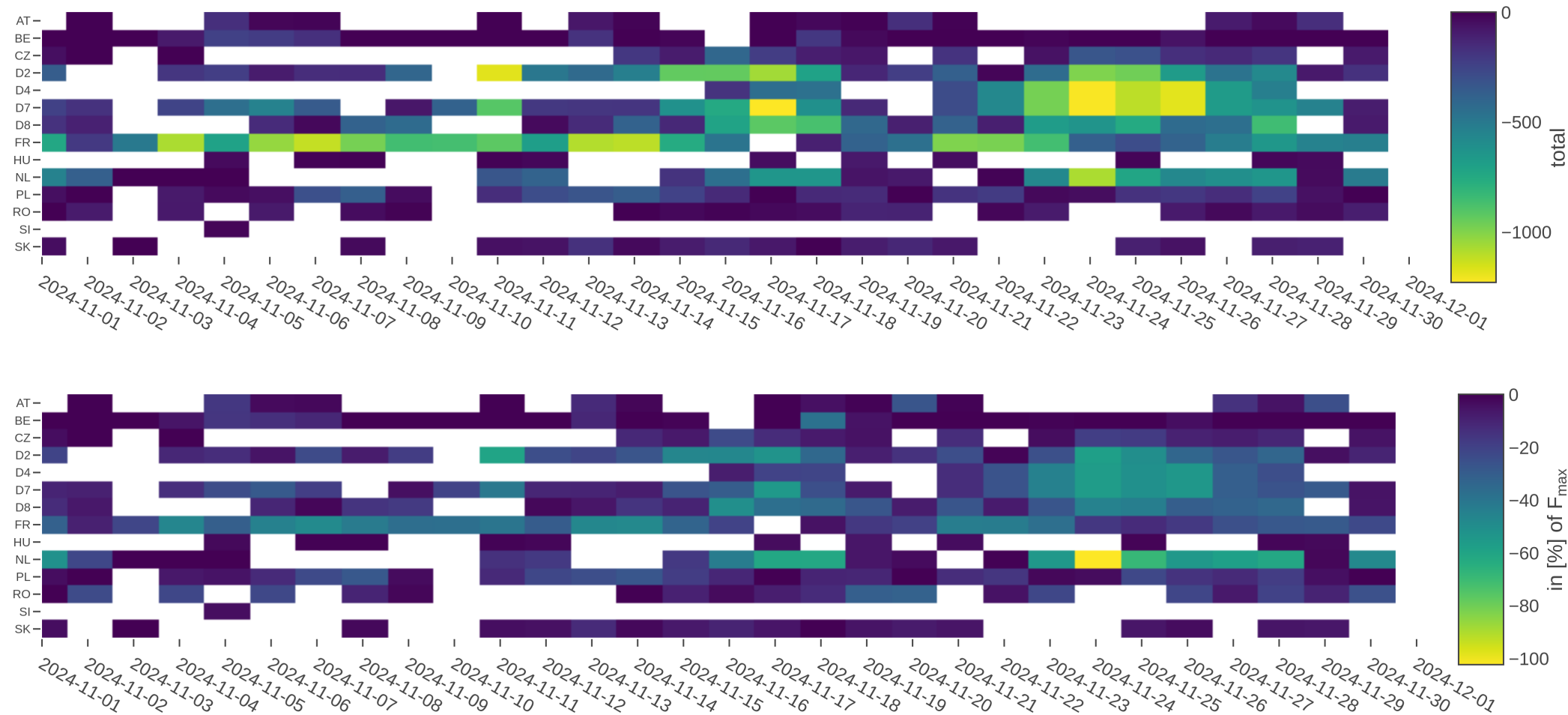
KPI 5: Min & max net positions per BZ hub



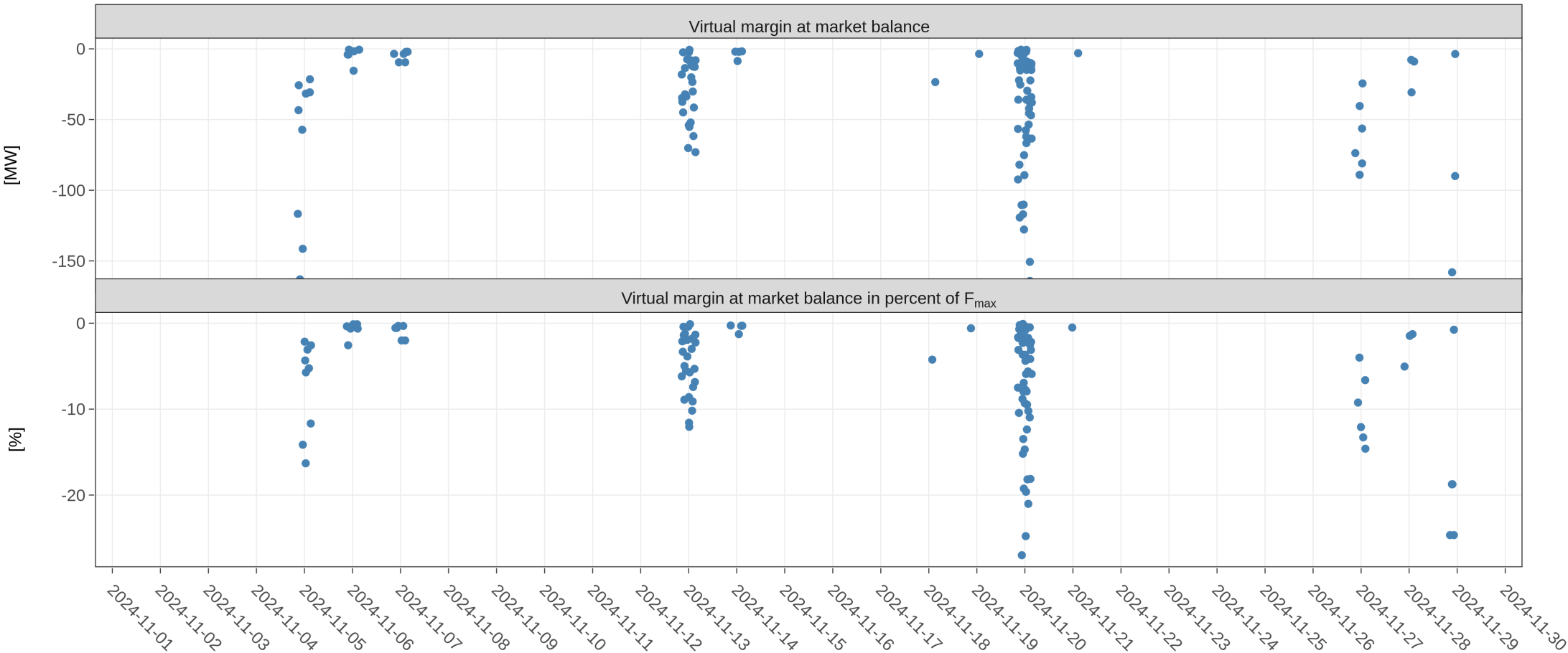
KPI 5: Min & max net positions per BZ hub



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

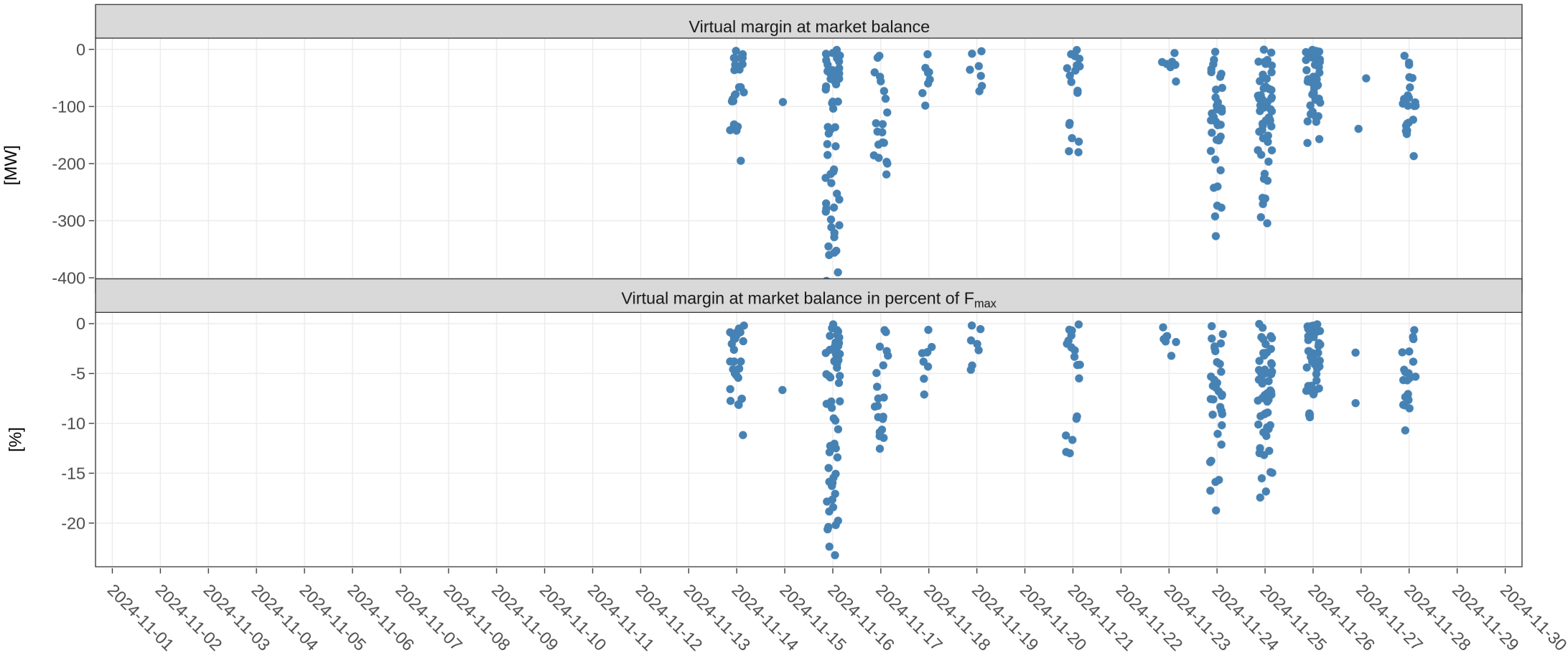


KPI 6b: Virtual margins at market balance AT

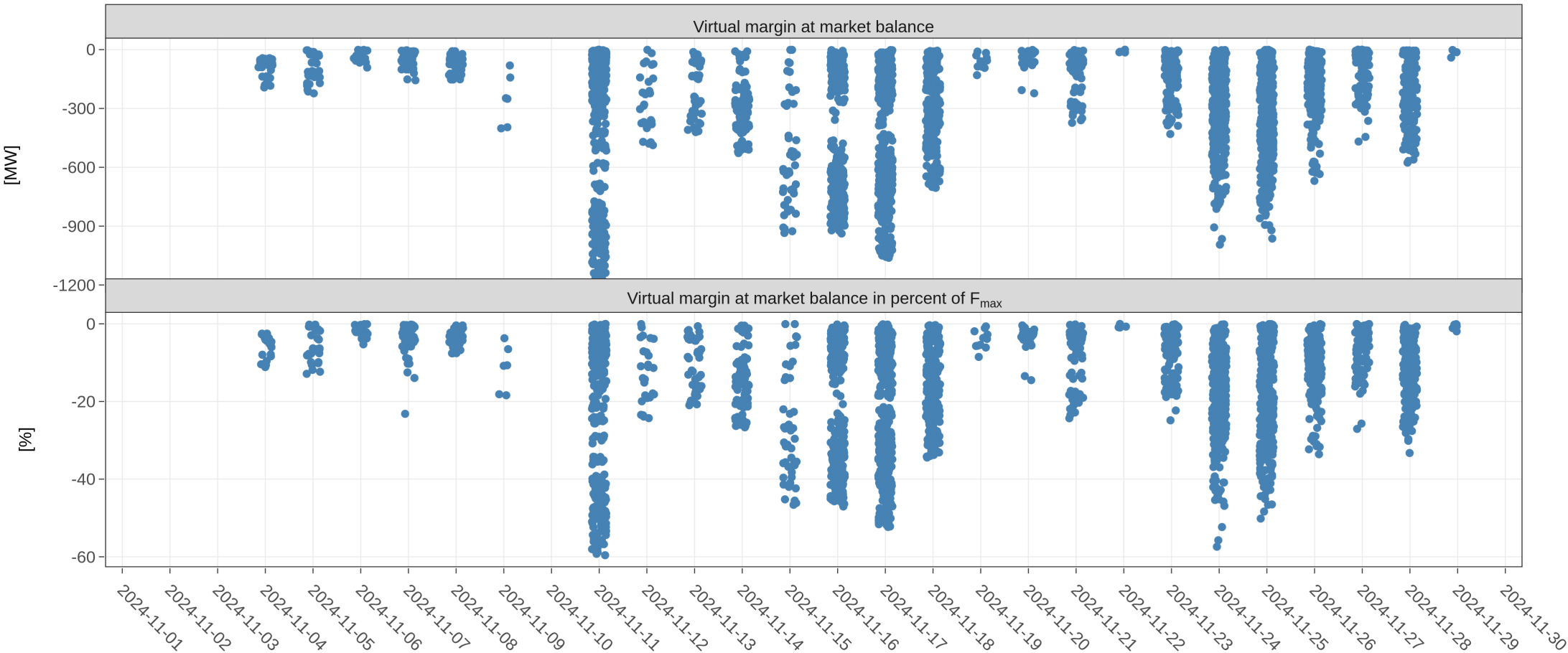




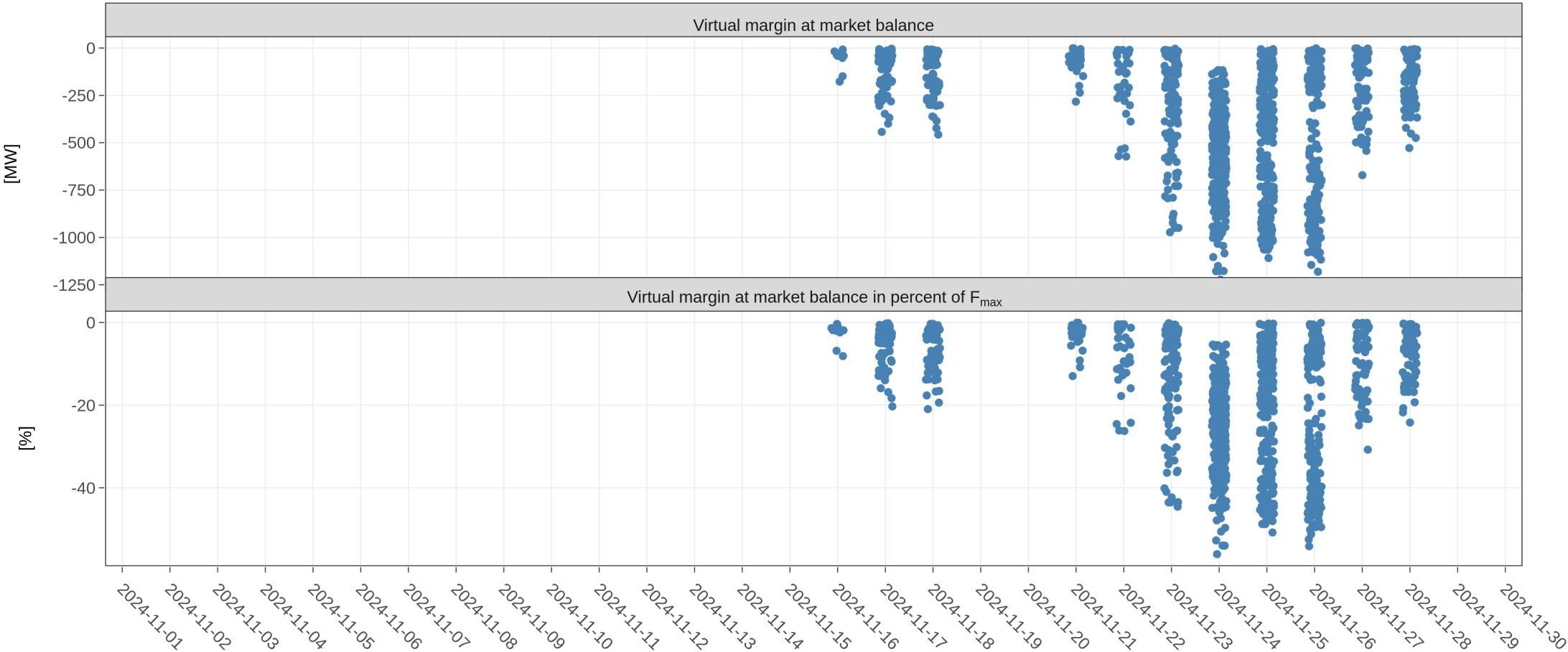
KPI 6b: Virtual margins at market balance CZ



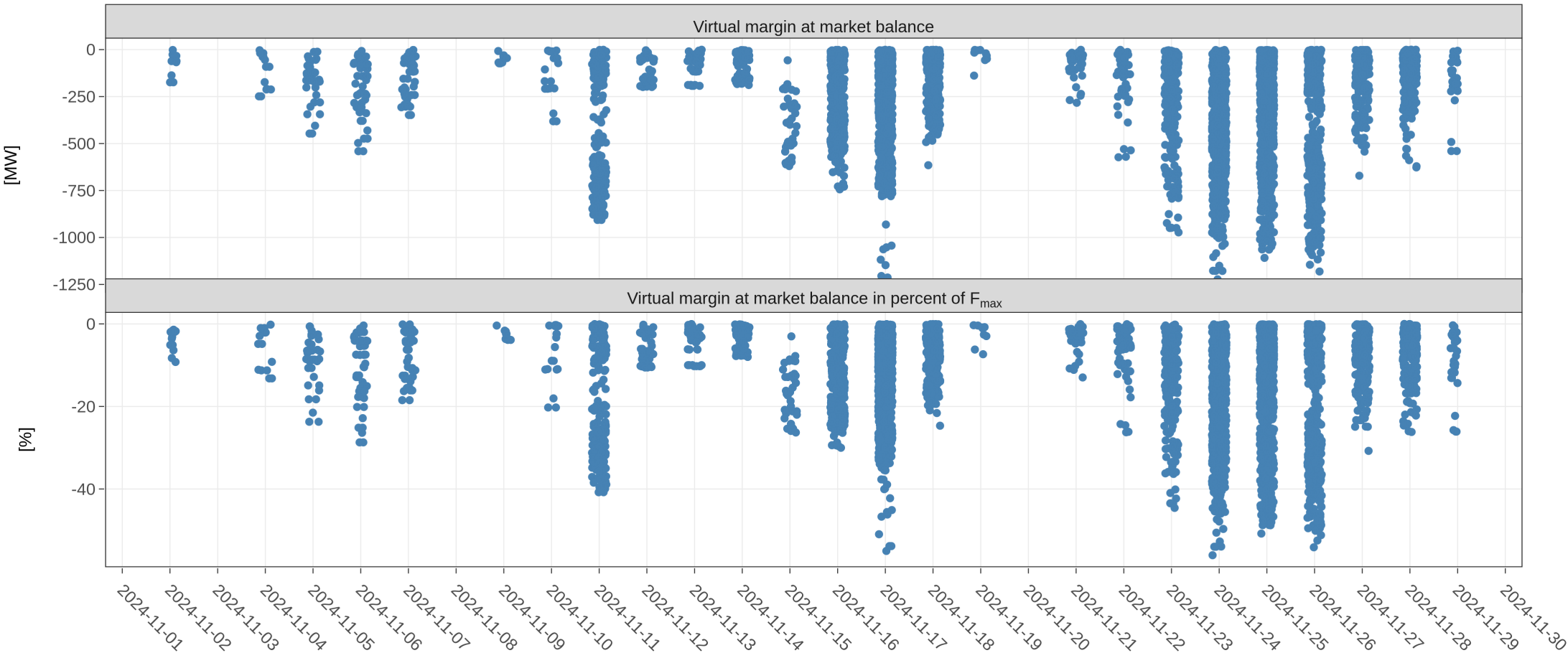
KPI 6b: Virtual margins at market balance D2



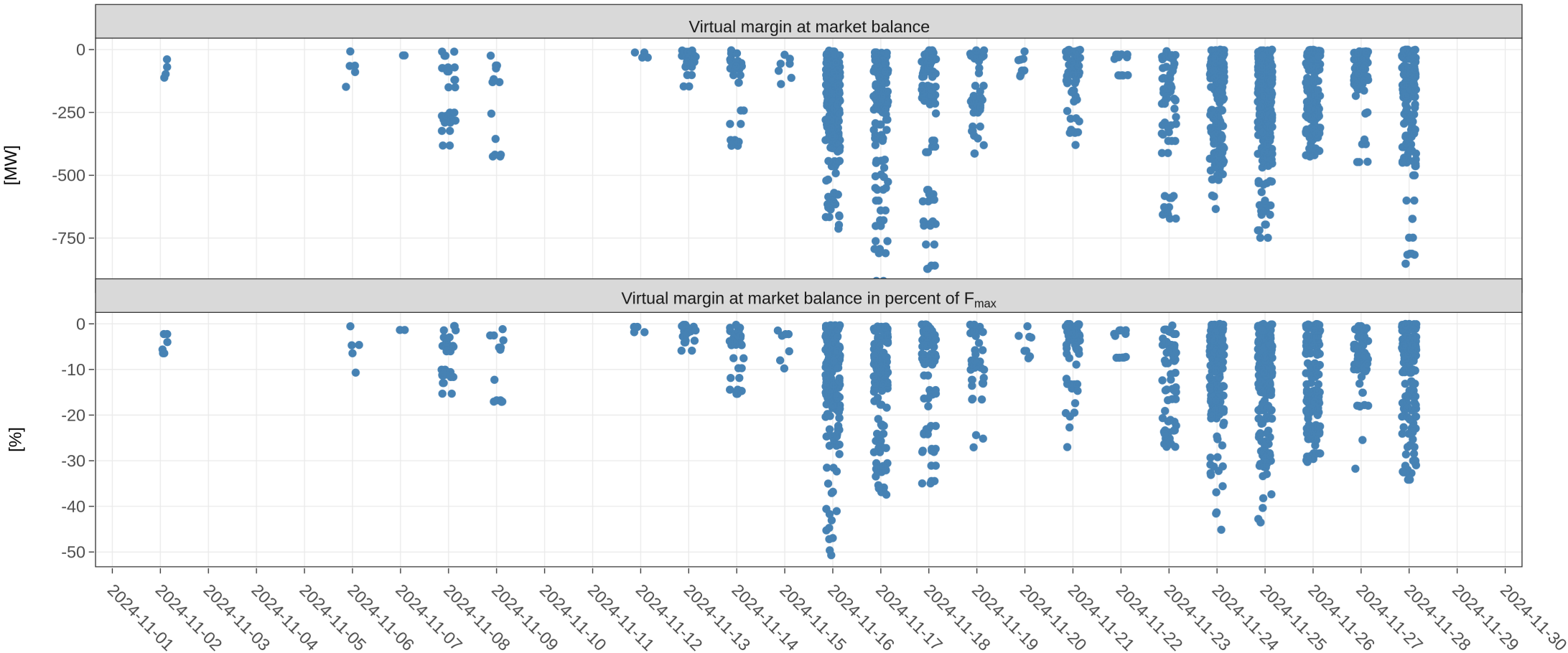
KPI 6b: Virtual margins at market balance D4



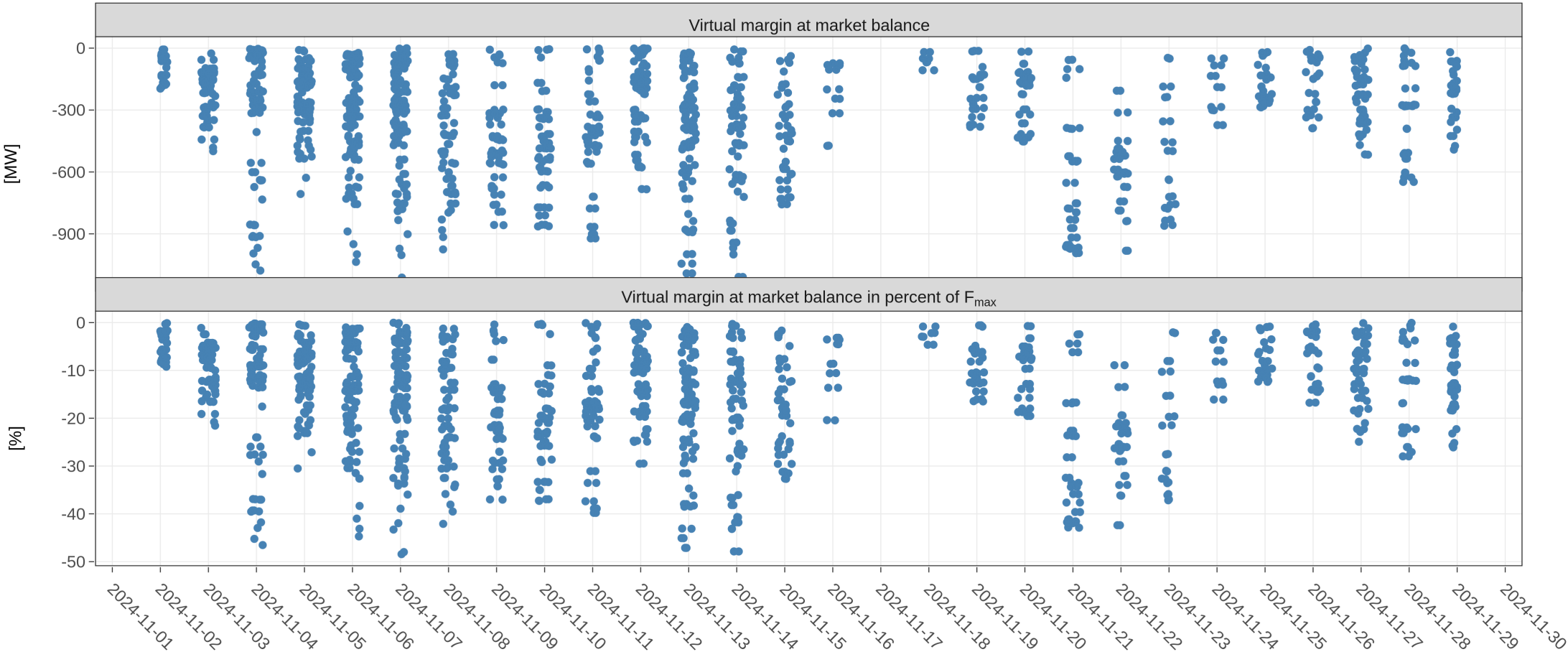
KPI 6b: Virtual margins at market balance D7



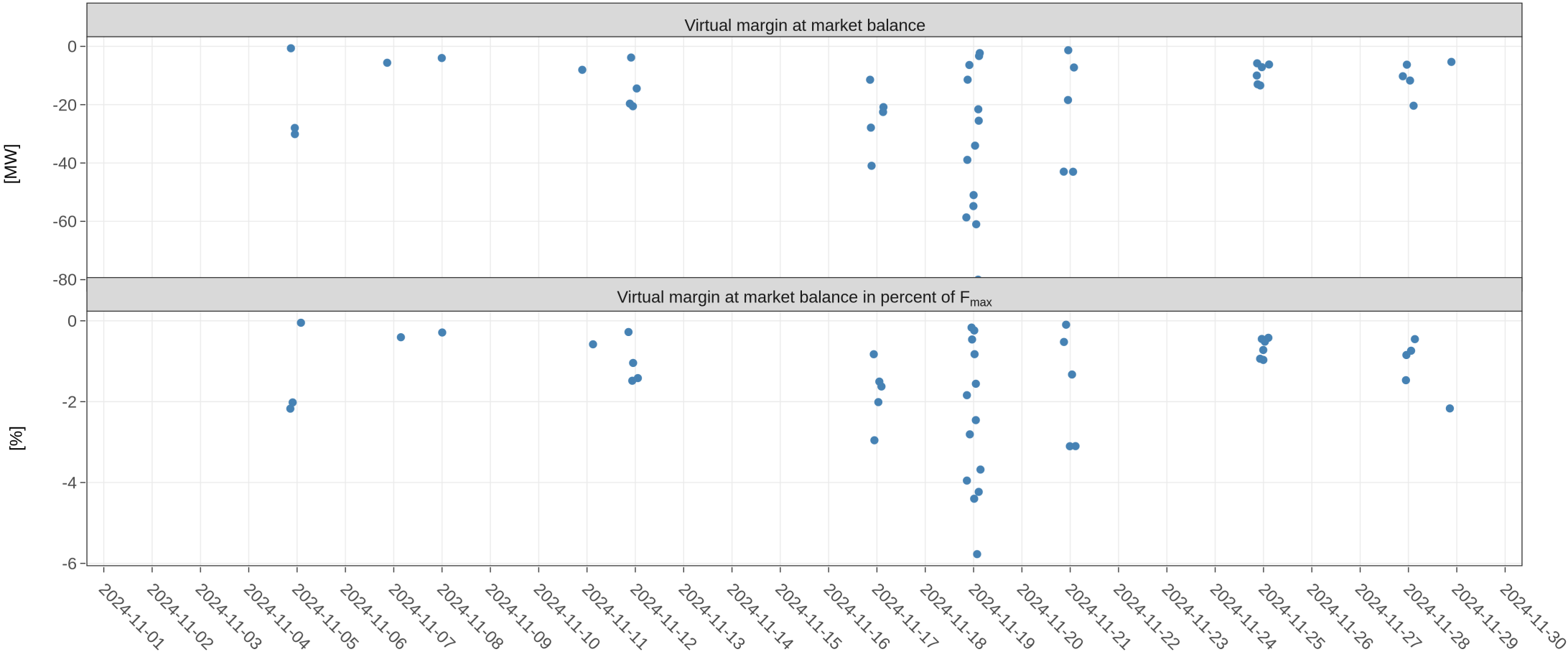
KPI 6b: Virtual margins at market balance D8



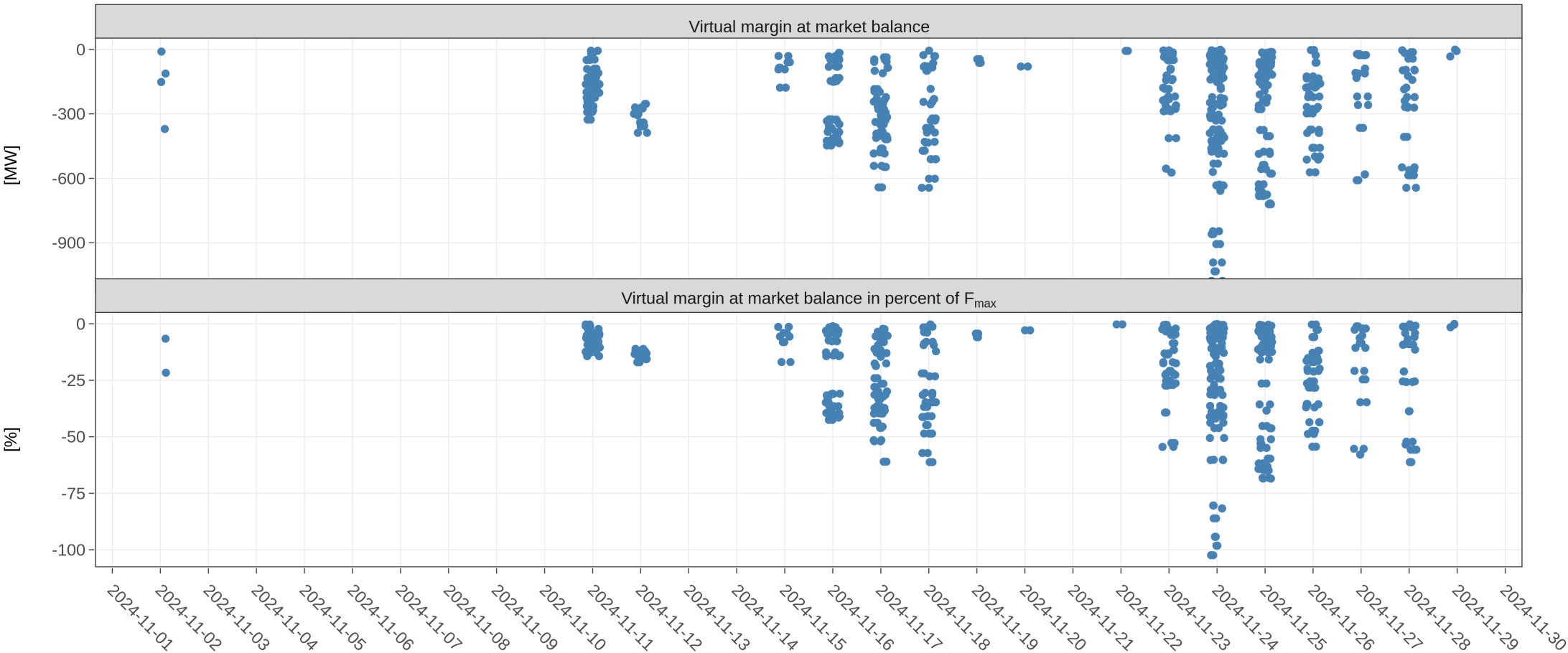
KPI 6b: Virtual margins at market balance FR



KPI 6b: Virtual margins at market balance HU



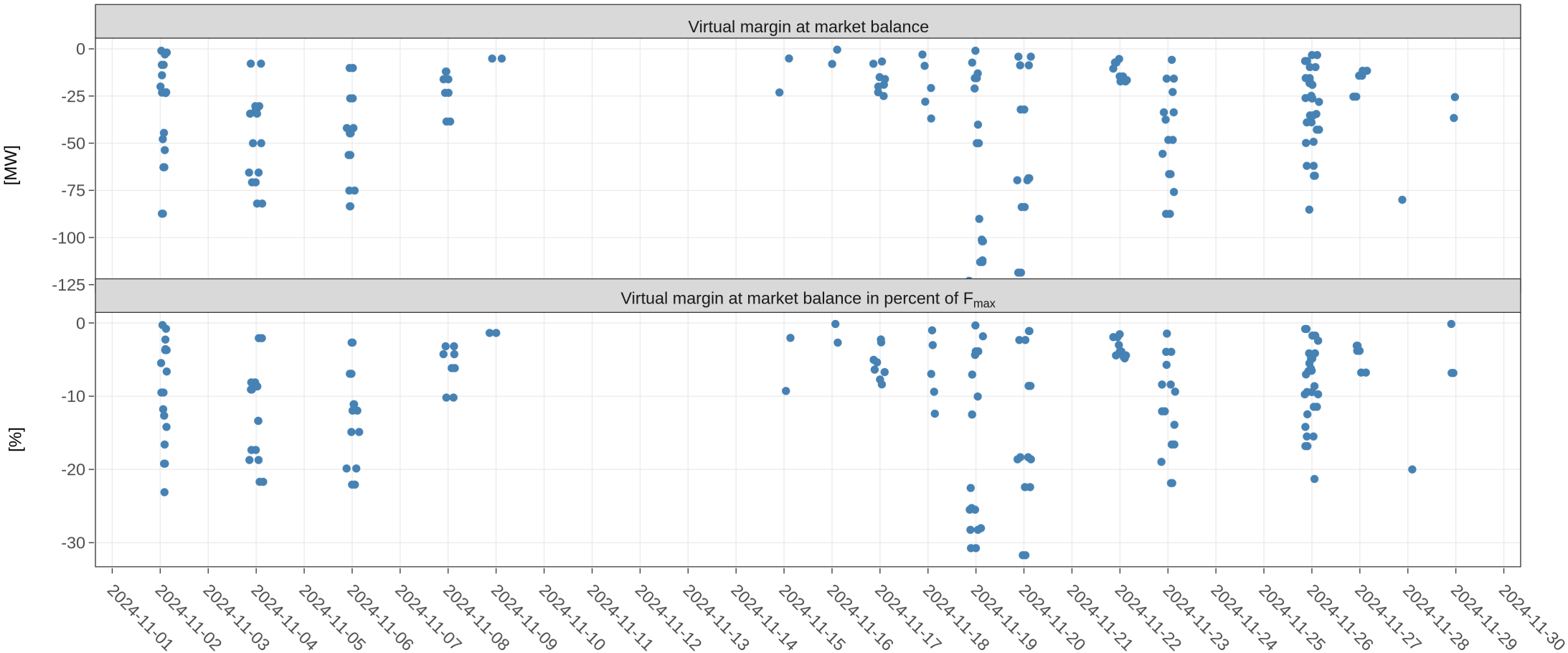
KPI 6b: Virtual margins at market balance NL



KPI 6b: Virtual margins at market balance PL



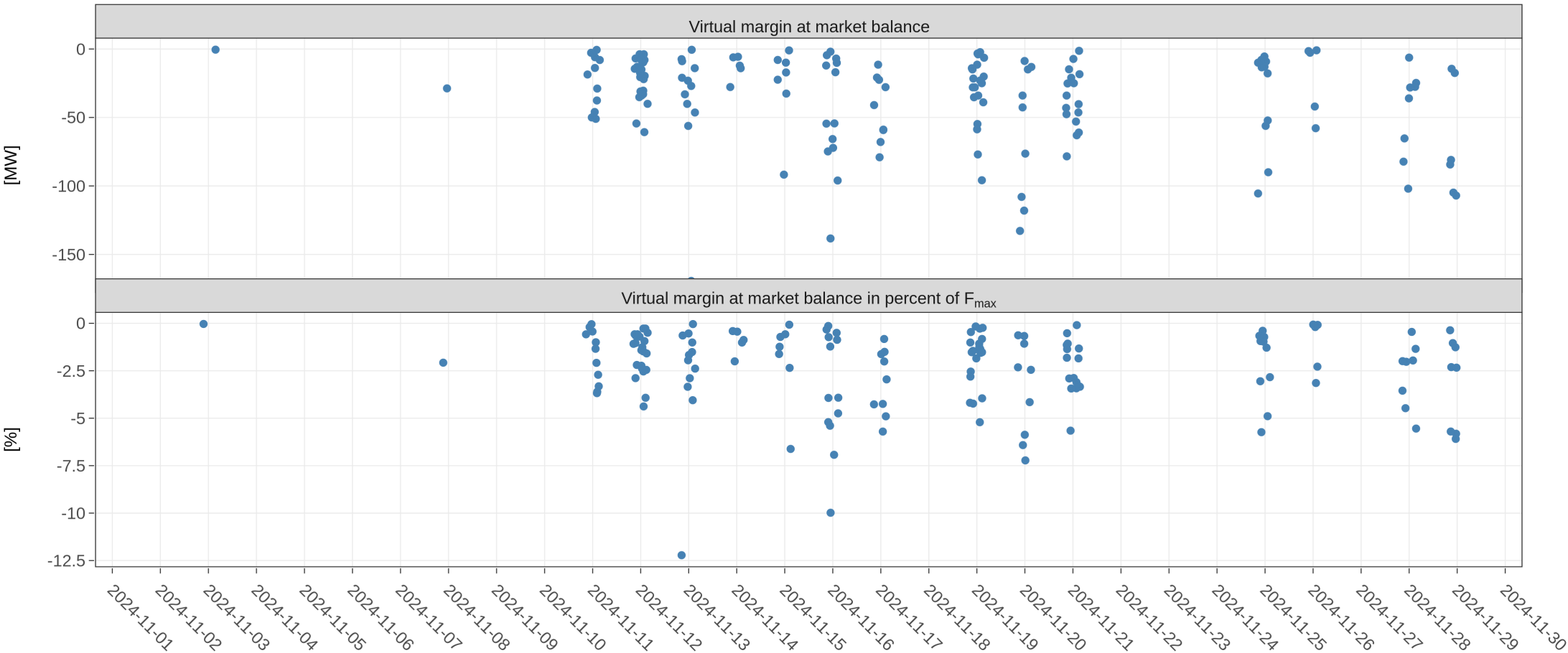
KPI 6b: Virtual margins at market balance RO



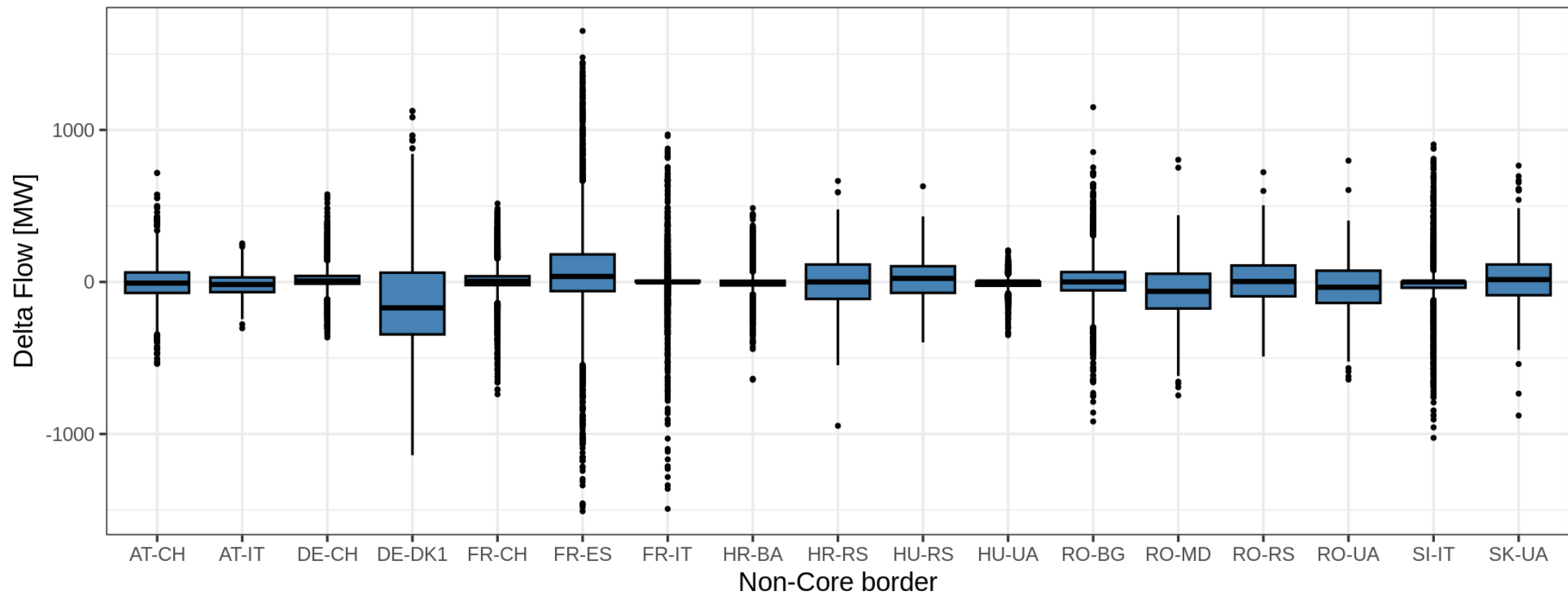
KPI 6b: Virtual margins at market balance SI



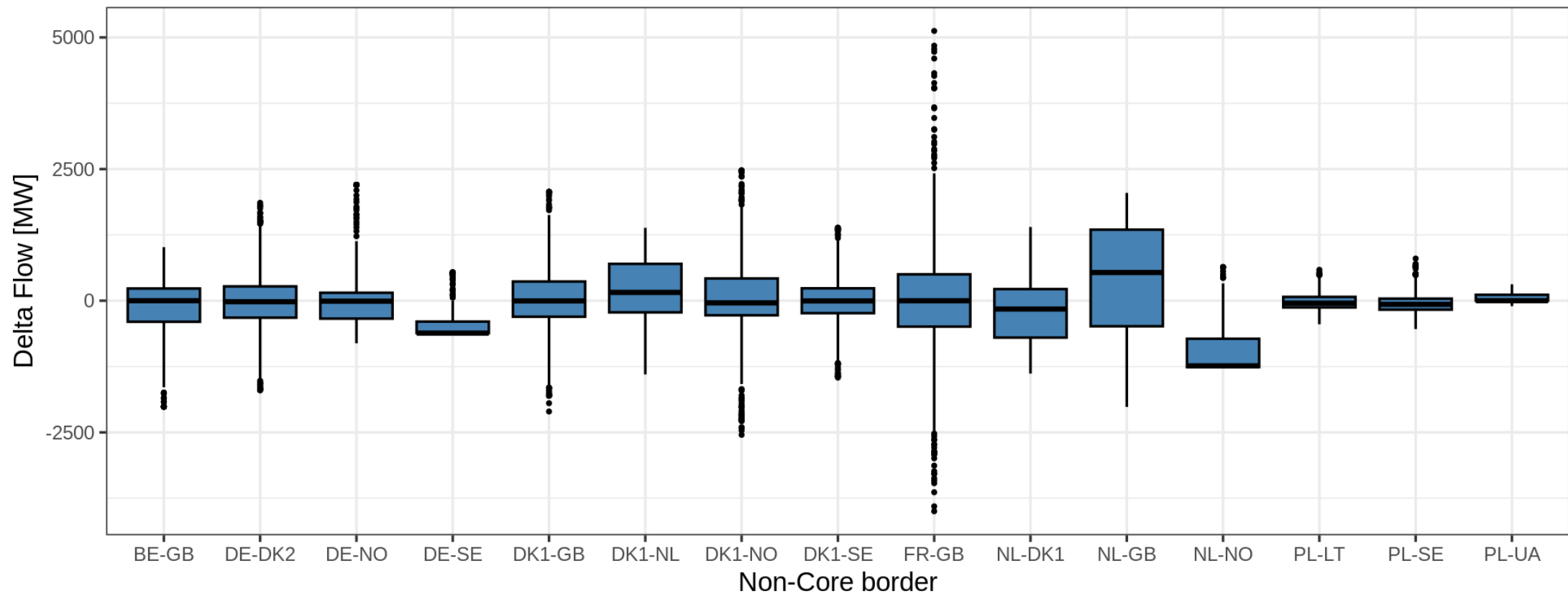
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



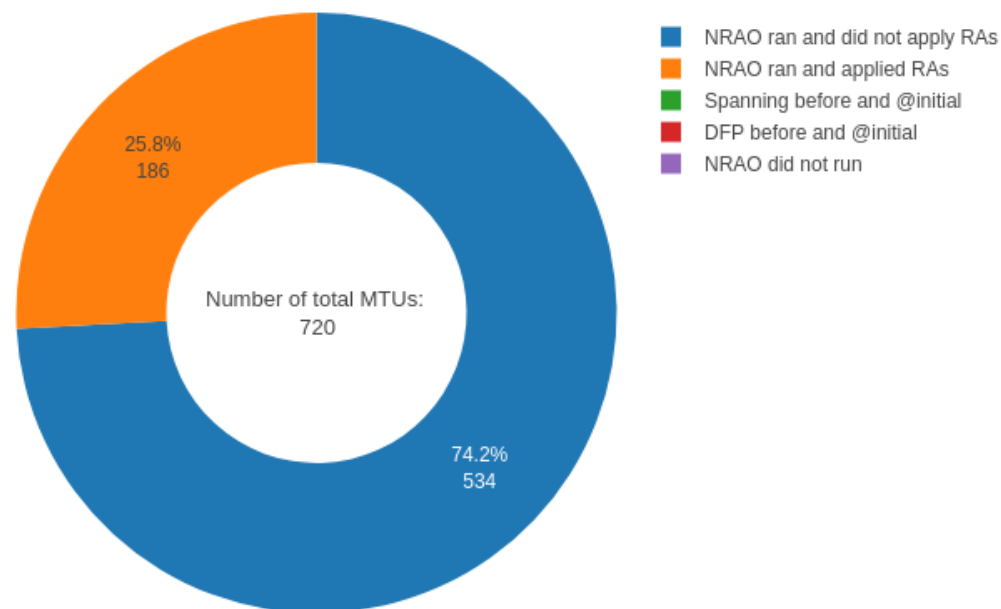
KPI 8: NRAO – Applied Remedial Action



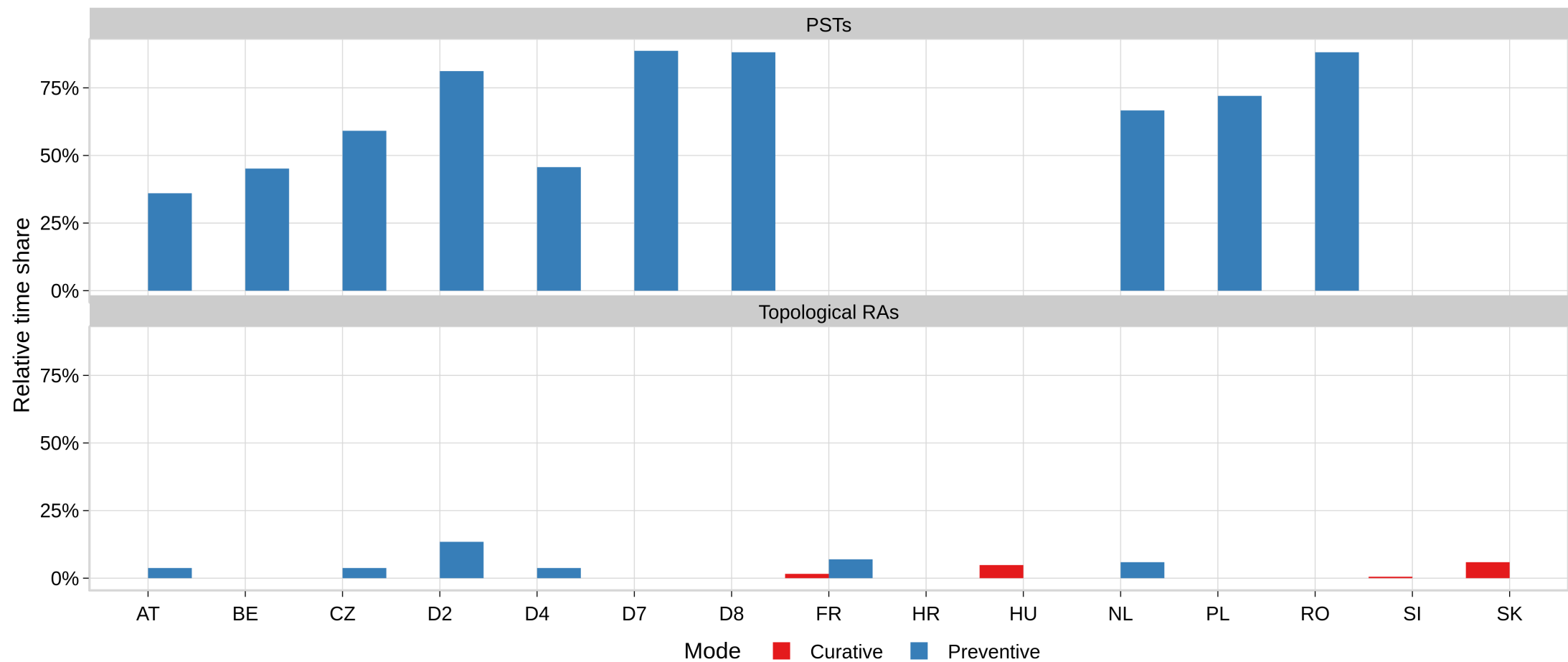
In the following plots, the relative time share relates to the hours labeled 'NRAO Ran and Applied RAs'.

Total MTUs: 720 hours

Category	Hours (%)
NRAO ran and did not apply RAs	534 hours (74.2%)
NRAO ran and applied RAs	186 hours (25.8%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

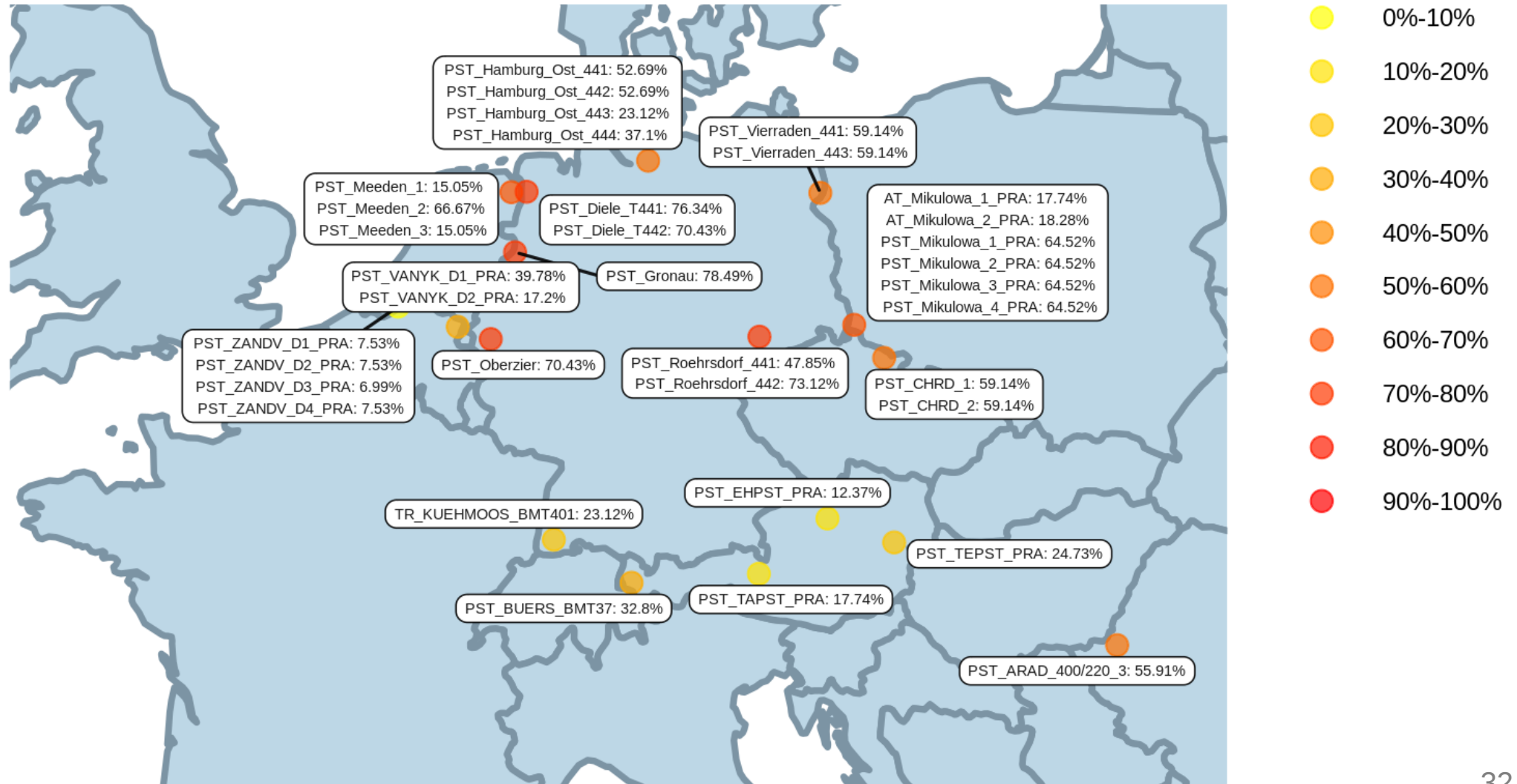


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



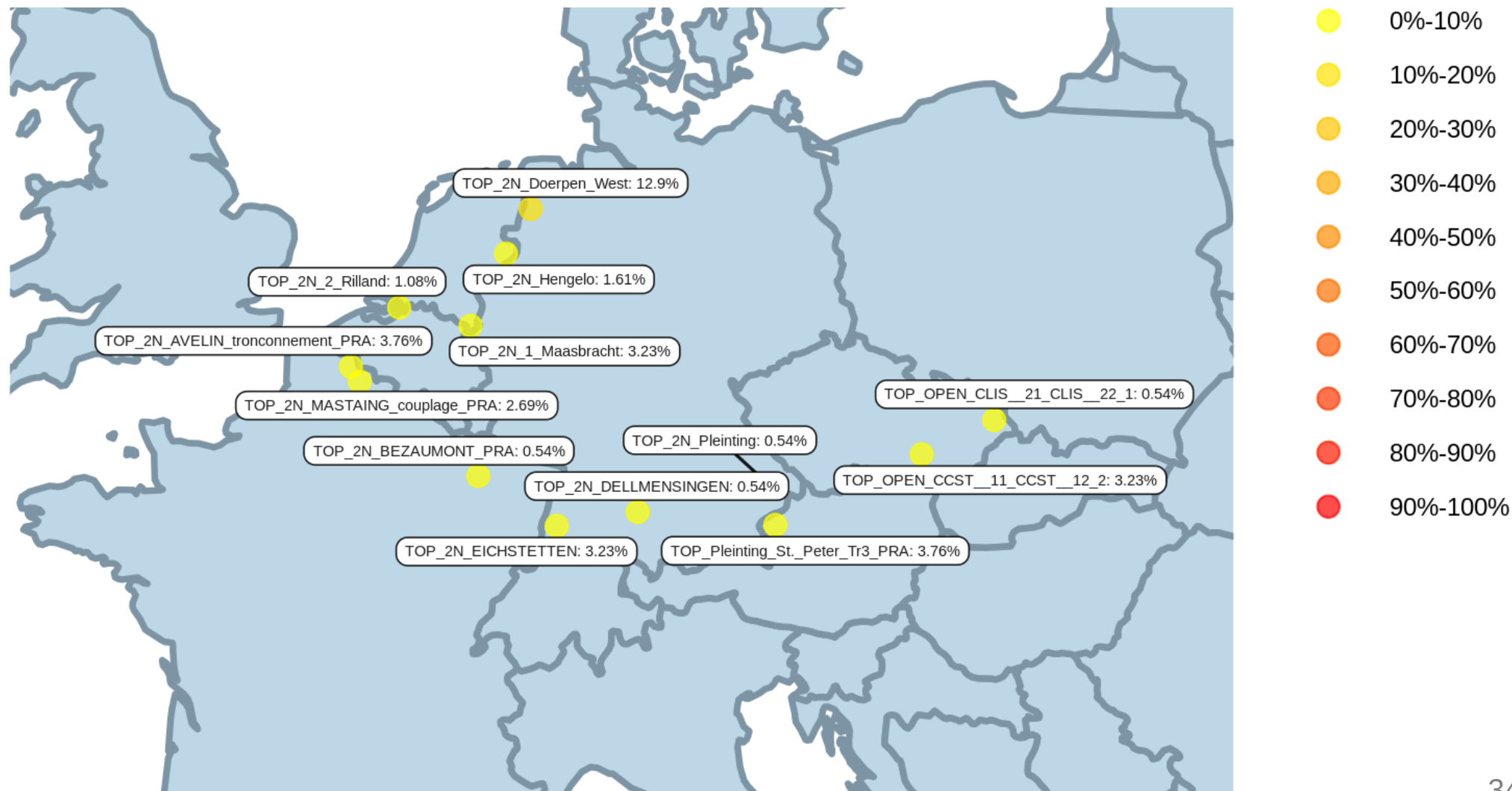
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



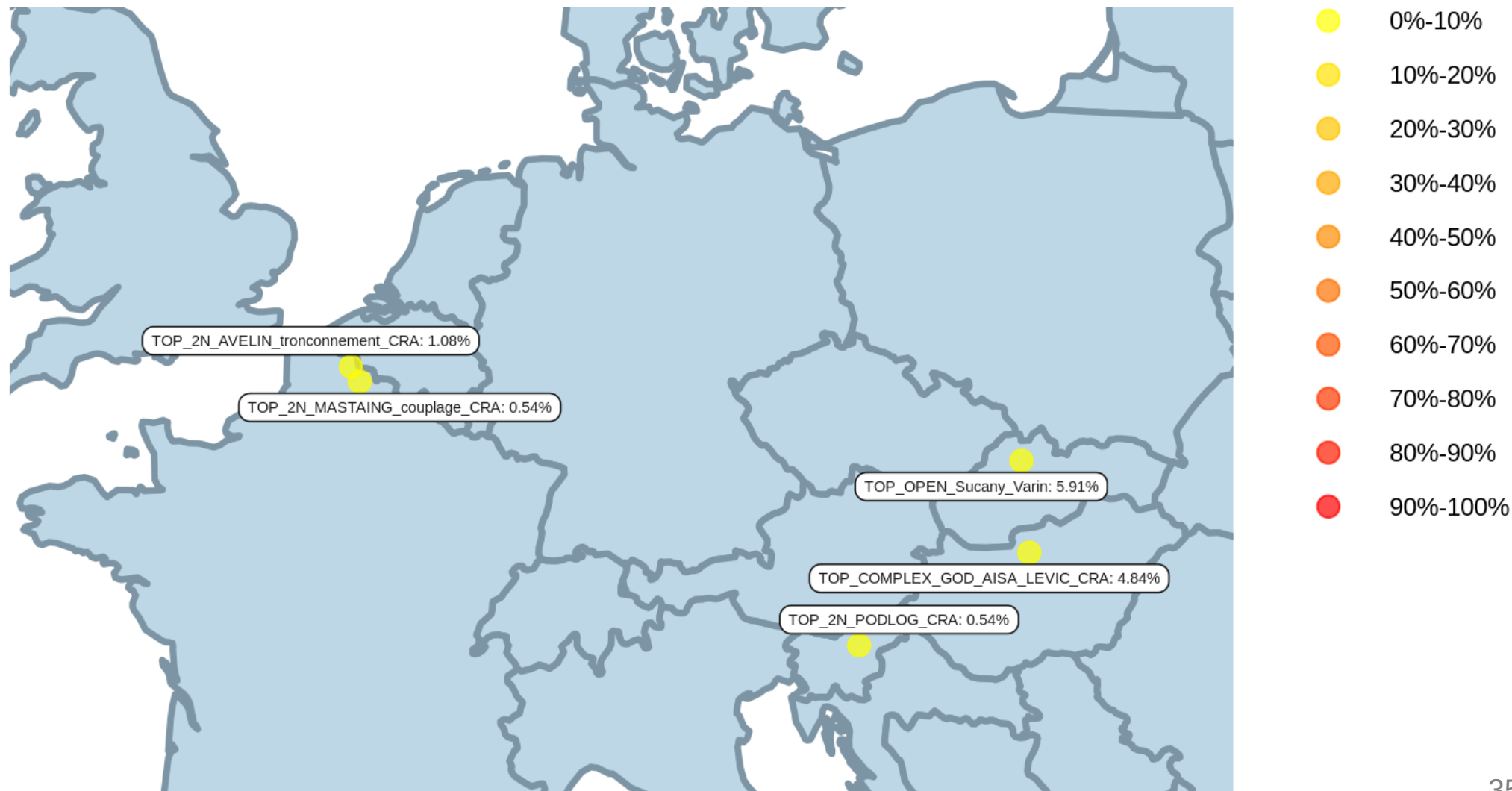
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

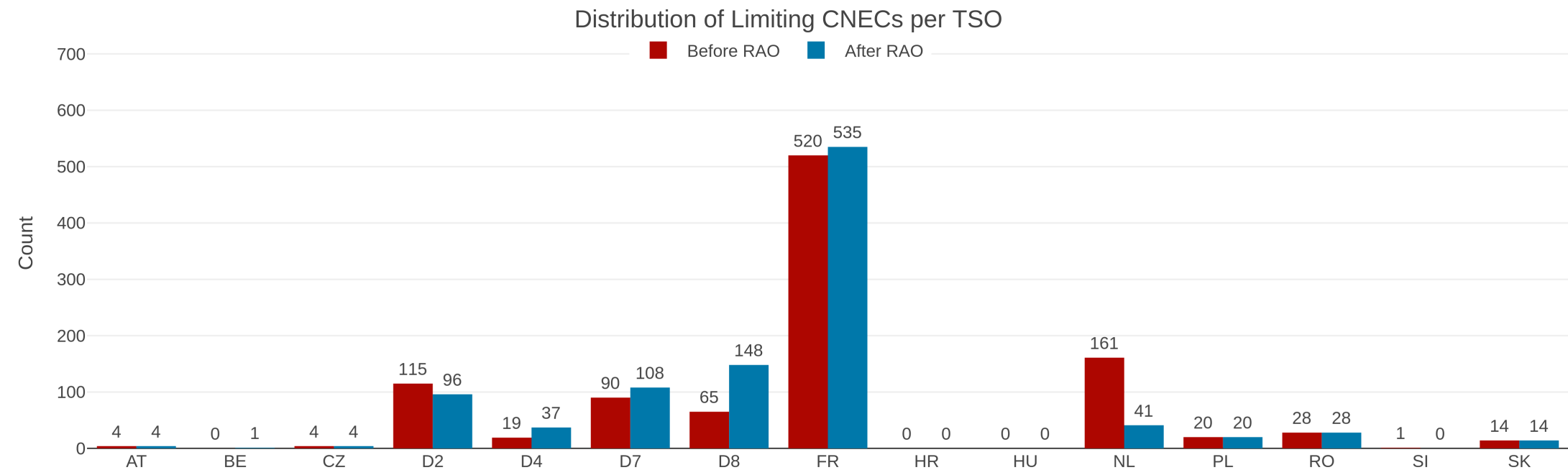
Relative Time Share of Applied Topological RAs in Curative Mode



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.

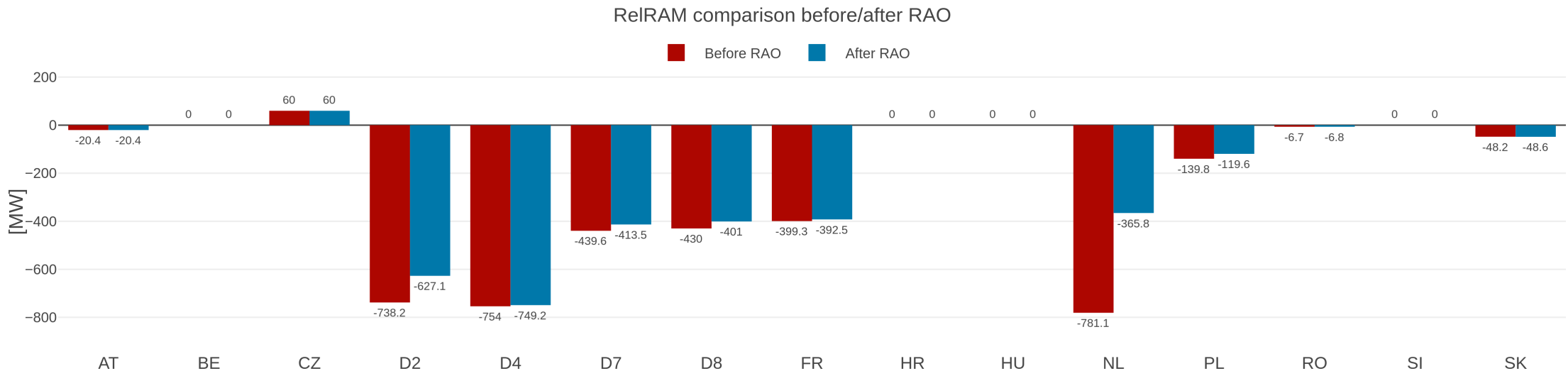
KPI 10: Average variation of relative RAM before and after NRAO



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]	720	851	100.98%	77.06%	125.90%	0.3366	1.3155
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	720	1435	83.74%	52.75%	112.98%	0.1724	0.9628
[HU-HU] Gonyu - Gyor [DIR]	720	994	74.21%	52.74%	100.94%	0.2567	1.2646
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	719	786	41.53%	0.00%	76.47%	0.2902	0.7156
[SK-SK] Gabcikovo - P.Biskupice [DIR]	719	719	82.78%	71.77%	95.63%	0.2949	1.0911
[SI-HU] Cirkovce - Heviz [OPP] [HU]	712	712	83.22%	65.37%	109.52%	0.2362	1.1044
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	711	1373	131.33%	103.48%	202.14%	0.2902	0.7156
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	705	1401	96.14%	68.26%	123.35%	0.1724	0.9628
[CZ-SK] Nosovice - Varin [DIR] [CZ]	703	1303	77.68%	56.13%	102.89%	0.3366	1.3155
[CZ-PL] Nosovice - Wielopole [DIR] [CZ]	702	702	130.89%	90.84%	163.28%	0.3676	1.2693
[HU-HU] Gonyu - Gyor [OPP]	696	710	107.35%	79.00%	160.39%	0.2567	1.2646
[AT-HU] Zurndorf - Gyoer 439B [DIR] [AT]	695	1904	84.45%	49.13%	112.41%	0.3424	1.4243
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	682	1769	54.26%	38.10%	79.29%	0.3676	1.2693
[SI-HR] 400 kV Divaca - Melina [OPP] [SI]	677	677	44.26%	6.69%	84.66%	0.2134	0.7169
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	676	804	81.54%	19.85%	131.20%	0.1996	0.7654
[D8-PL] Mikulowa PST1 [DIR] [PL]	669	669	49.90%	35.15%	84.70%	0.3812	1.3744
[FR-D7] Vigy - Enseldorf VIGY2 S [DIR] [D7]	666	712	37.66%	19.90%	74.36%	0.2434	0.5979
[SK-SK] V.Dur - Krizovany [DIR]	666	666	82.81%	72.03%	98.49%	0.2591	0.968
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	663	1006	84.95%	31.41%	142.89%	0.1754	0.5431
[CZ-SK] Nosovice - Varin [OPP] [SK]	662	1080	100.02%	74.89%	122.51%	0.3773	1.4363

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
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	203	203	682.47	40.26%	19.93%	62.70%	0.269
[FR-D7] Vigy - Ens Dorf VIGY2 S [DIR] [D7]	170	172	1512.78	24.75%	19.90%	62.00%	0.2362
[NL-NL] MEE DRT2 [DIR] [NL]	153	153	495.02	24.82%	19.96%	70.72%	0.2958
[FR-FR] Creys - Saint-Vulbas 2 [OPP]	131	131	663.51	23.54%	19.98%	35.91%	0.1487
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	123	124	442.38	49.31%	39.54%	64.21%	0.335
[SK-SK] V.Dur - Levice 1 [DIR]	122	122	2429.63	46.19%	36.92%	55.03%	0.3159
[D8-PL] Mikulowa PST1 [DIR] [PL]	112	112	523.29	44.95%	35.15%	60.76%	0.3791
[CZ-SK] Nosovice - Varin [DIR] [SK]	94	94	643.49	62.62%	49.49%	82.90%	0.3829
[FR-FR] Creys - Genissiat 1 [DIR]	82	82	257	26.40%	19.98%	42.56%	0.1795
[CZ-SK] Nosovice - Varin [DIR] [CZ]	80	80	292.04	69.73%	56.13%	88.31%	0.3366
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	73	73	1759.85	69.55%	20.13%	131.20%	0.1758
[SK-HU] Levice - God [DIR] [HU]	69	69	451.92	61.76%	47.04%	71.57%	0.3196
[NL-NL] Krimpen a/d IJssel-Geertruidenberg 380 W [DIR]	55	55	344.04	46.49%	30.27%	96.59%	0.4377
[D2-NL] Diele - Meeden SCHWARZ [OPP] [D2]	51	51	522.01	61.19%	43.30%	87.53%	0.3484
[RO-RO] PST Arad 400/220 3 [DIR]	41	41	3494.61	59.53%	22.25%	85.25%	0.1491
[D8-D8] Vierraden - Vierraden PST441 [DIR]	36	36	358.68	45.42%	37.52%	66.67%	0.2704
[SK-HU] Levice - God [DIR] [SK]	31	31	1668.96	56.47%	49.13%	62.12%	0.3287
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	26	26	499.15	21.57%	19.98%	30.08%	0.1479
[RO-RO] Cluj Est - Gadalin [OPP] [RO]	24	24	8357.9	20.15%	18.79%	23.83%	0.0787
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	23	23	5.05	44.37%	36.09%	83.23%	0.2534

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	94
AC < 0 MW	12
AC = 0 MW	57
AC > 0 MW	25

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-2313.99	3570.28
Min.	-10213.00	0.00
Max.	0.00	16200.00

