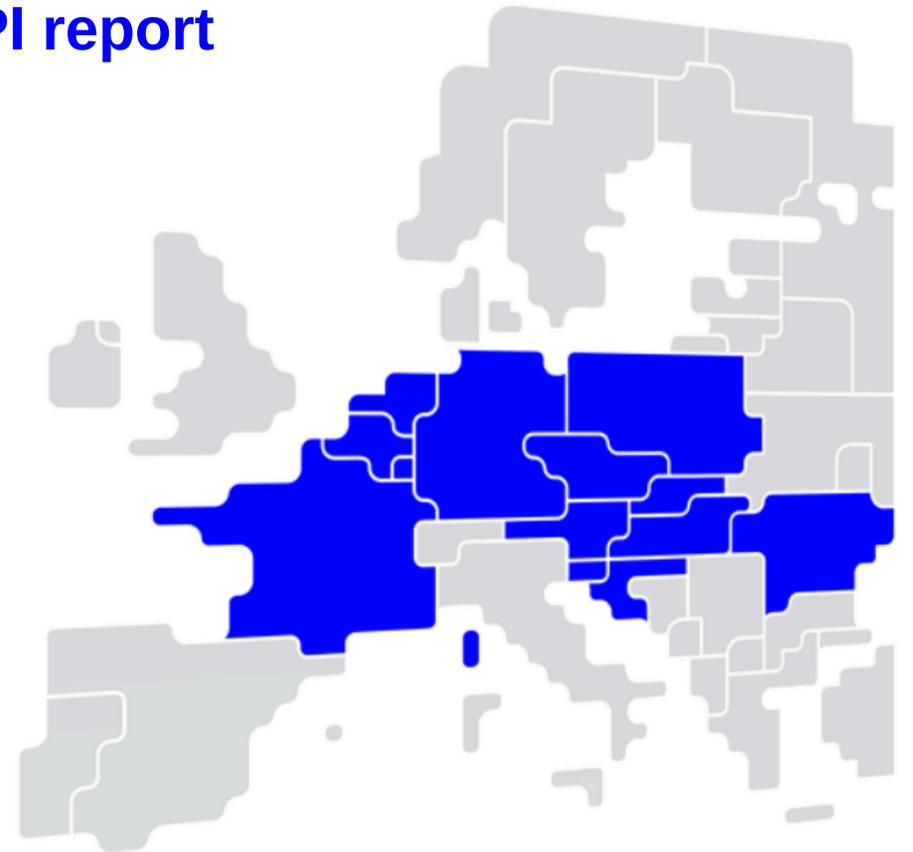


Core FB MC Operational KPI report

December 2025



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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- 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)

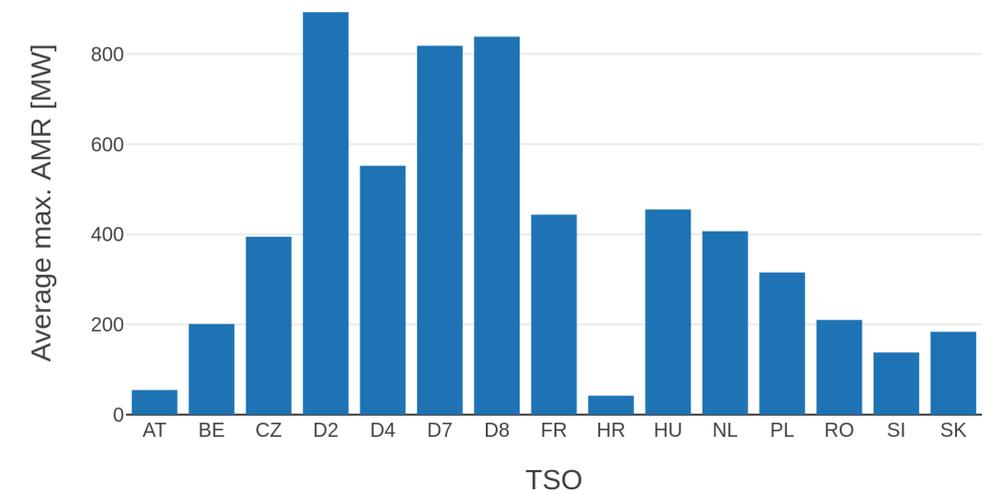
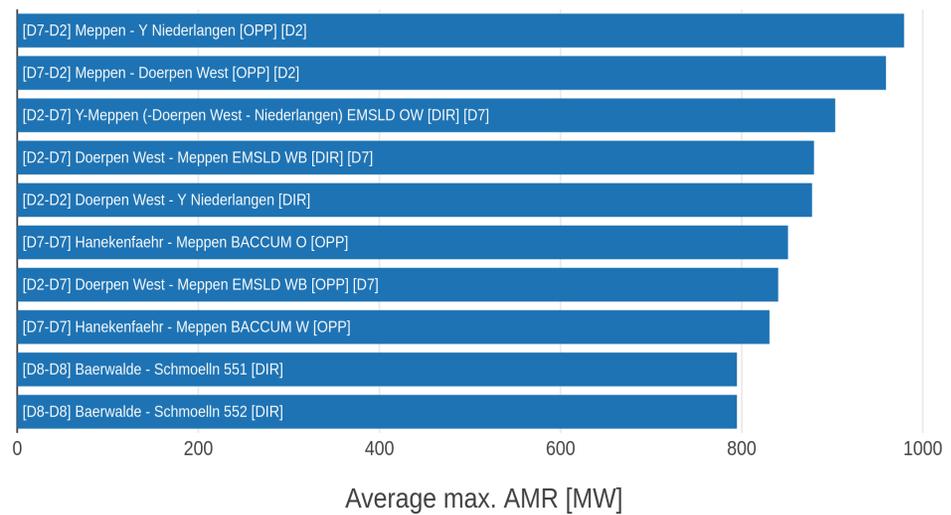
KPI 2: Average maximum AMR per TSO



CNE	Avg. Max. AMR (MW)	AMR/Fmax%	
		(MTUs with AMR > 0 MW)	AMR/Fmax% (all MTUs)
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	979.38	48.51%	39.77%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	959.38	47.51%	39.08%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	903.34	36.22%	27.80%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	879.86	35.28%	27.22%
[D2-D2] Doerpen West - Y Niederlangen [DIR]	877.75	43.48%	35.53%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	851.18	34.69%	27.14%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	840.34	33.69%	25.81%
[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	830.76	34.09%	26.81%
[D8-D8] Baerwalde - Schmoelln 552 [DIR]	794.80	31.87%	31.70%
[D8-D8] Baerwalde - Schmoelln 551 [DIR]	794.80	31.87%	31.70%

TSO	Average maximum AMR per TSO
AT	54.39
BE	201.09
CZ	394.65
D2	892.57
D4	552.03
D7	818.14
D8	838.21
FR	443.52
HR	41.96
HU	454.92

TSO	Average maximum AMR per TSO
NL	406.83
PL	315.46
RO	210.08
SI	137.75
SK	183.71



KPI 3: Share of MTUs with intervention per TSO



Total BDs

31

Total MTUs

744

MTUs without IVA

111

Share of distinct MTUs without IVA

14.92%

MTUs with IVA

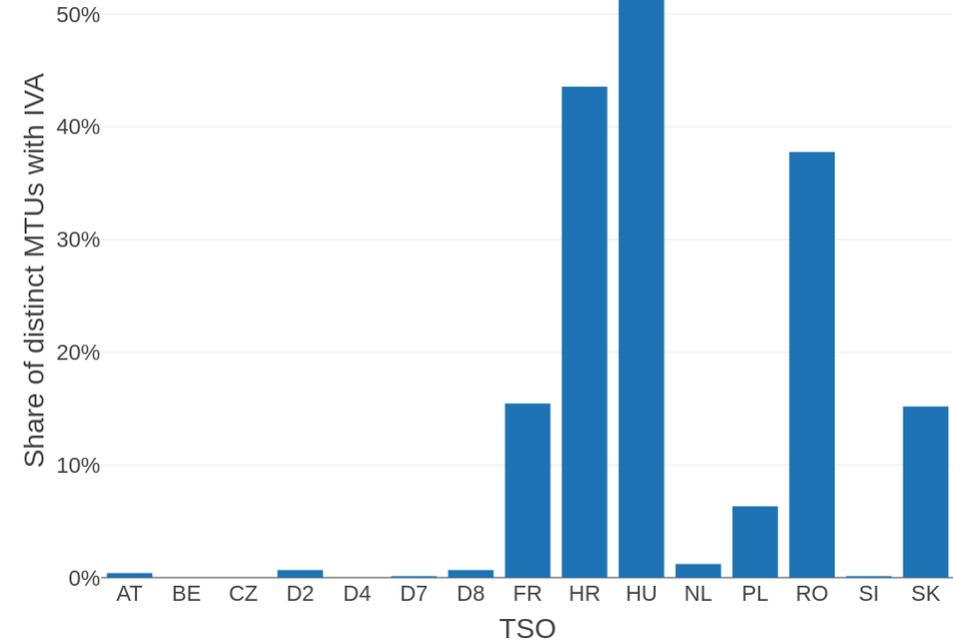
633

Share of distinct MTUs with IVA

85.1%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.40%	3
BE	0.00%	0
CZ	0.00%	0
D2	0.67%	5
D4	0.00%	0
D7	0.13%	1
D8	0.67%	5
FR	15.46%	115
HR	43.55%	324
HU	51.75%	385

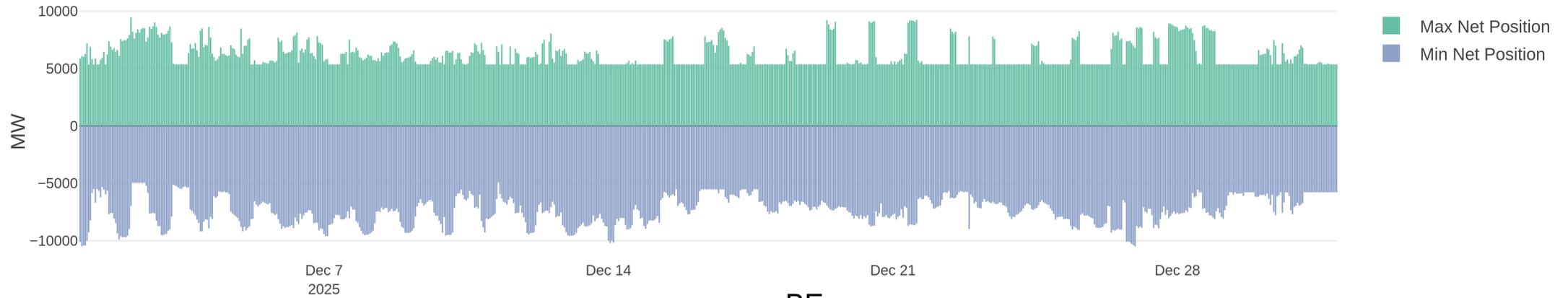
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
NL	1.21%	9
PL	6.32%	47
RO	37.77%	281
SI	0.13%	1
SK	15.19%	113



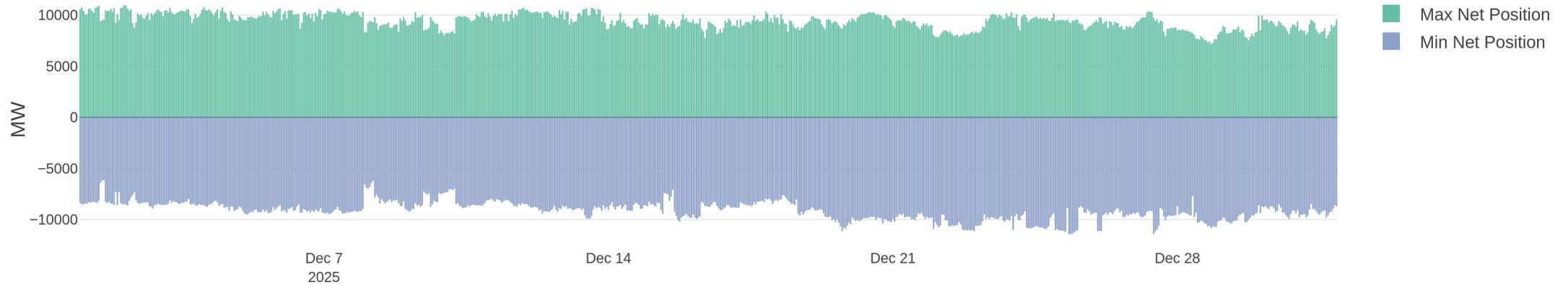
KPI 5: Min & max net positions per BZ hub



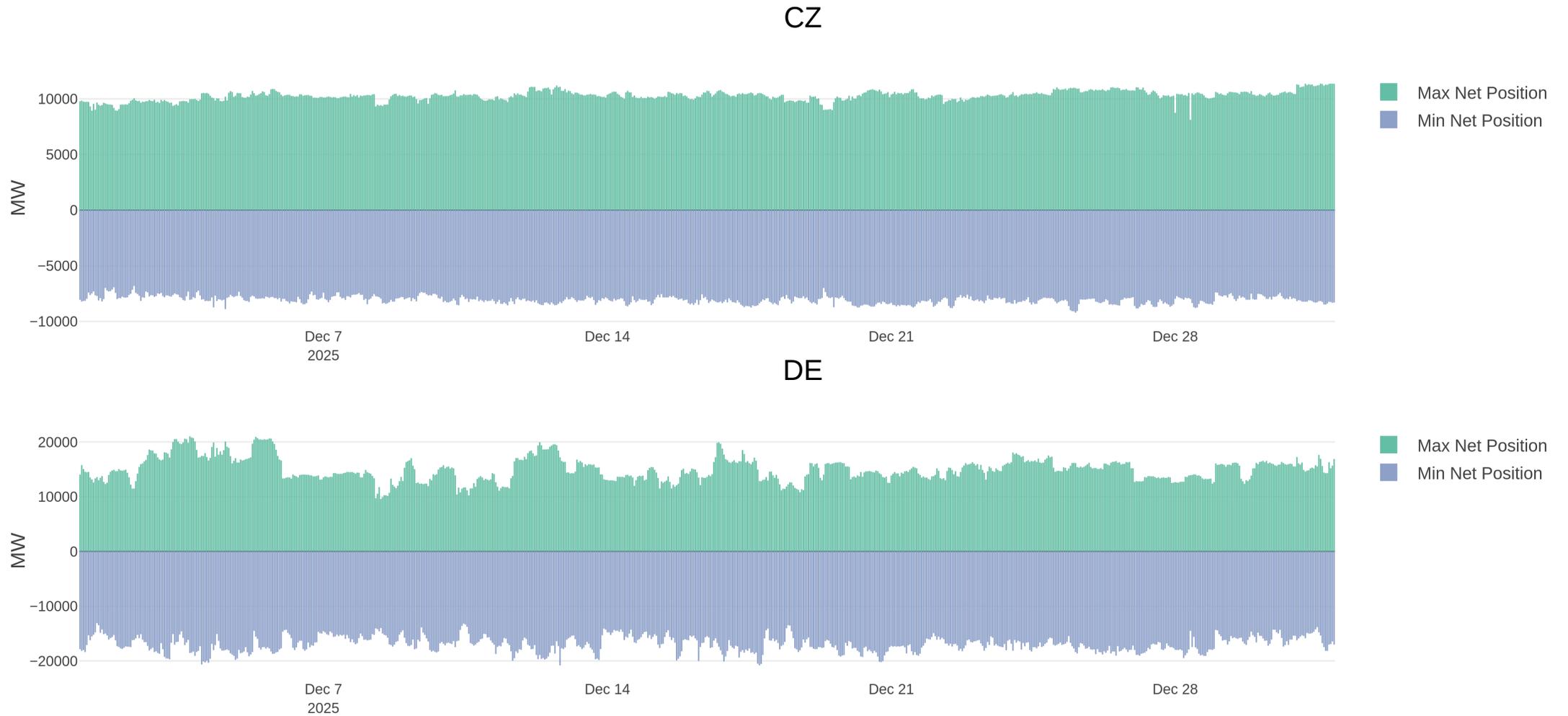
AT



BE



KPI 5: Min & max net positions per BZ hub



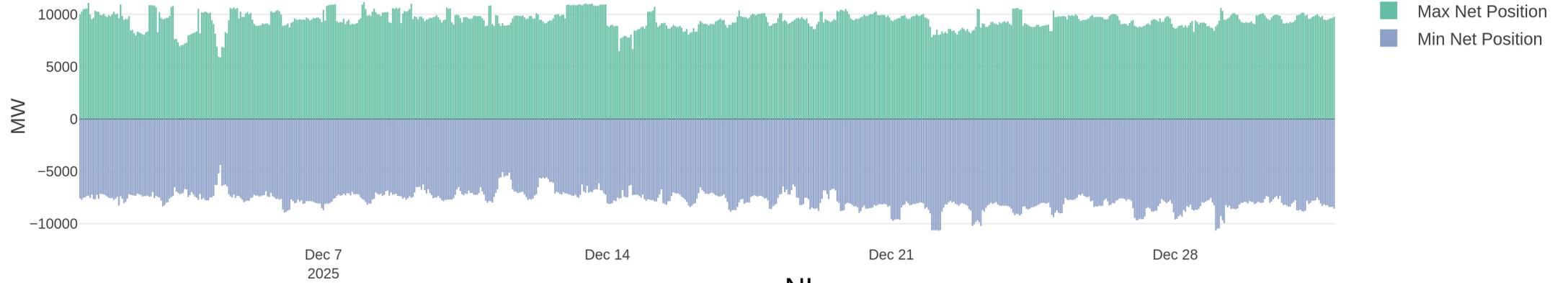
KPI 5: Min & max net positions per BZ hub



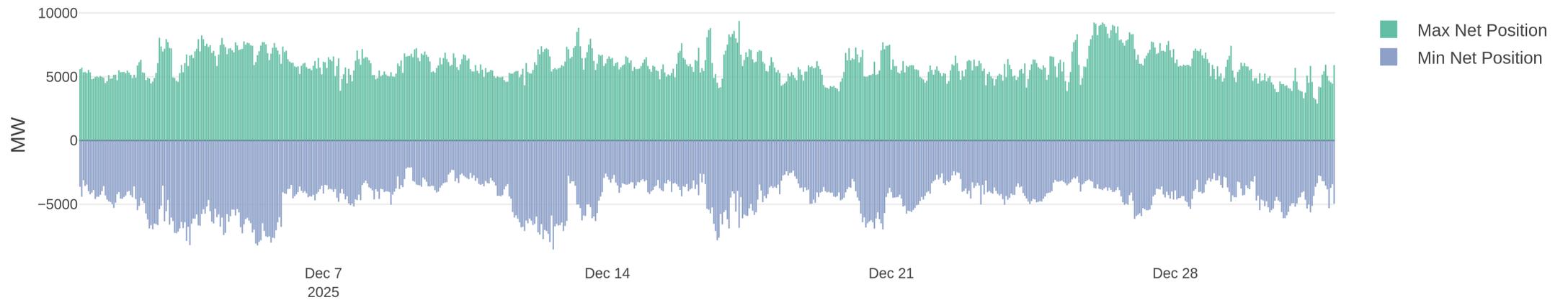
KPI 5: Min & max net positions per BZ hub



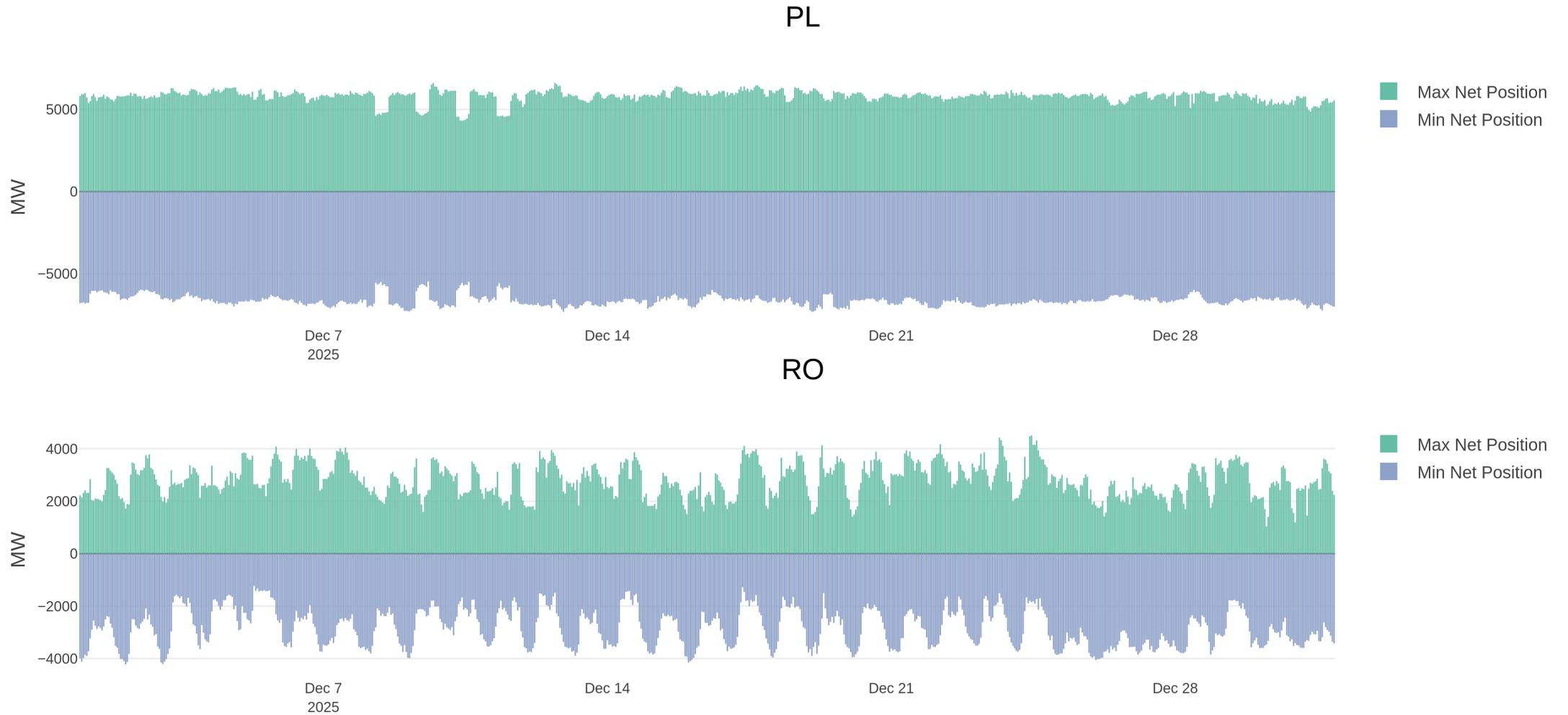
HU



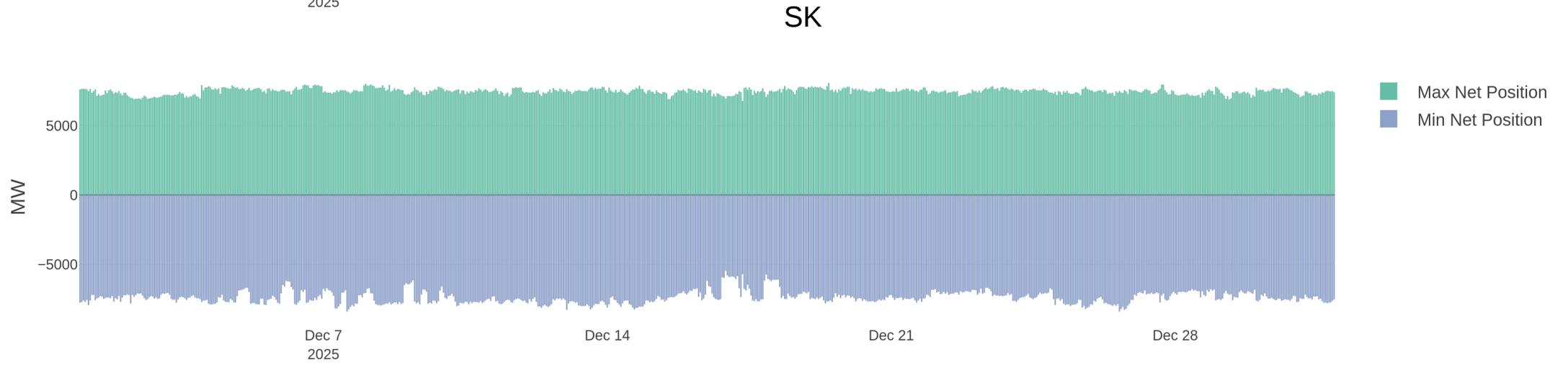
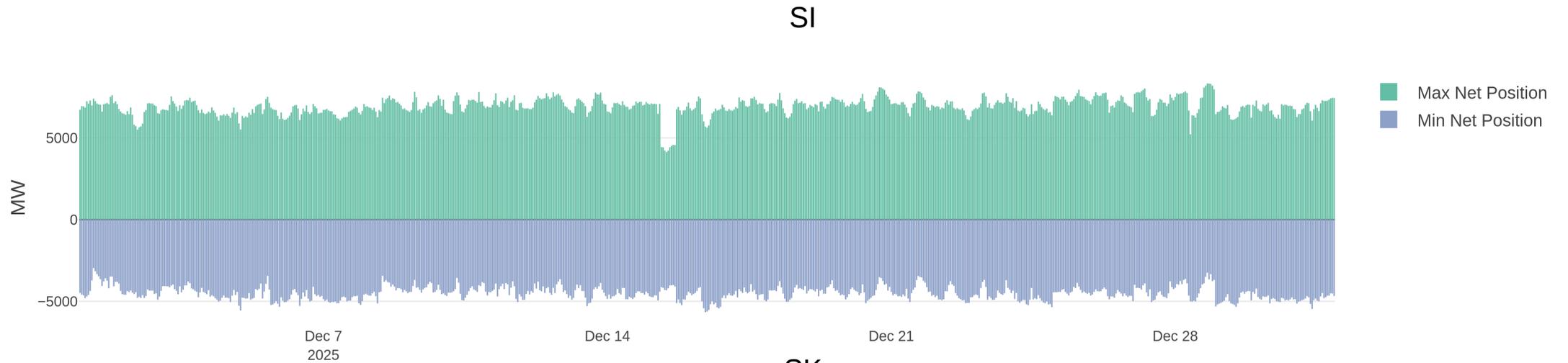
NL



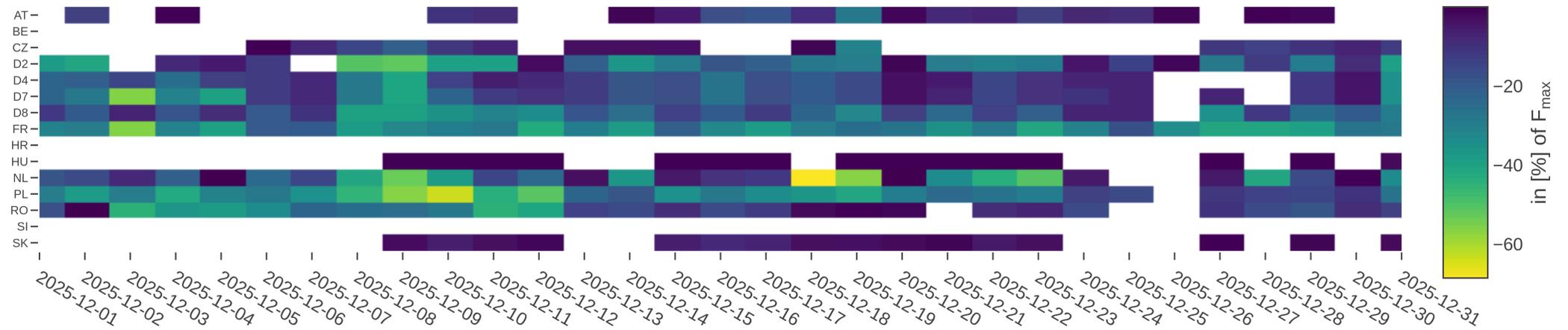
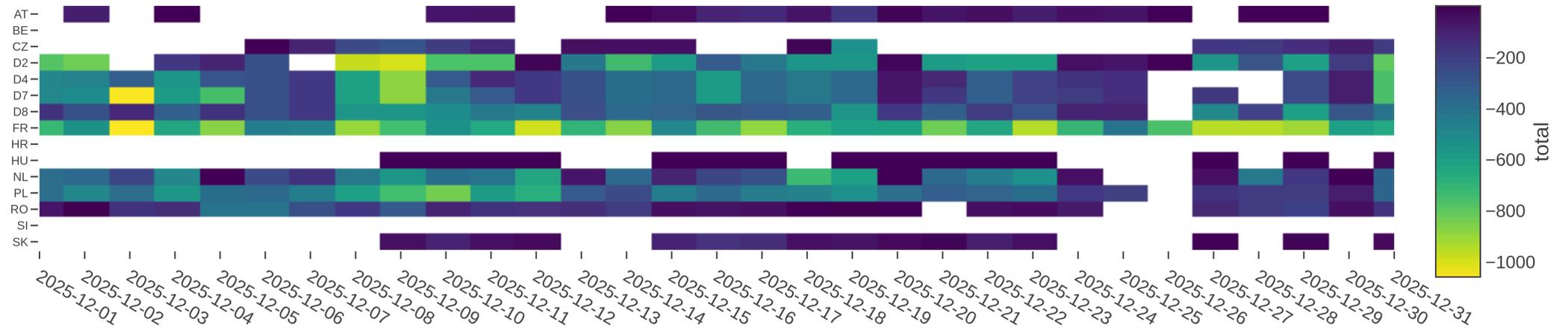
KPI 5: Min & max net positions per BZ hub



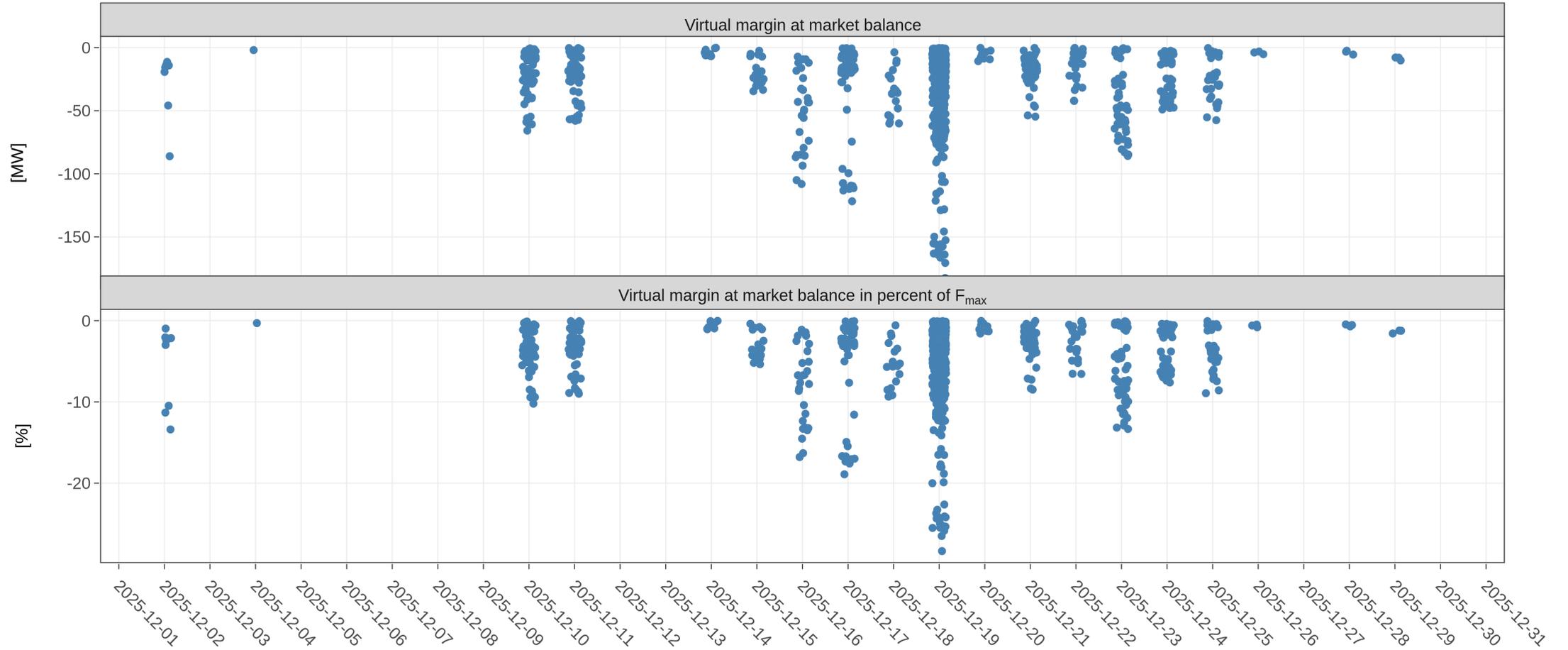
KPI 5: Min & max net positions per BZ hub



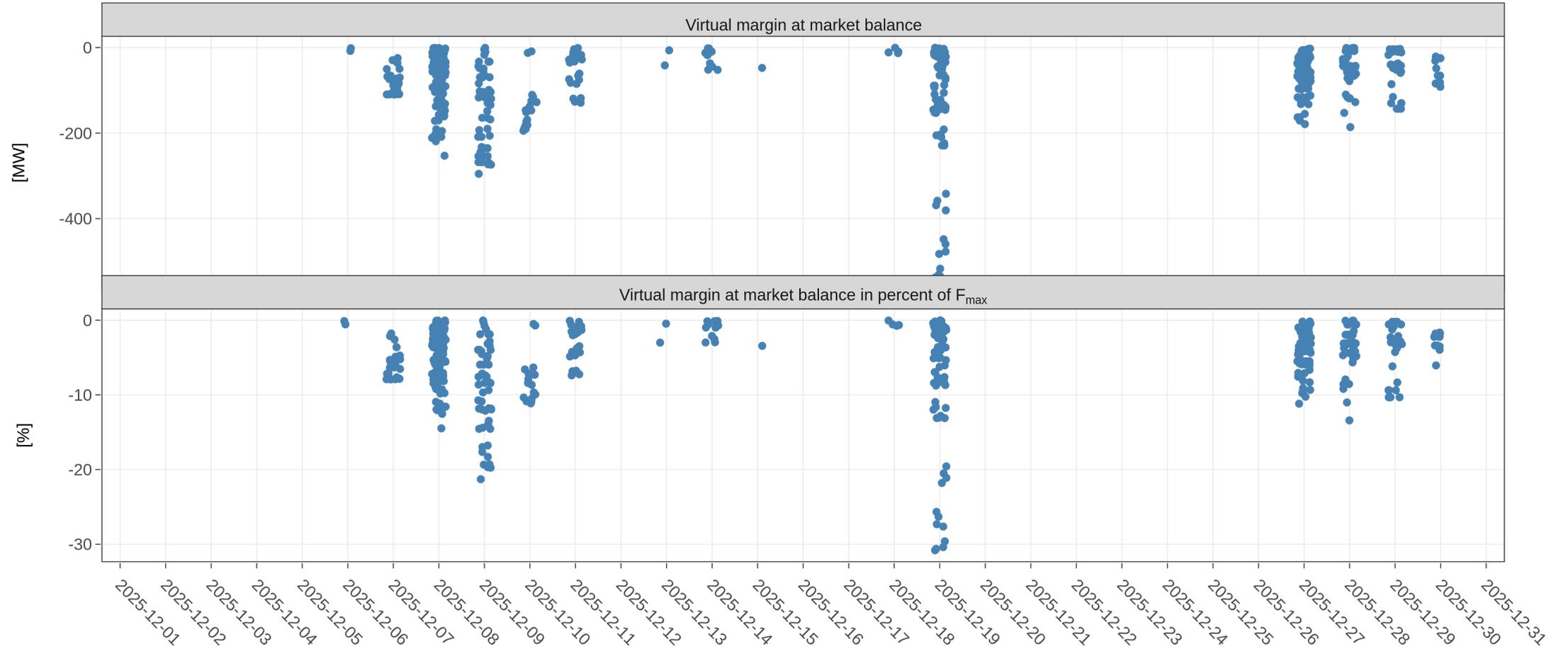
KPI 6a: Highest virtual margins at market balance for CORE TSOs



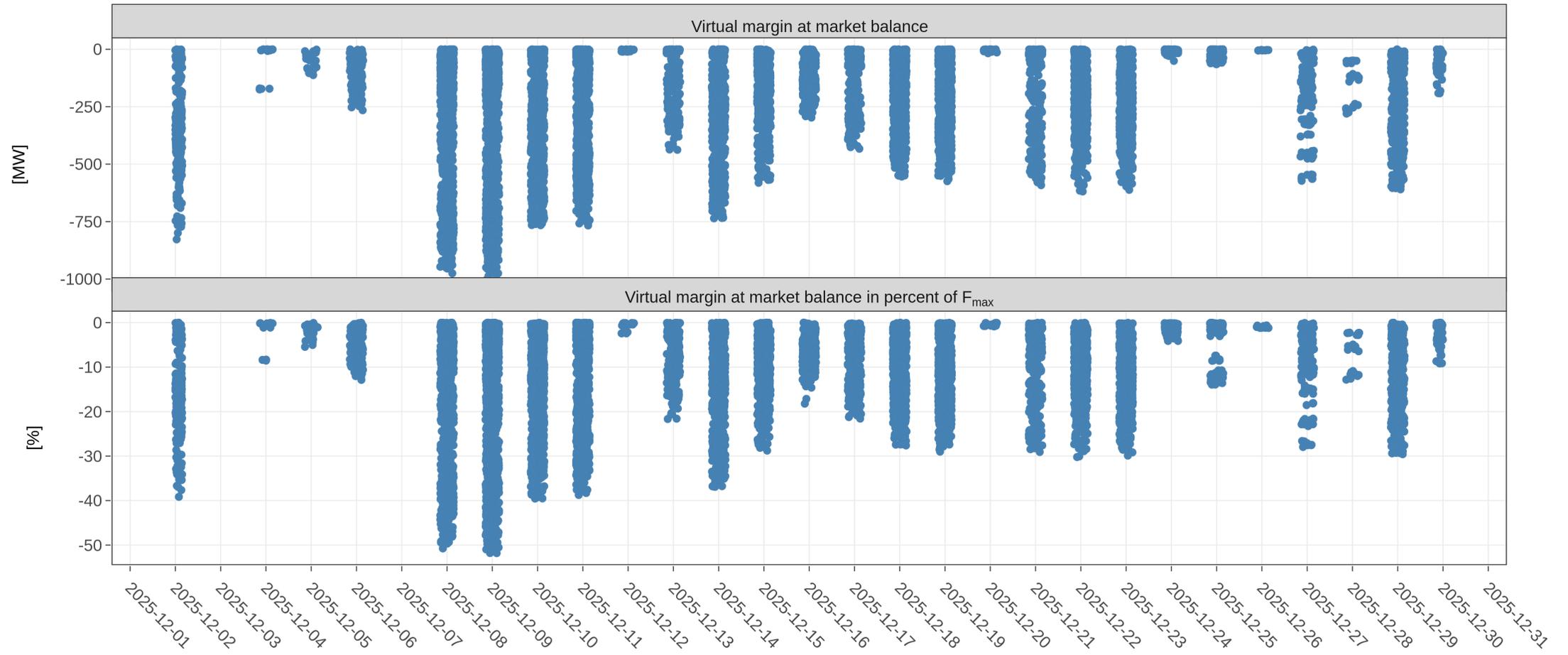
KPI 6b: Virtual margins at market balance AT



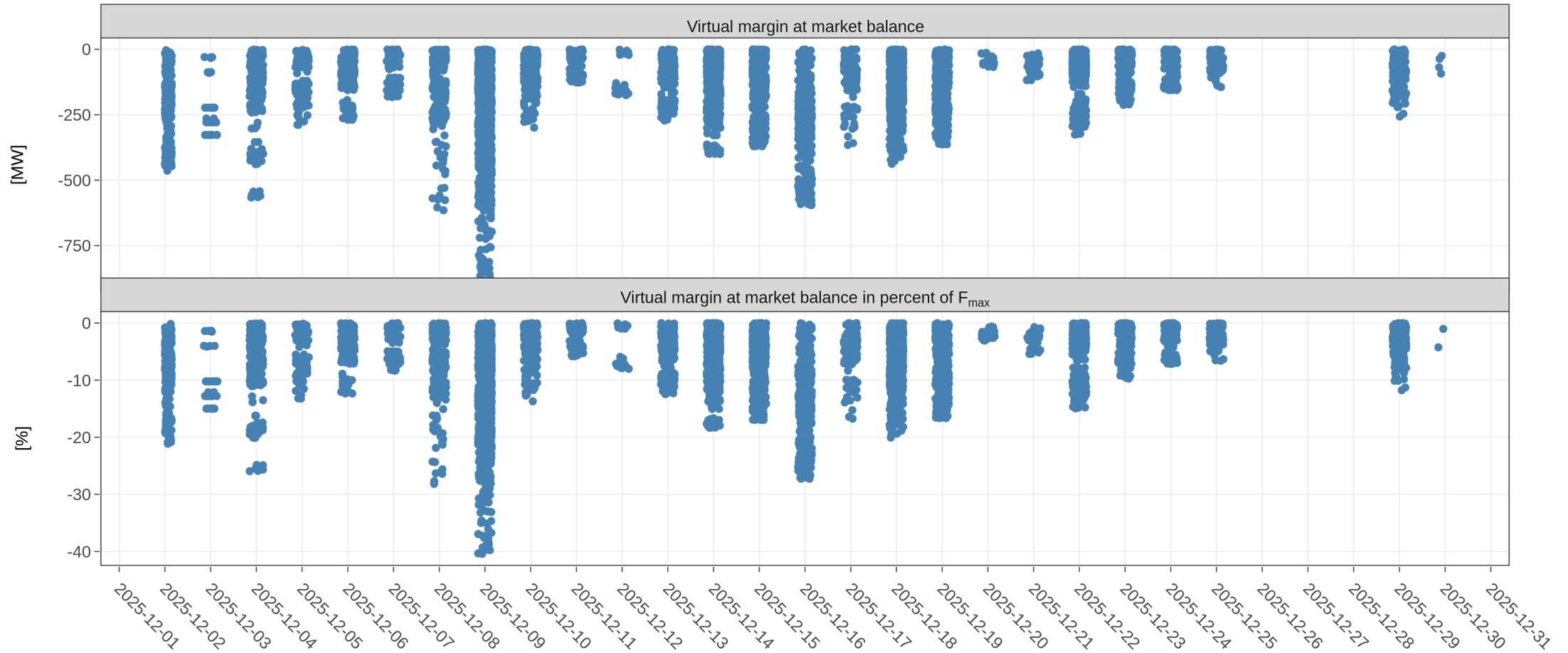
KPI 6b: Virtual margins at market balance CZ



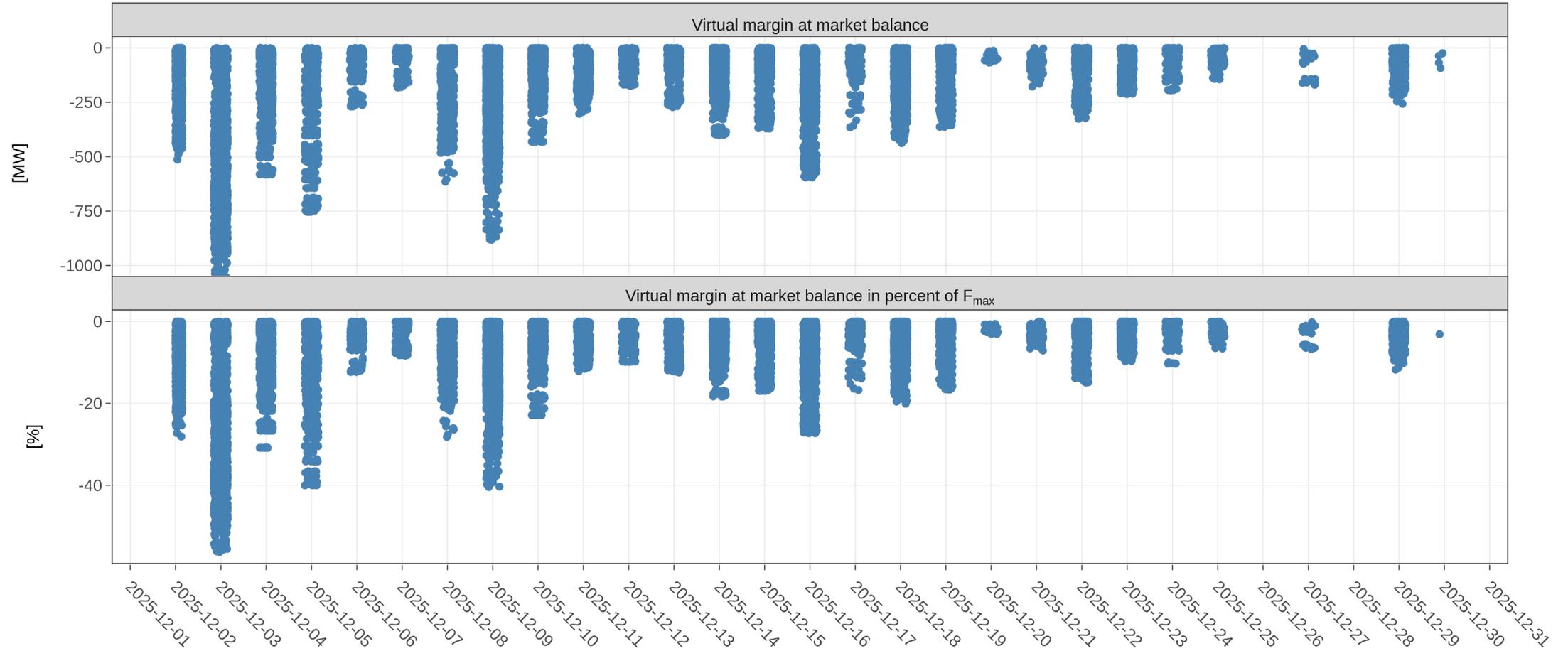
KPI 6b: Virtual margins at market balance D2



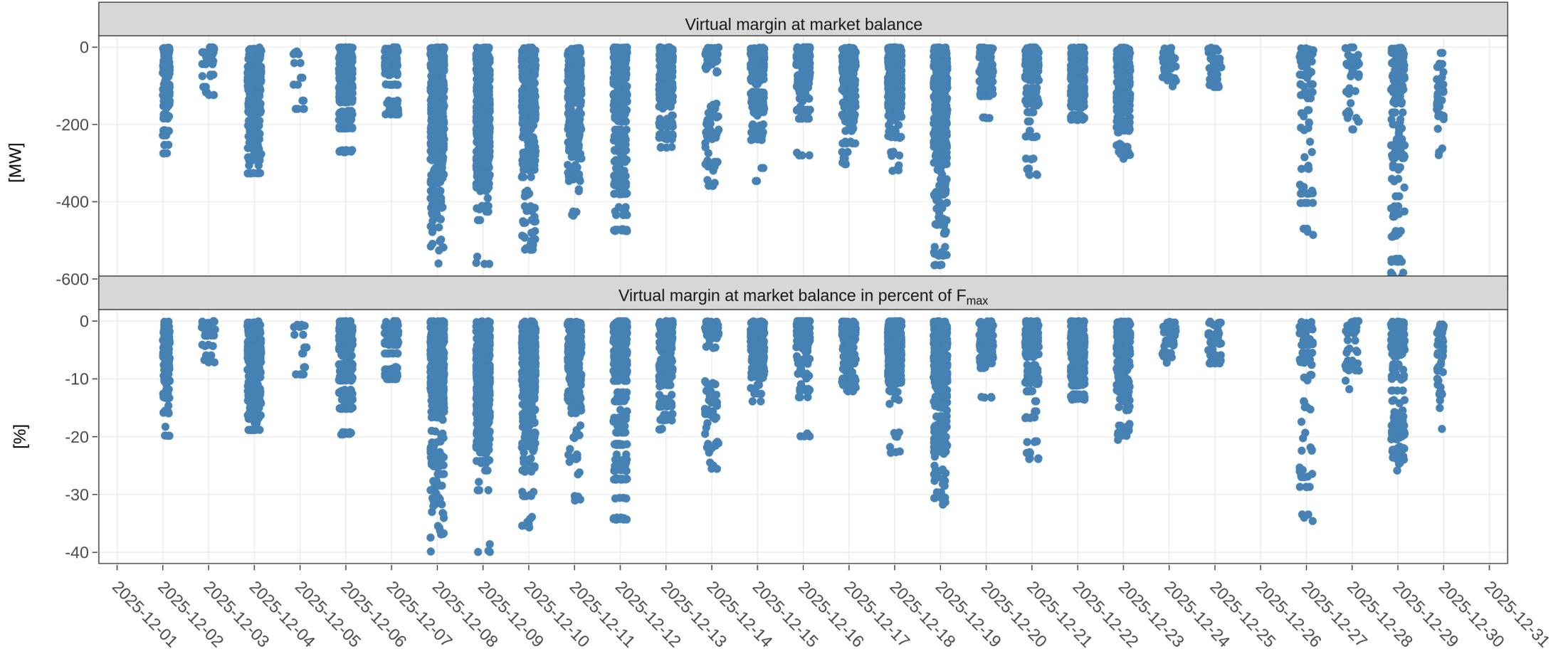
KPI 6b: Virtual margins at market balance D4



KPI 6b: Virtual margins at market balance D7



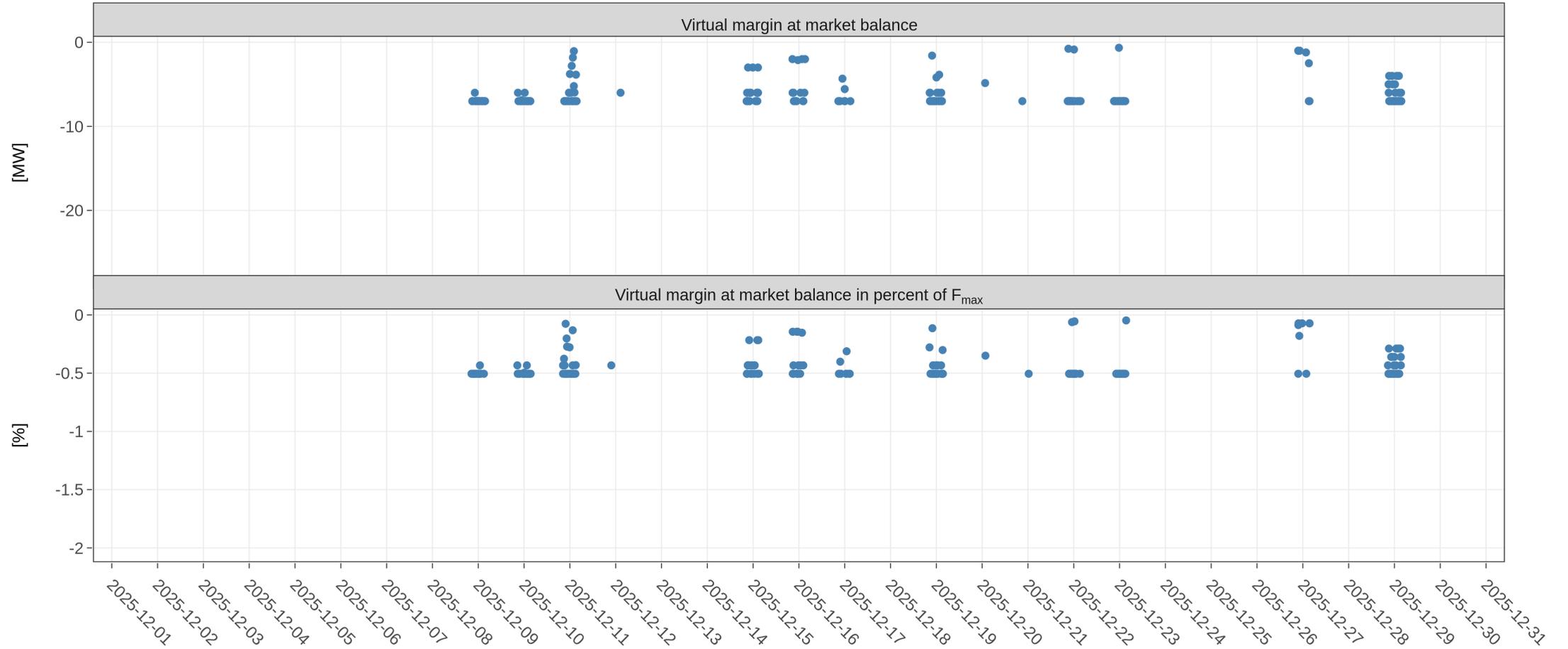
KPI 6b: Virtual margins at market balance D8



KPI 6b: Virtual margins at market balance FR



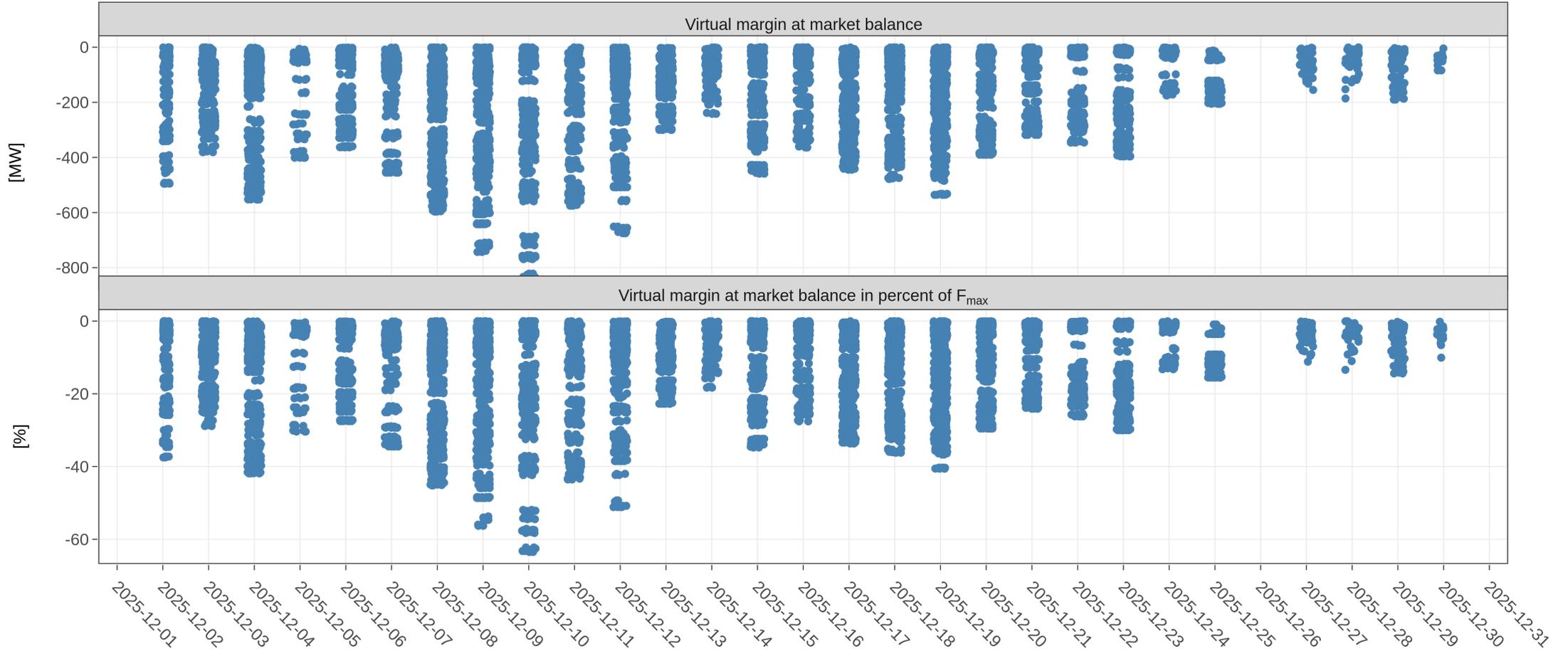
KPI 6b: Virtual margins at market balance HU



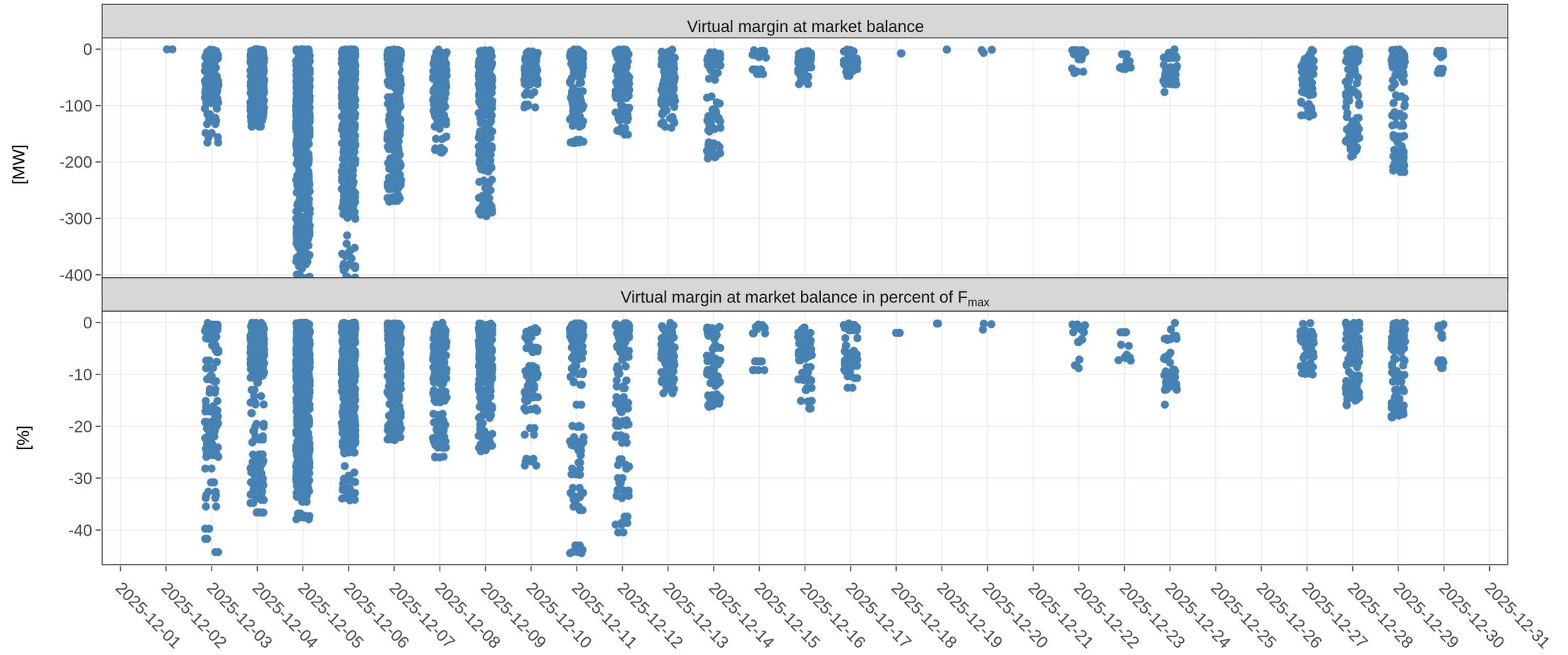
KPI 6b: Virtual margins at market balance NL



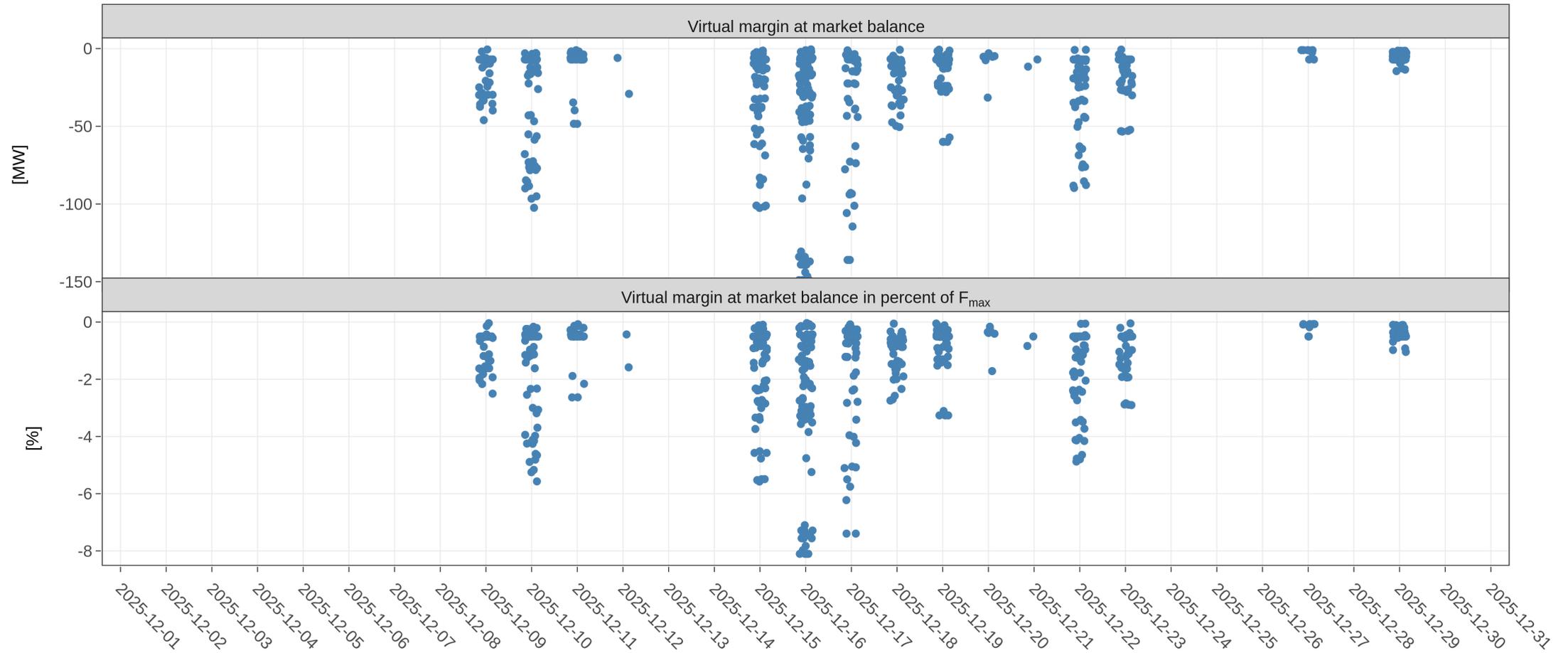
KPI 6b: Virtual margins at market balance PL



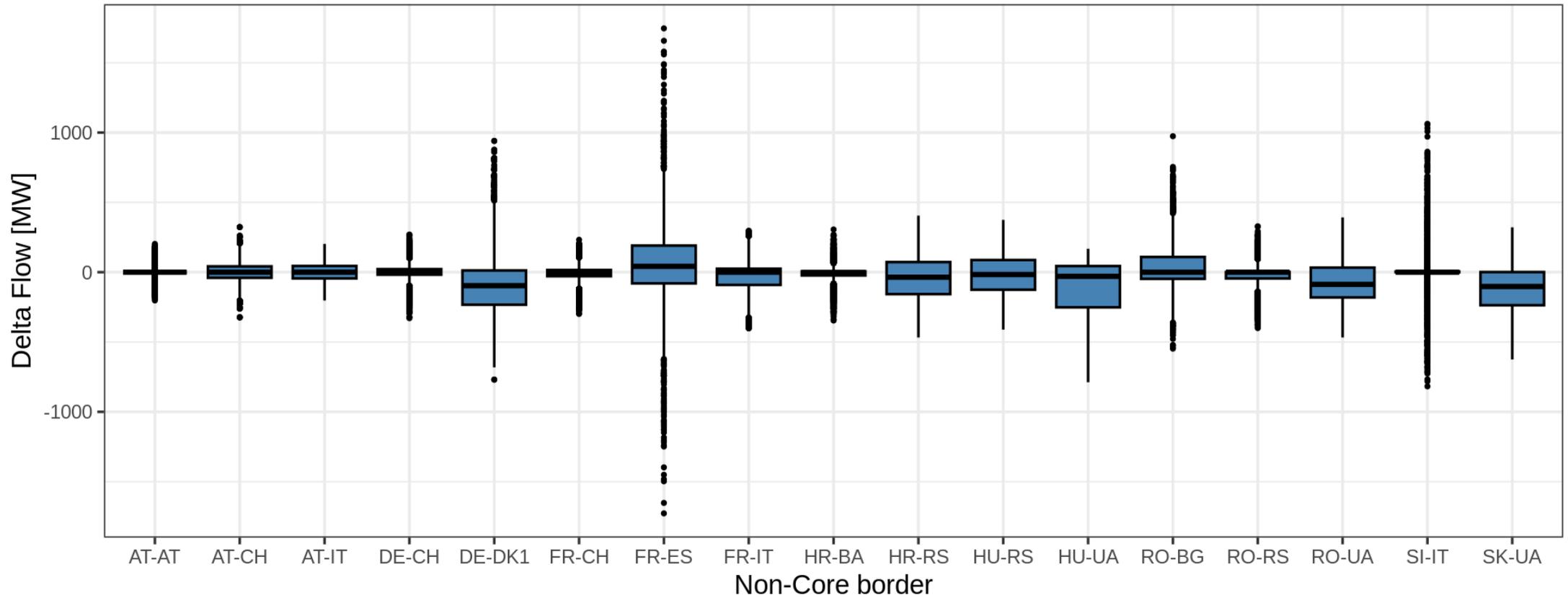
KPI 6b: Virtual margins at market balance RO



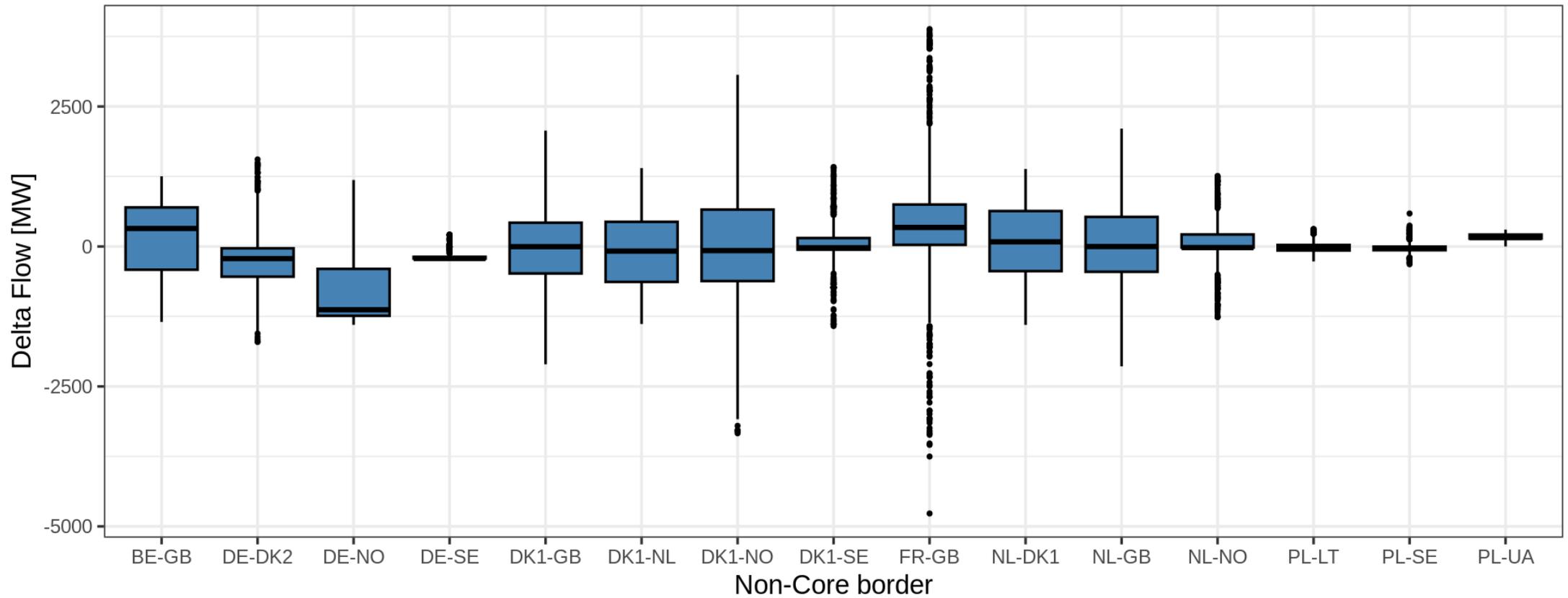
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



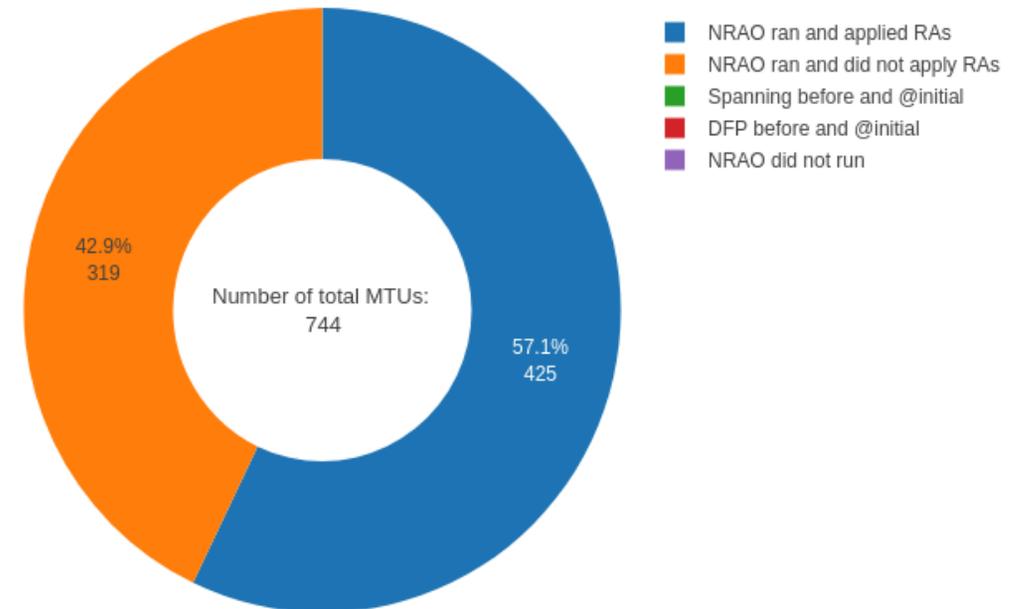
KPI 8: NRAO – Applied Remedial Action



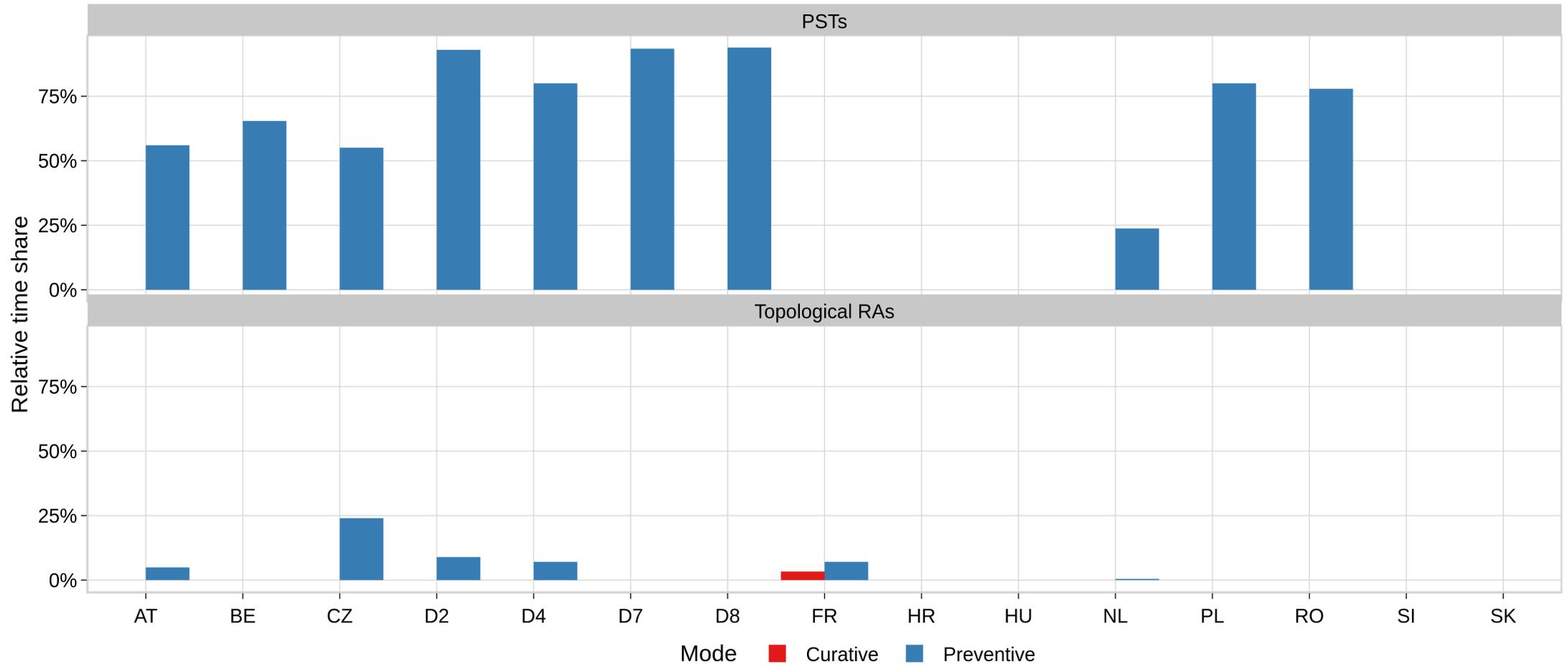
In the following plots, the relative time share relates to the hours labeled 'NRAO Ran and Applied RAs'.

Total MTUs: 744 hours

Category	Hours (%)
NRAO ran and applied RAs	425 hours (57.1%)
NRAO ran and did not apply RAs	319 hours (42.9%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

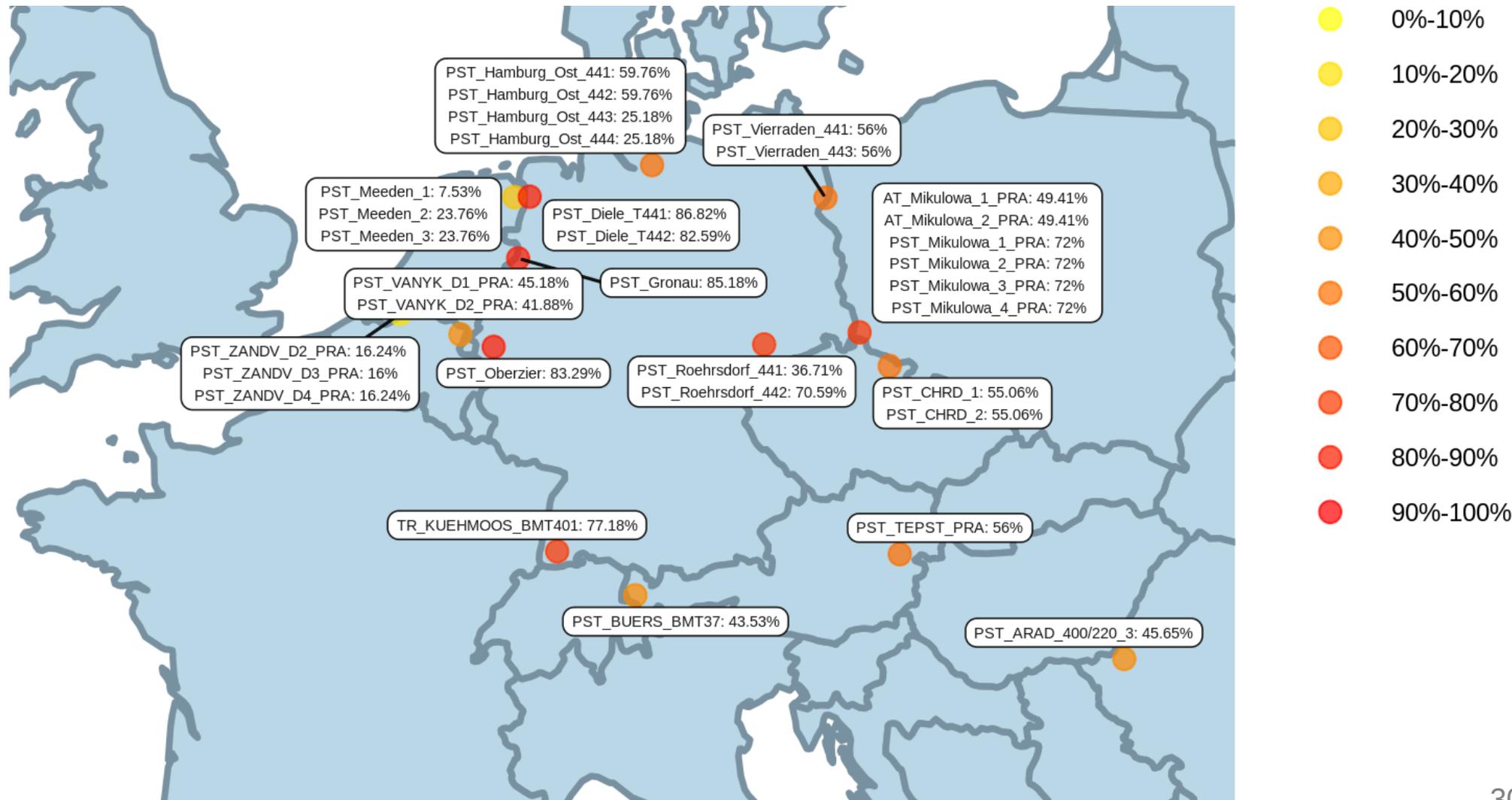


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



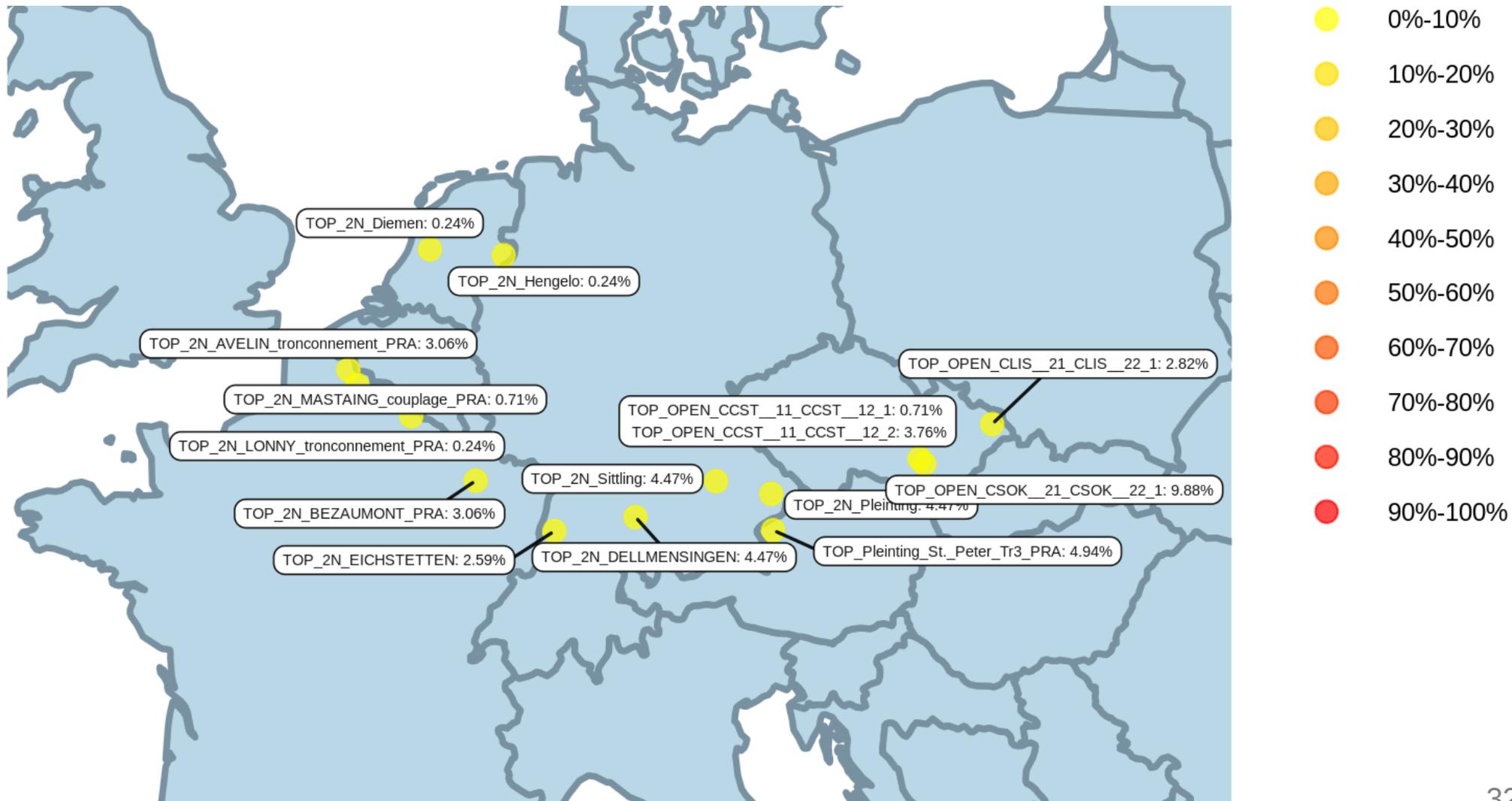
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



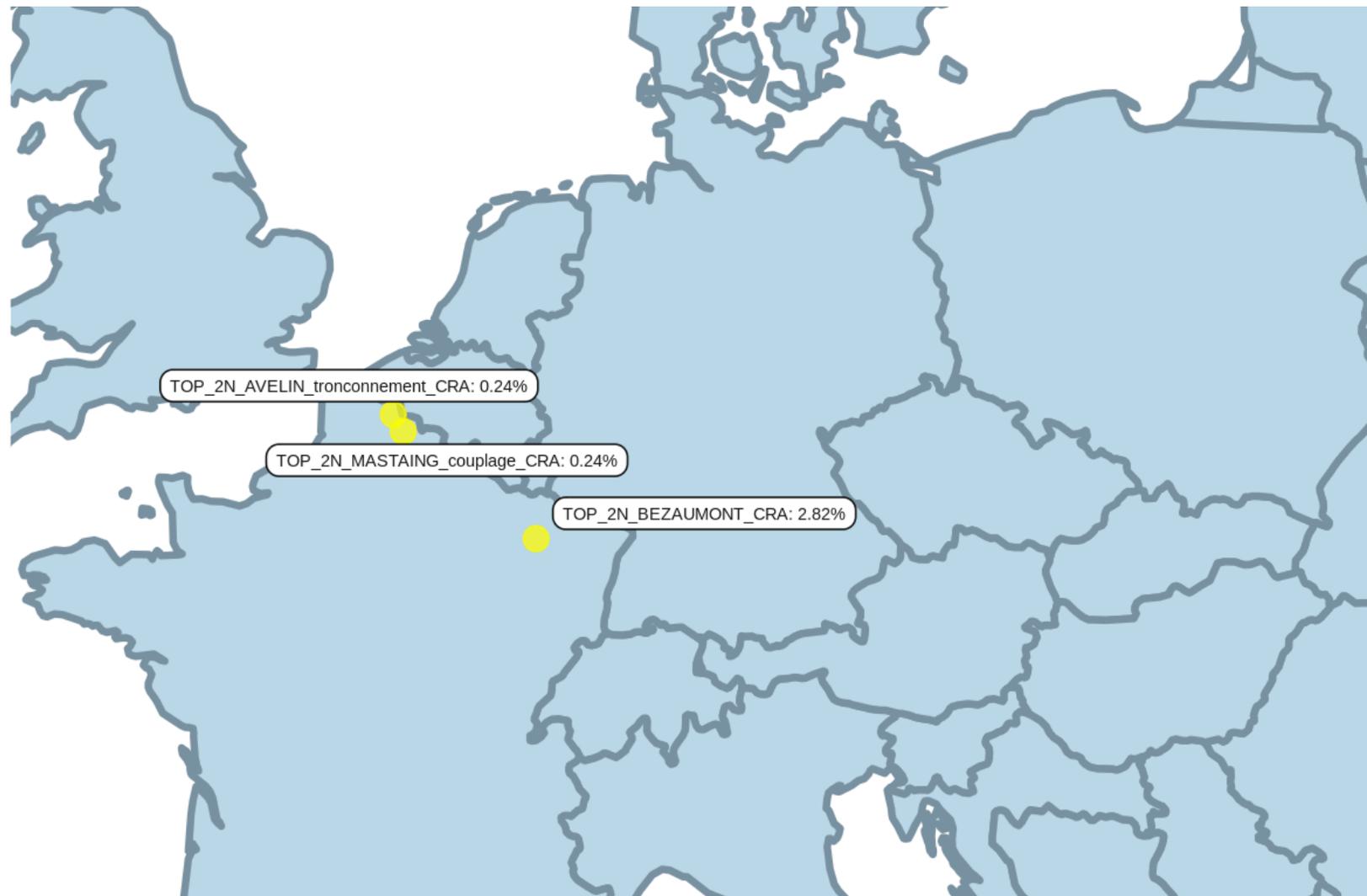
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

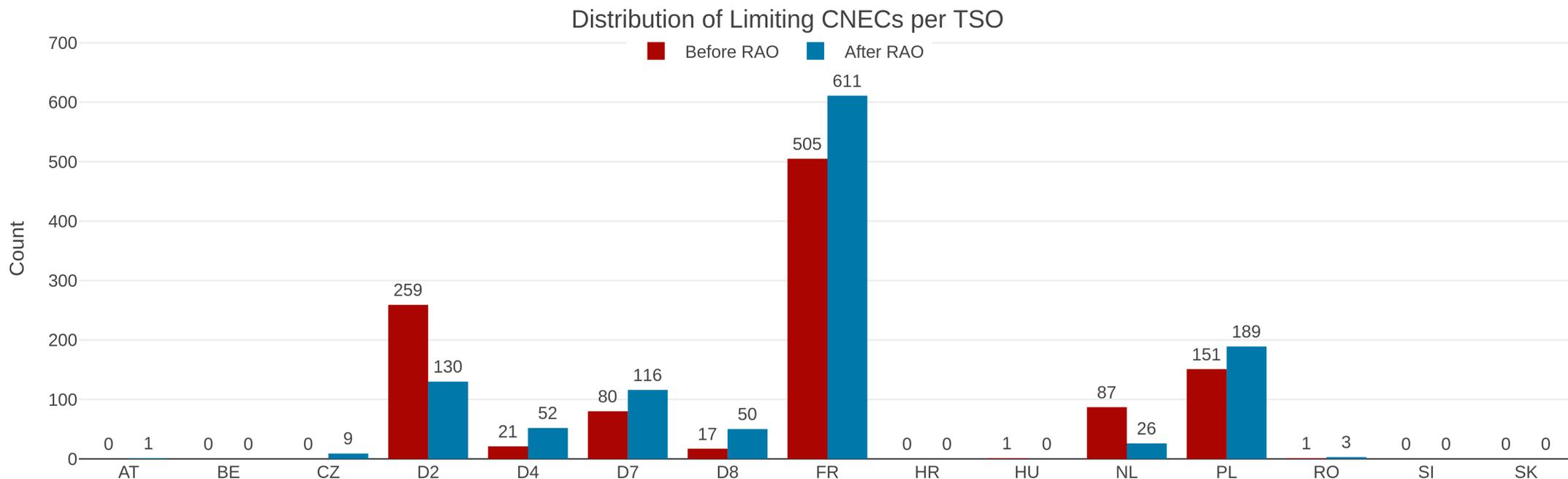
Relative Time Share of Applied Topological RAs in Curative Mode



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

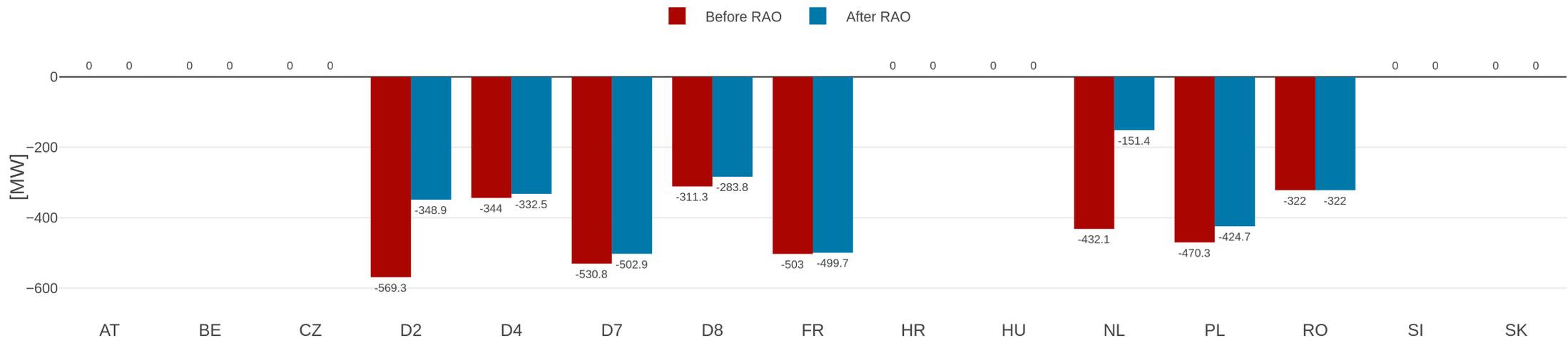


The graph shows average values of relative RAM before and after NRAO, per TSO on the most limiting CNECs from NRAO perspective. Selected CNECs before RAO are the same as after RAO, and average computed for MTUs when was used further in the process.

- 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

$$RAM_{rel} = \begin{cases} \frac{RAM_{nrao}}{\sum_{(A,B) \in \text{neighbouring Core bidding zones pairs}} |PTDF_{A \rightarrow B, nrao}|}, & \text{if } RAM_{nrao} \geq 0 \\ RAM_{nrao}, & \text{if } RAM_{nrao} < 0 \end{cases}$$

RelRAM comparison before/after RAO



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
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	744	776	43.36%	2.67%	71.12%	0.1952	0.4591
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	744	1488	77.89%	56.99%	98.83%	0.1838	0.9483
[CZ-SK] Nosovice - Varin [DIR] [CZ]	744	1878	78.86%	60.03%	107.79%	0.3345	1.3279
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	744	1478	127.70%	93.58%	178.61%	0.1952	0.4591
[SK-SK] V.Dur - Levice 1 [DIR]	744	744	43.02%	35.35%	54.49%	0.1986	0.7978
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	744	744	50.12%	27.90%	88.26%	0.2715	1.1696
[HU-HU] Gonyu - Gyor [DIR]	744	1721	70.82%	57.07%	100.07%	0.2731	1.5426
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	744	1485	102.77%	81.15%	131.83%	0.1838	0.9483
[SK-SK] Gabcikovo - P.Biskupice [DIR]	744	744	87.72%	74.39%	101.82%	0.3059	1.0625
[CZ-SK] Nosovice - Varin [OPP] [CZ]	744	1497	99.35%	72.51%	119.34%	0.3345	1.328
[D8-PL] Mikulowa PST1 [DIR] [PL]	744	744	52.06%	19.70%	63.03%	0.3846	1.3834
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	743	1627	64.85%	19.80%	107.20%	0.2237	0.9966
[RO-RO] TR Rosiori 400/220 1 [DIR]	743	743	46.54%	19.38%	67.08%	0.1208	0.1966
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	743	743	67.57%	49.56%	84.84%	0.2247	0.7896
[CZ-SK] Nosovice - Varin [OPP] [SK]	742	742	100.51%	81.89%	114.57%	0.3136	1.1785
[SI-HU] Cirkovce - Heviz [OPP] [HU]	738	738	77.29%	57.86%	98.27%	0.2381	1.1122
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	738	738	62.62%	41.03%	83.63%	0.2723	1.1039
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	738	2128	59.27%	49.21%	76.33%	0.3429	1.2229
[HU-HU] Gonyu - Gyor [OPP]	736	748	121.22%	79.87%	154.83%	0.2597	1.5426
[NL-NL] MEE DRT2 [DIR] [NL]	735	741	52.75%	19.96%	161.31%	0.347	0.7703

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]	490	490	840.27	22.16%	19.98%	37.20%	0.1442
[D8-PL] Mikulowa PST1 [DIR] [PL]	271	271	1178.22	47.90%	19.70%	61.36%	0.3846
[D2-D2] Altheim - Sittling 219 [OPP]	258	258	1677.59	67.16%	34.02%	100.92%	0.0862
[SK-HU] Levice - God [DIR] [HU]	229	229	1004.66	51.85%	32.40%	62.48%	0.2299
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	199	199	481.76	48.08%	27.90%	66.33%	0.2704
[RO-RO] TR Rosiori 400/220 1 [DIR]	133	133	2738.26	39.48%	19.38%	63.13%	0.1208
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	115	115	386.84	75.62%	27.99%	111.04%	0.145
[NL-NL] MEE DRT2 [DIR] [NL]	114	114	122.42	38.06%	19.96%	74.05%	0.347
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	95	95	766.02	21.09%	19.98%	29.00%	0.1447
[NL-NL] Krimpen a/d IJssel-Geertruidenberg 380 W [DIR]	87	87	241.45	56.17%	36.26%	90.38%	0.4921
[D2-D2] Altheim - Sittling 220 [OPP]	73	73	1589.69	66.01%	27.27%	99.31%	0.0794
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	54	54	56.86	52.93%	26.96%	77.97%	0.2874
[FR-D7] Vigy - Ensdorf VIGY2 S [DIR] [D7]	48	48	555.46	21.79%	19.90%	41.08%	0.2247
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	35	35	256.69	55.83%	53.97%	58.08%	0.3031
[FR-D7] Vigy - Ensdorf VIGY1 N [DIR] [D7]	35	45	685.06	21.79%	19.90%	39.44%	0.2384
[NL-NL] Eemshaven-Meeden 380 Z [DIR]	35	35	436.44	42.99%	30.08%	80.80%	0.3571
[SK-SK] V.Dur - Levice 1 [DIR]	26	26	671.23	39.06%	36.70%	44.32%	0.1676
[D2-D2] Altheim - Simbach 234/230 [DIR]	25	25	414.36	83.07%	62.99%	110.85%	0.0977
[D4-D7] Daxlanden - Maximiliansau sw (Goldgrund Ost)	25	25	258.42	24.09%	20.03%	31.67%	0.1005
[AT-SI] Kainachtal - Maribor 473 [DIR] [AT]	25	25	41.97	62.72%	51.05%	87.07%	0.3713

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	858
AC < 0 MW	341
AC = 0 MW	517
AC > 0 MW	0

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-2409.89	5257.14
Min.	-9676.00	0.00
Max.	0.00	17088.00

