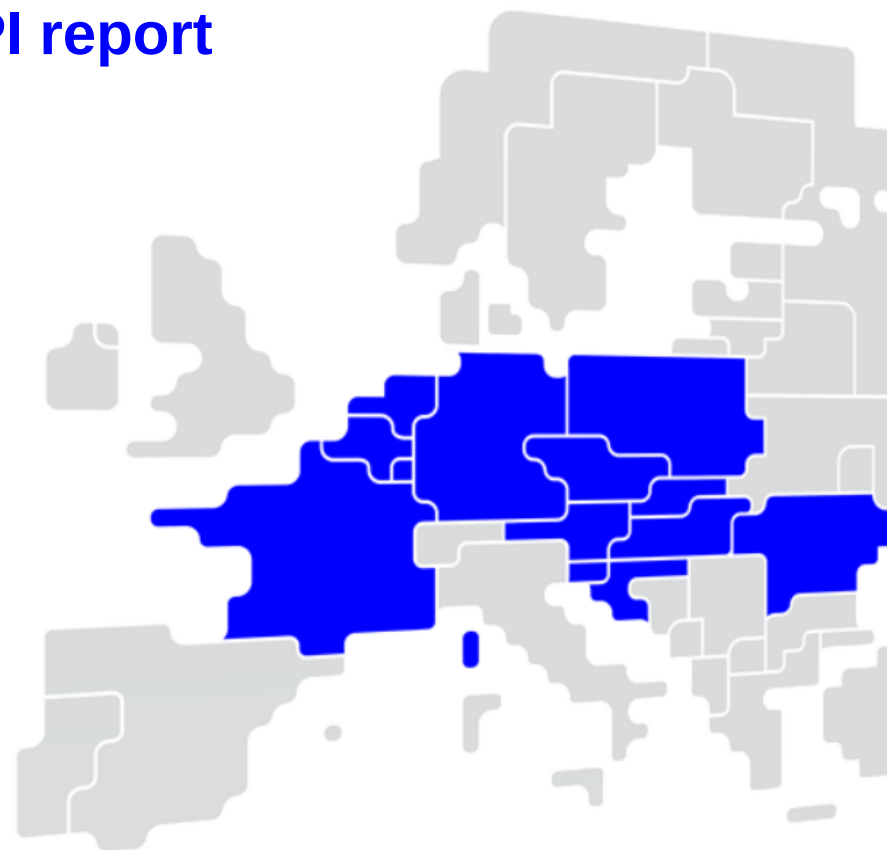




Core FB MC Operational KPI report

September 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

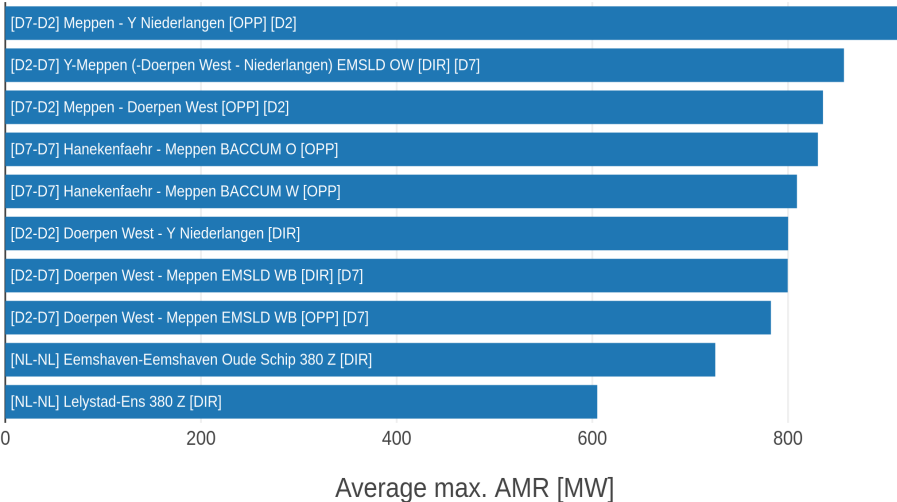
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

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%	AMR/Fmax% (all MTUs)
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	911.69	48.24%	29.34%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	857.14	34.37%	18.19%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	835.72	44.28%	30.13%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	830.50	37.00%	21.07%
[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	809.09	36.60%	22.31%
[D2-D2] Doerpen West - Y Niederlangen [DIR]	800.07	42.32%	25.10%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	799.64	32.79%	19.22%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	782.47	32.07%	18.44%
[NL-NL] Eemshaven-Eemshaven Oude Schip 380 Z [DIR]	725.65	26.19%	1.75%
[NL-NL] Lelystad-Ens 380 Z [DIR]	605.00	21.83%	0.09%

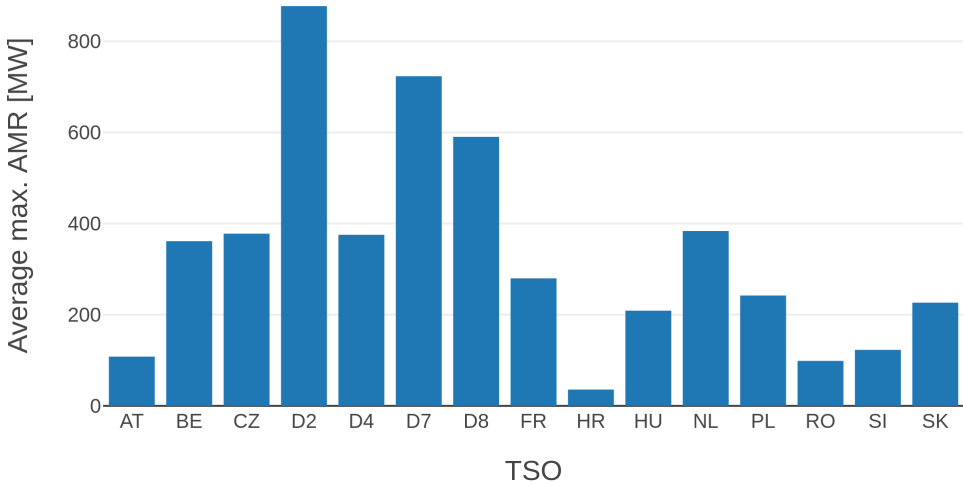


KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	108.00
BE	361.41
CZ	377.94
D2	877.24
D4	375.53
D7	723.23
D8	590.19
FR	279.65
HR	35.64
HU	208.73

TSO	Average maximum AMR per TSO
NL	383.78
PL	242.12
RO	98.72
SI	122.95
SK	226.54



KPI 3: Share of MTUs with intervention per TSO



Total BDs
30

Total MTUs
720

MTUs without IVA
92

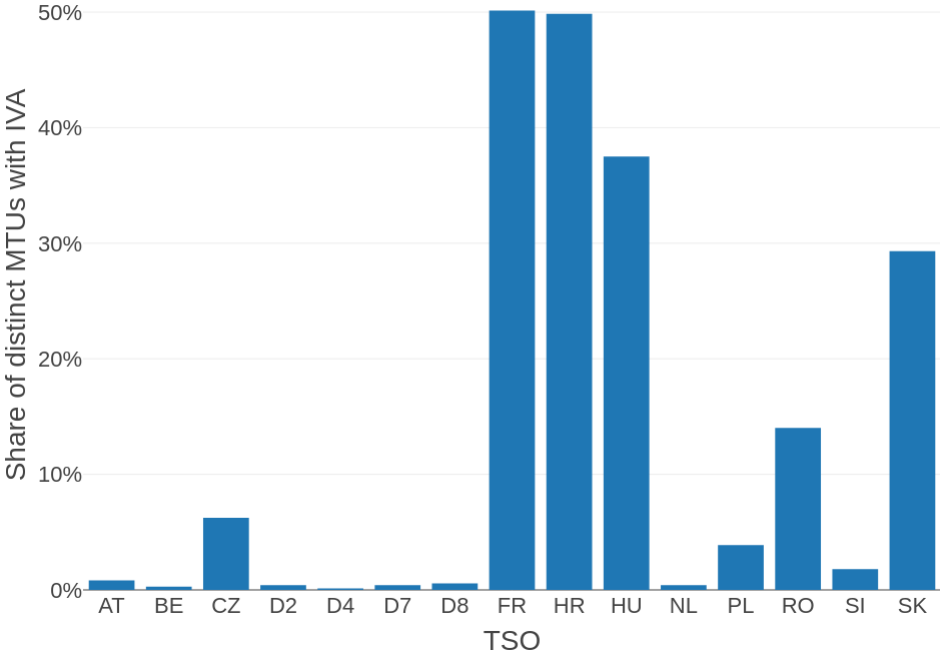
Share of distinct MTUs without IVA
12.78%

MTUs with IVA
628

Share of distinct MTUs with IVA
87.2%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.83%	6
BE	0.28%	2
CZ	6.25%	45
D2	0.42%	3
D4	0.14%	1
D7	0.42%	3
D8	0.56%	4
FR	50.14%	361
HR	49.86%	359
HU	37.50%	270

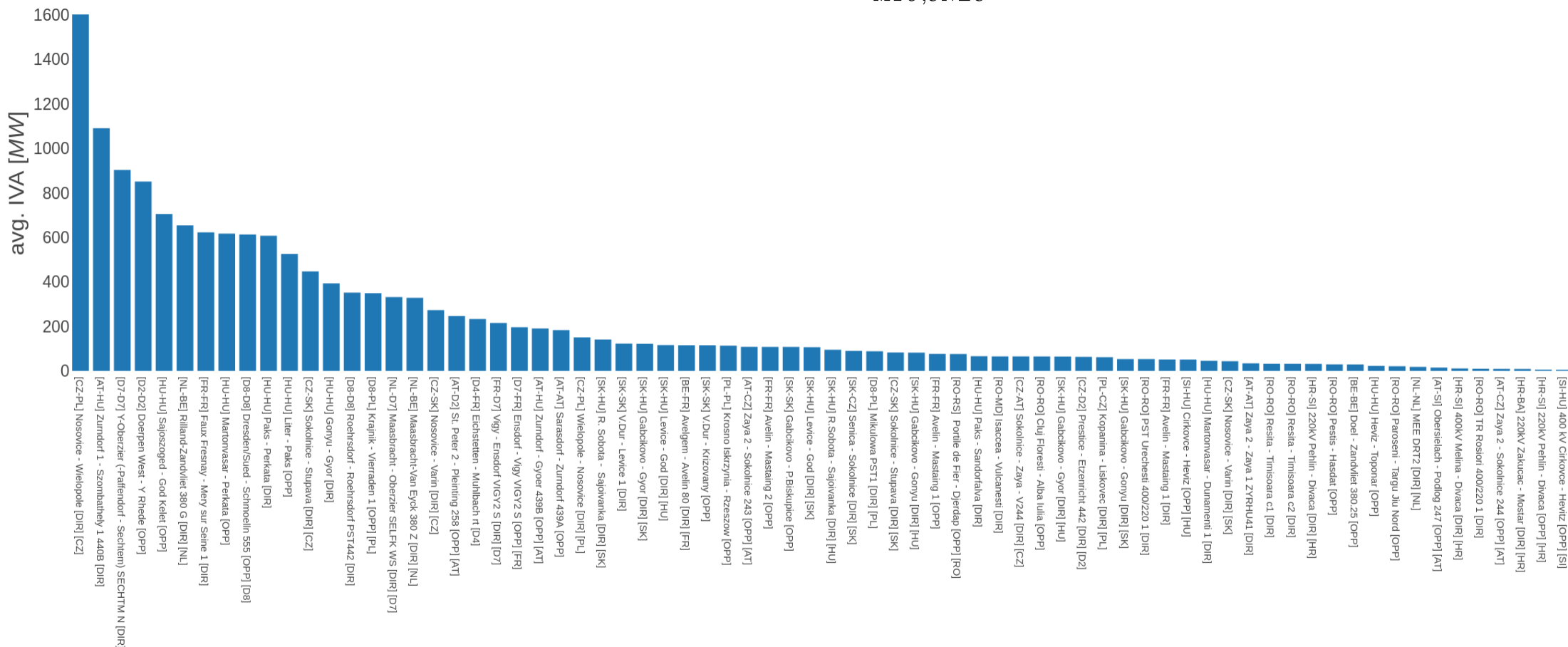
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
NL	0.42%	3
PL	3.89%	28
RO	14.03%	101
SI	1.81%	13
SK	29.31%	211



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



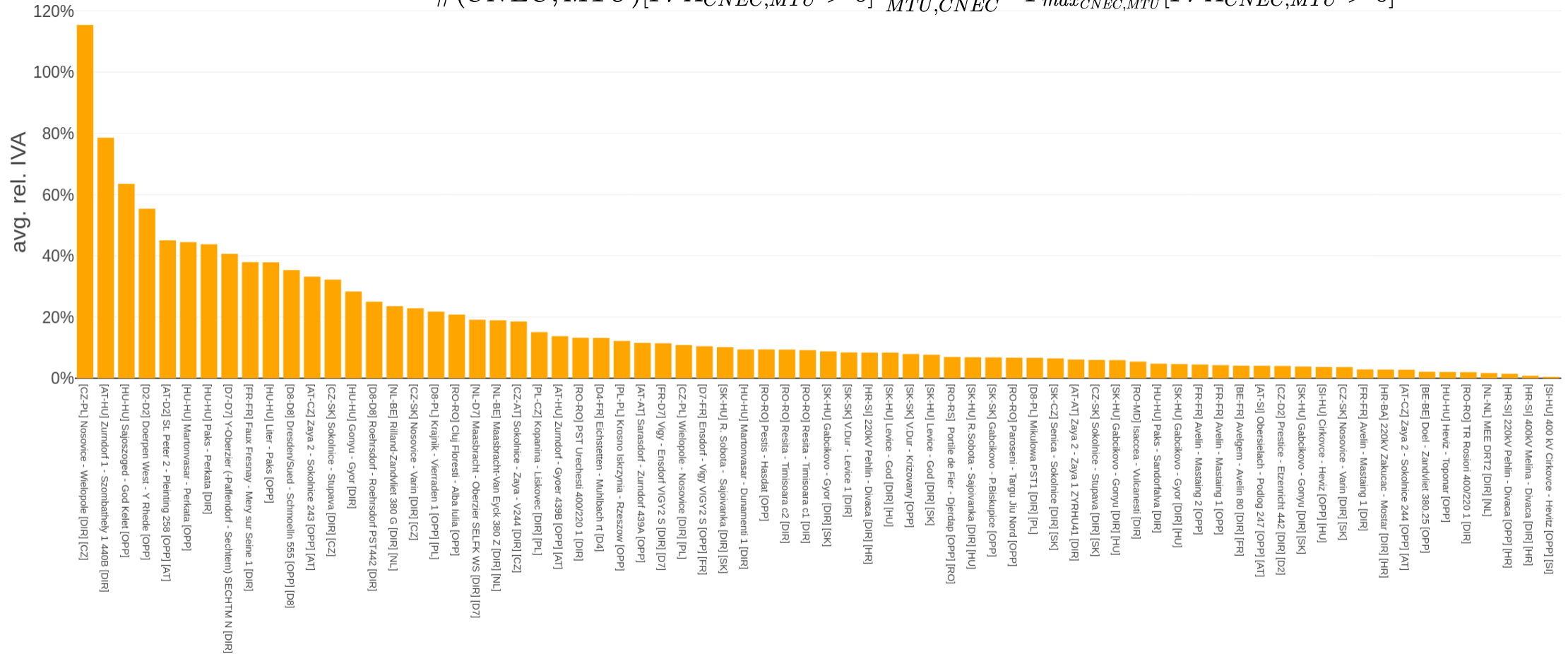
$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]$$



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



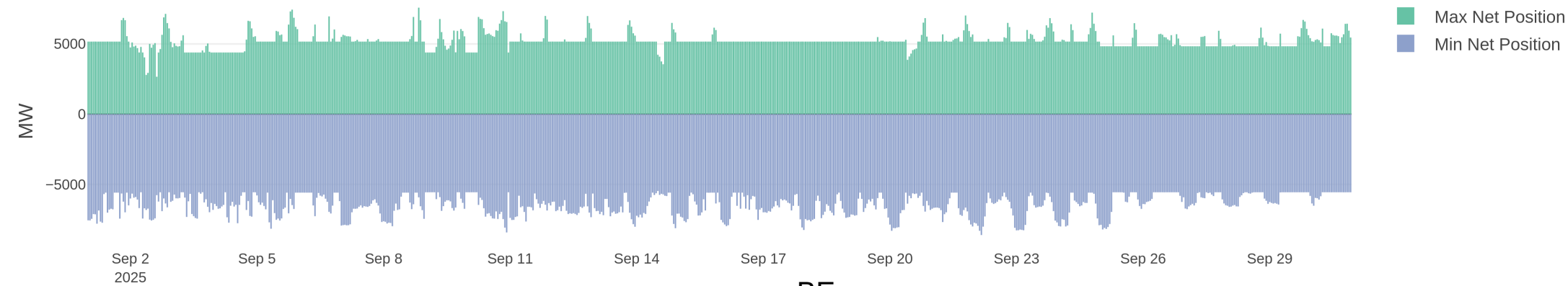
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{maxCNEC, MTU}[IVA_{CNEC, MTU} > 0]}$$



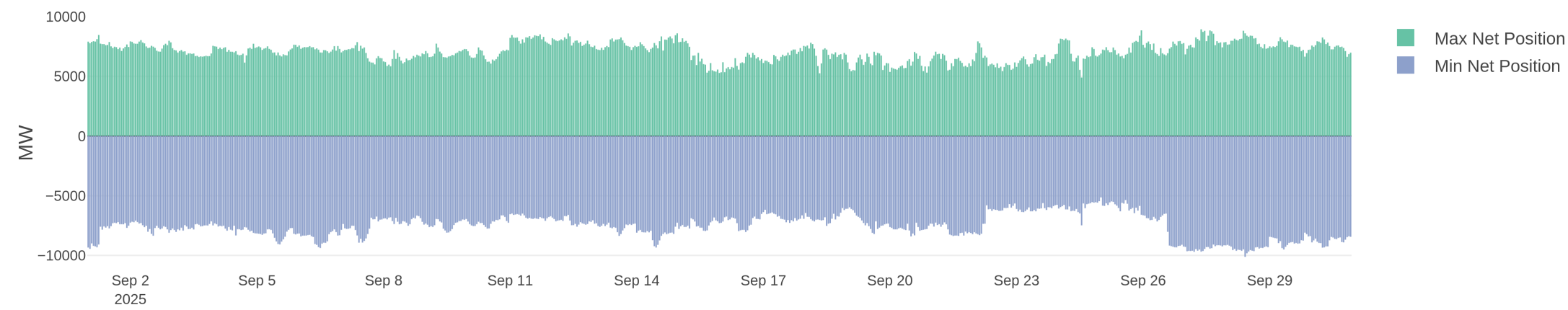
KPI 5: Min & max net positions per BZ hub



AT



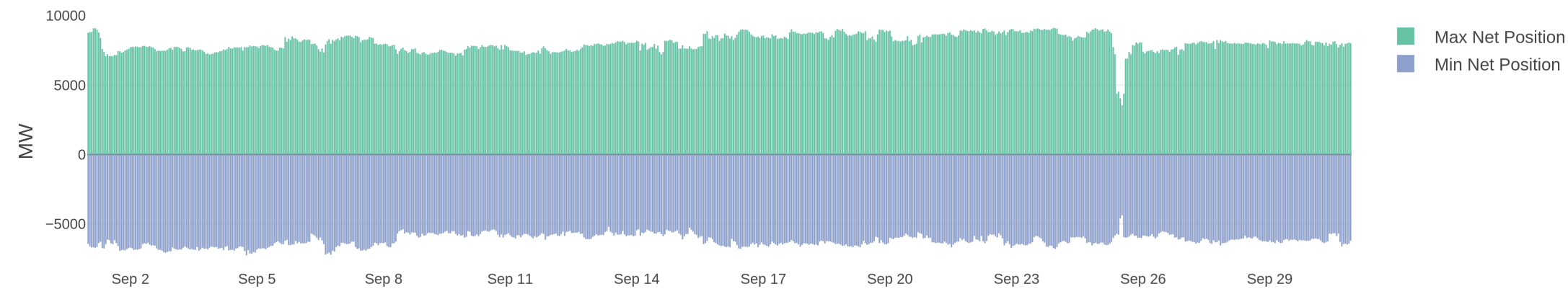
BE



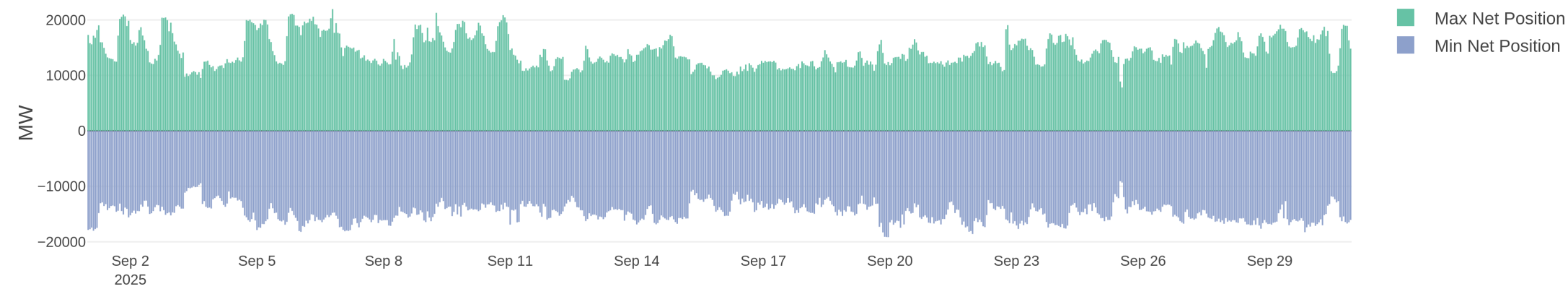
KPI 5: Min & max net positions per BZ hub



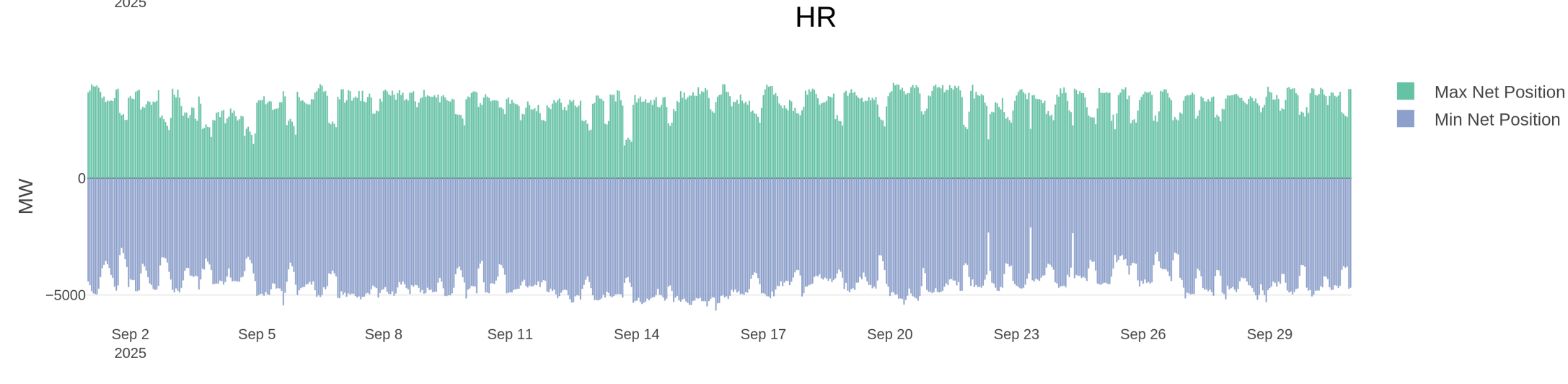
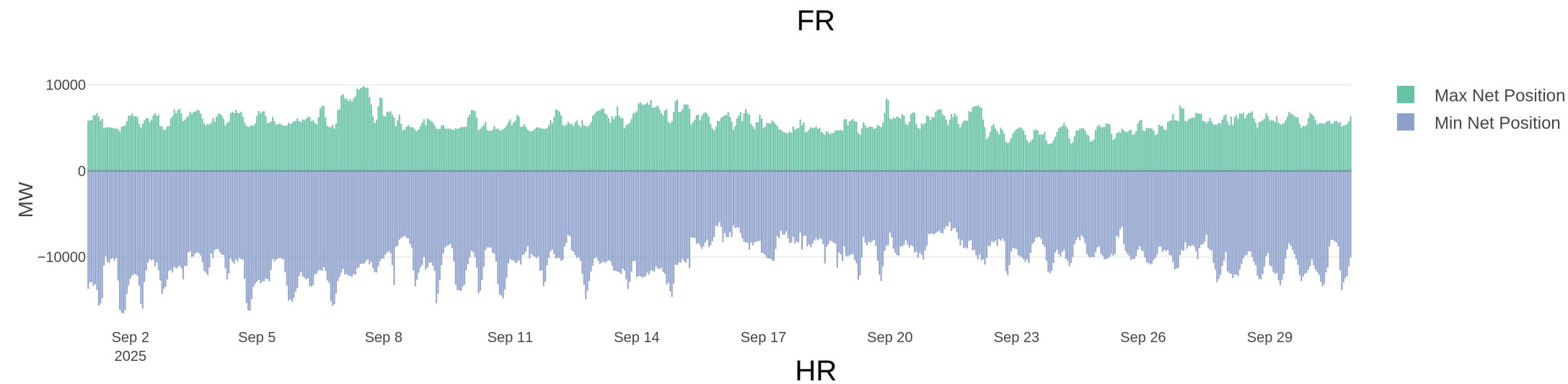
CZ



DE



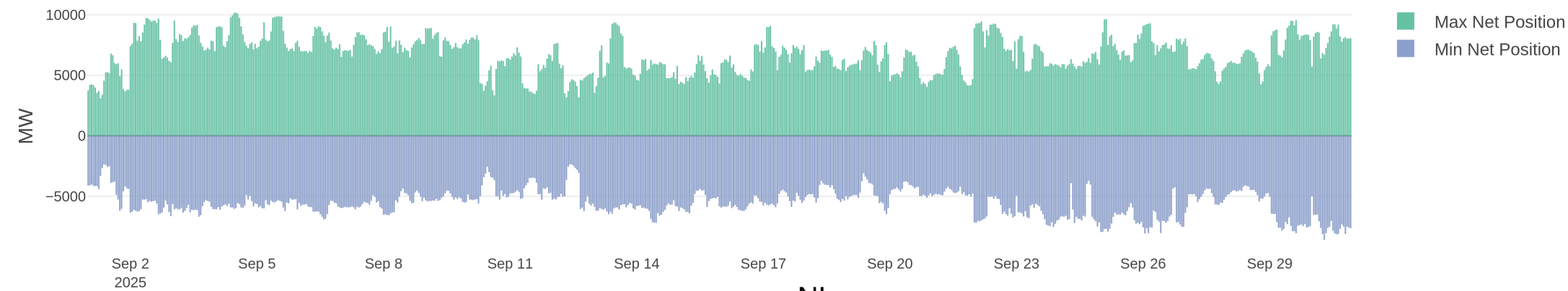
KPI 5: Min & max net positions per BZ hub



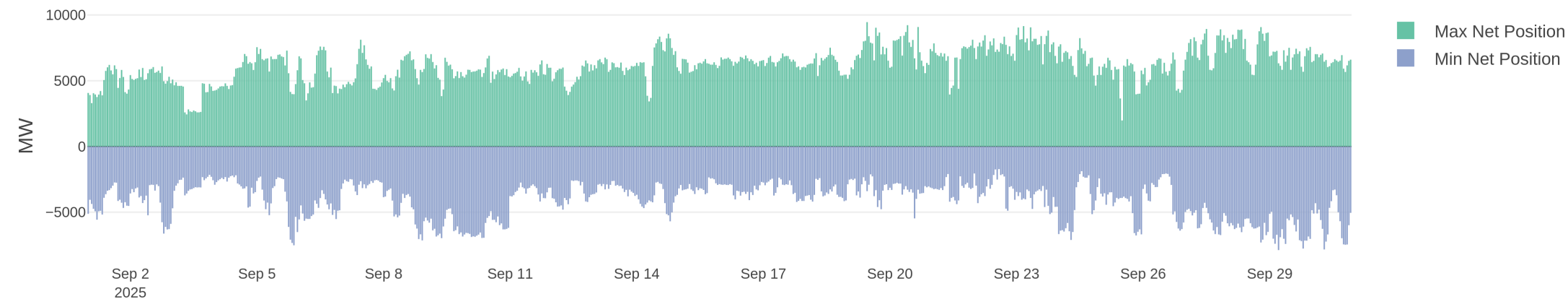
KPI 5: Min & max net positions per BZ hub



HU



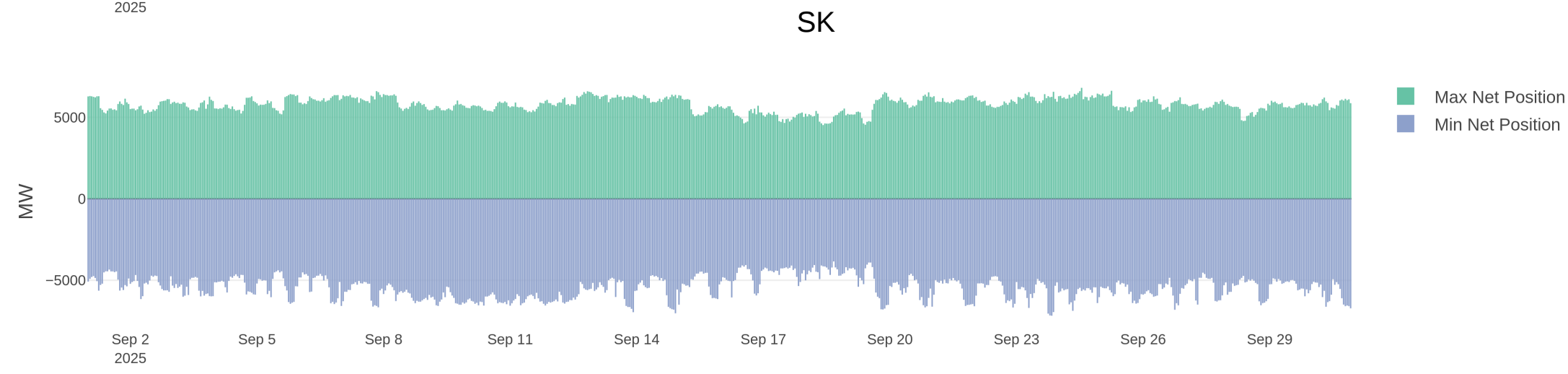
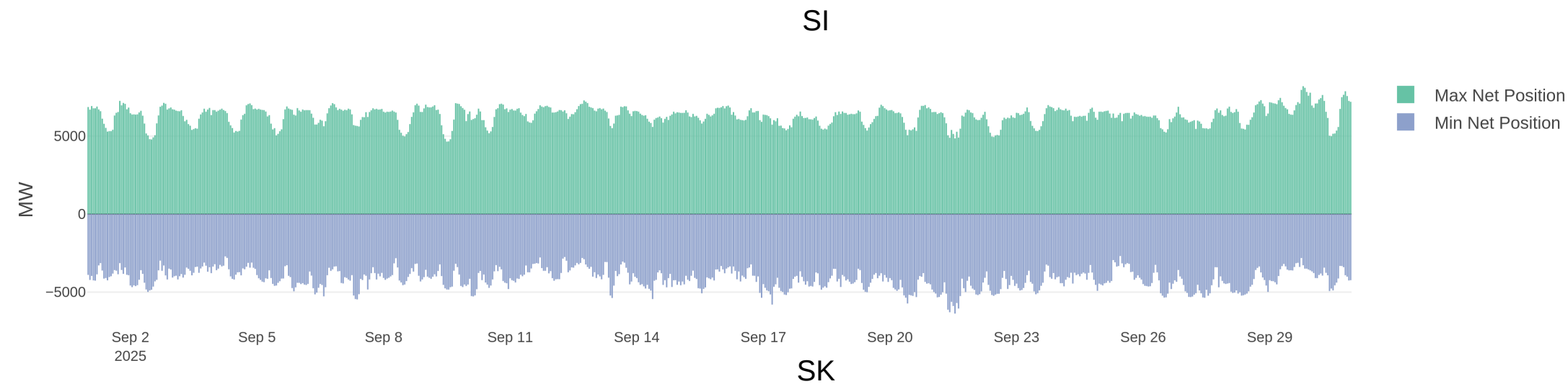
NL



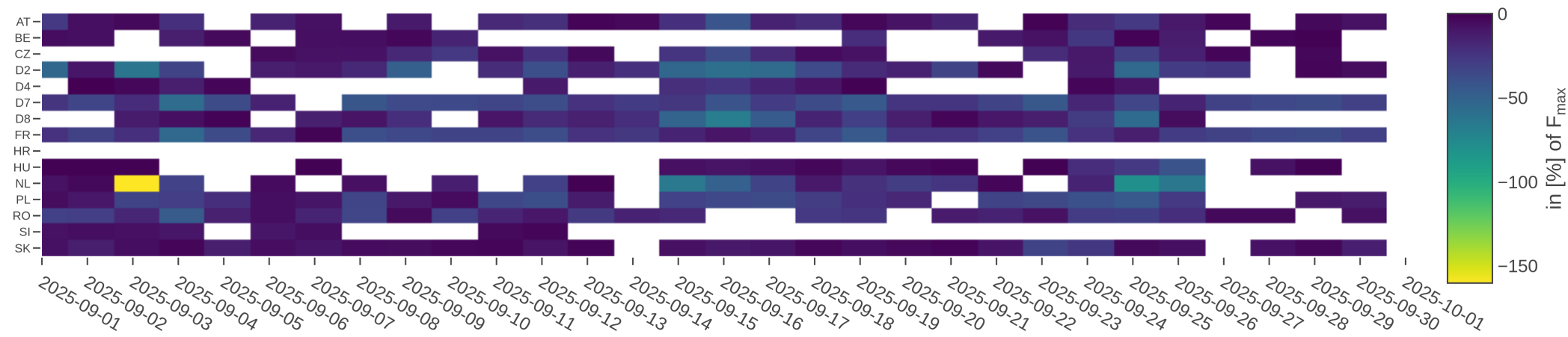
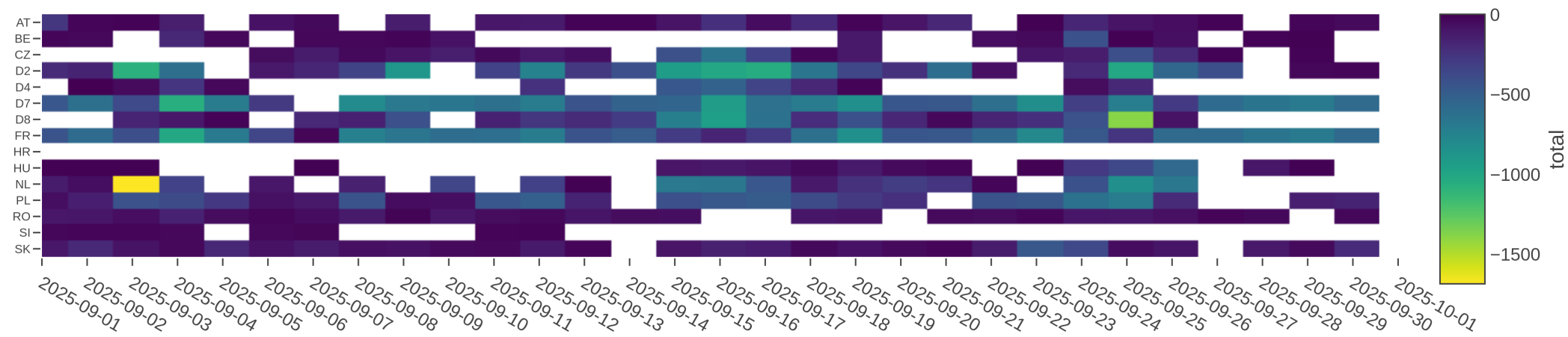
KPI 5: Min & max net positions per BZ hub



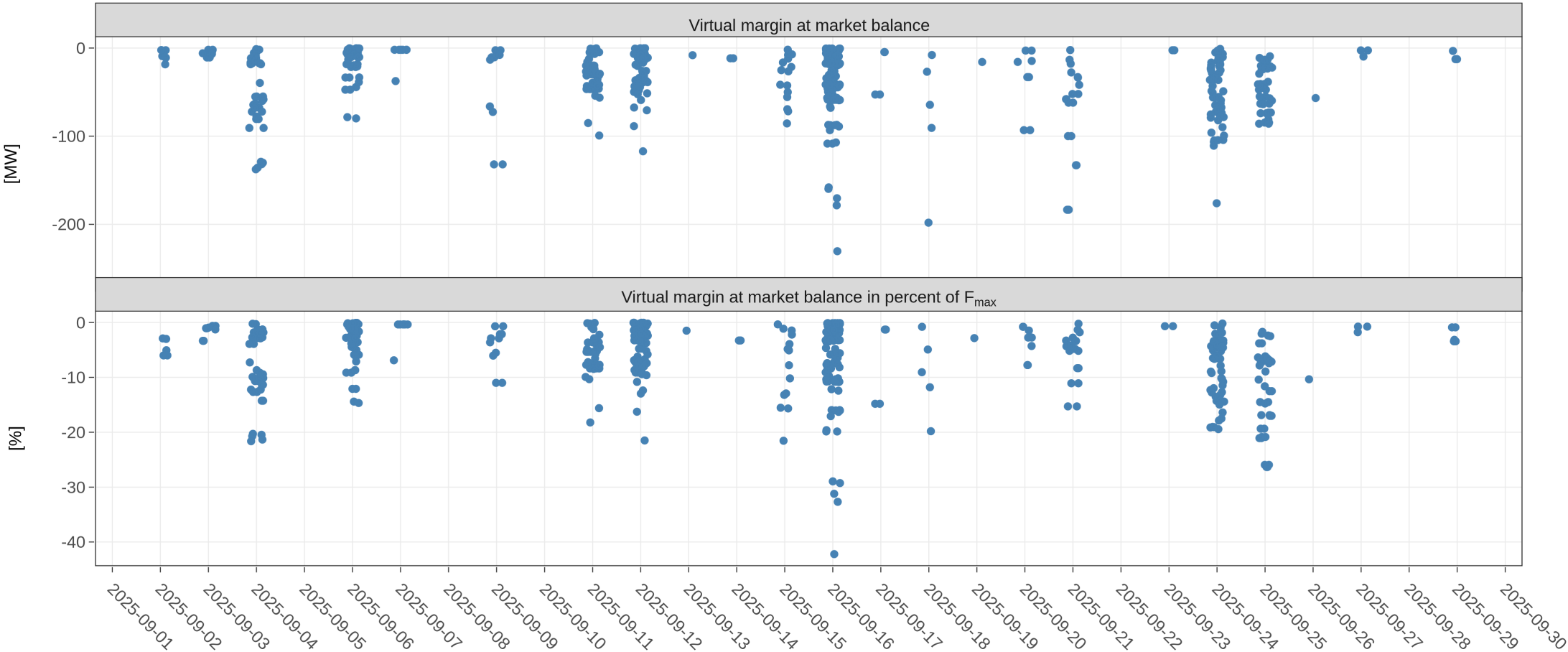
KPI 5: Min & max net positions per BZ hub



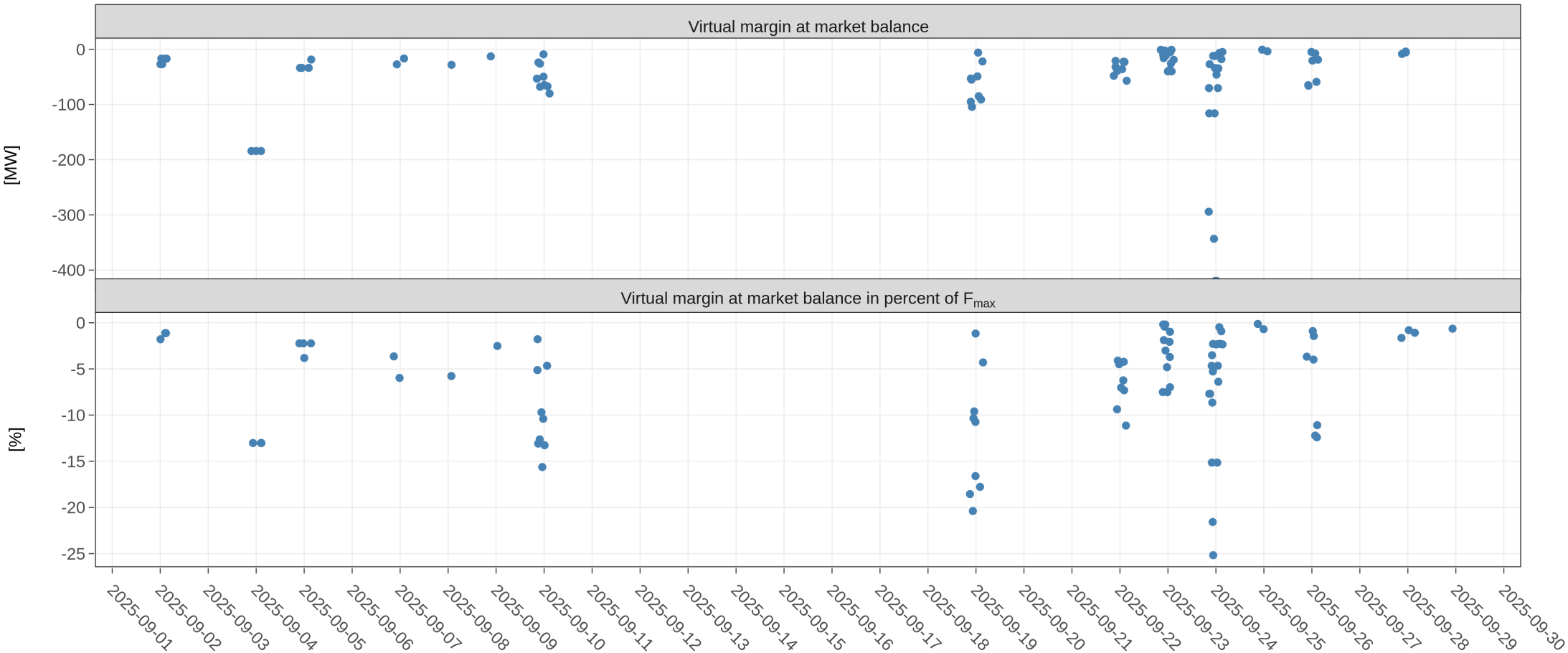
KPI 6a: Highest virtual margins at market balance for CORE TSOs



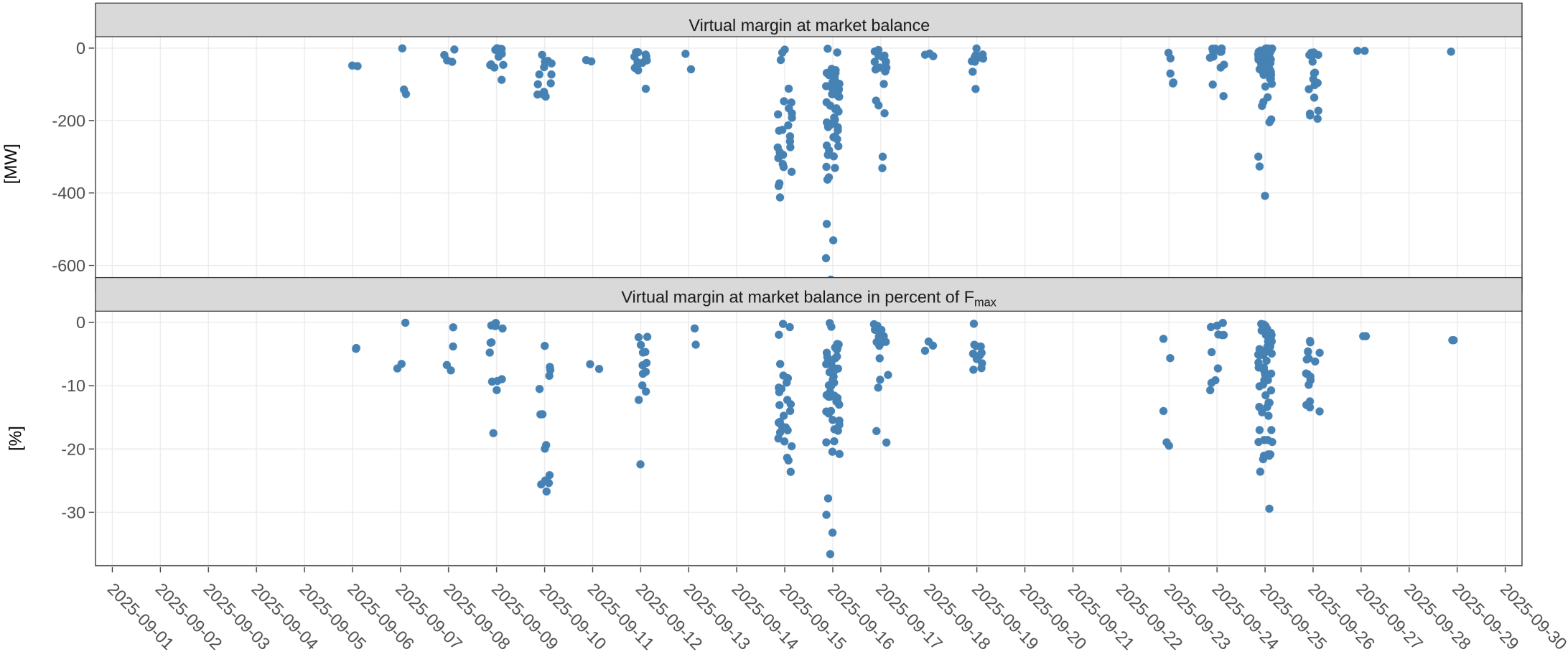
KPI 6b: Virtual margins at market balance AT



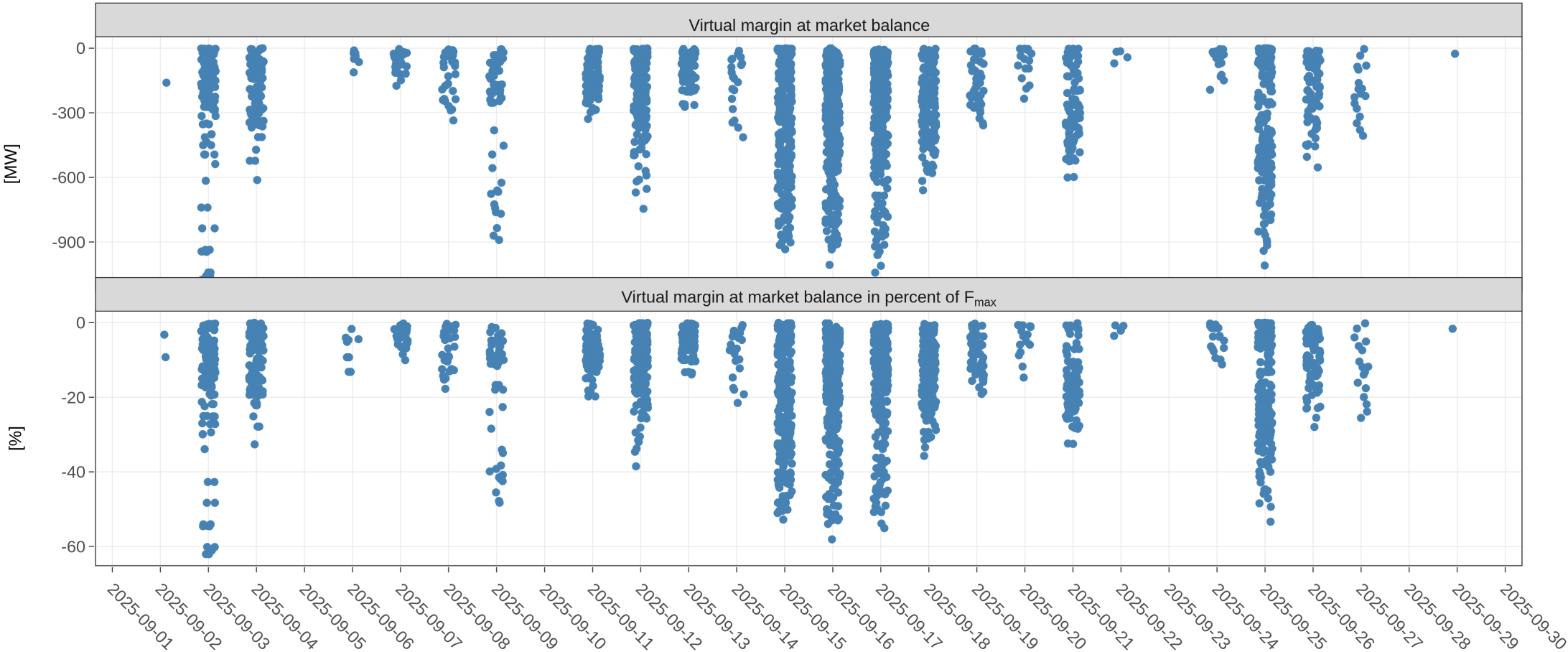
KPI 6b: Virtual margins at market balance BE



KPI 6b: Virtual margins at market balance CZ



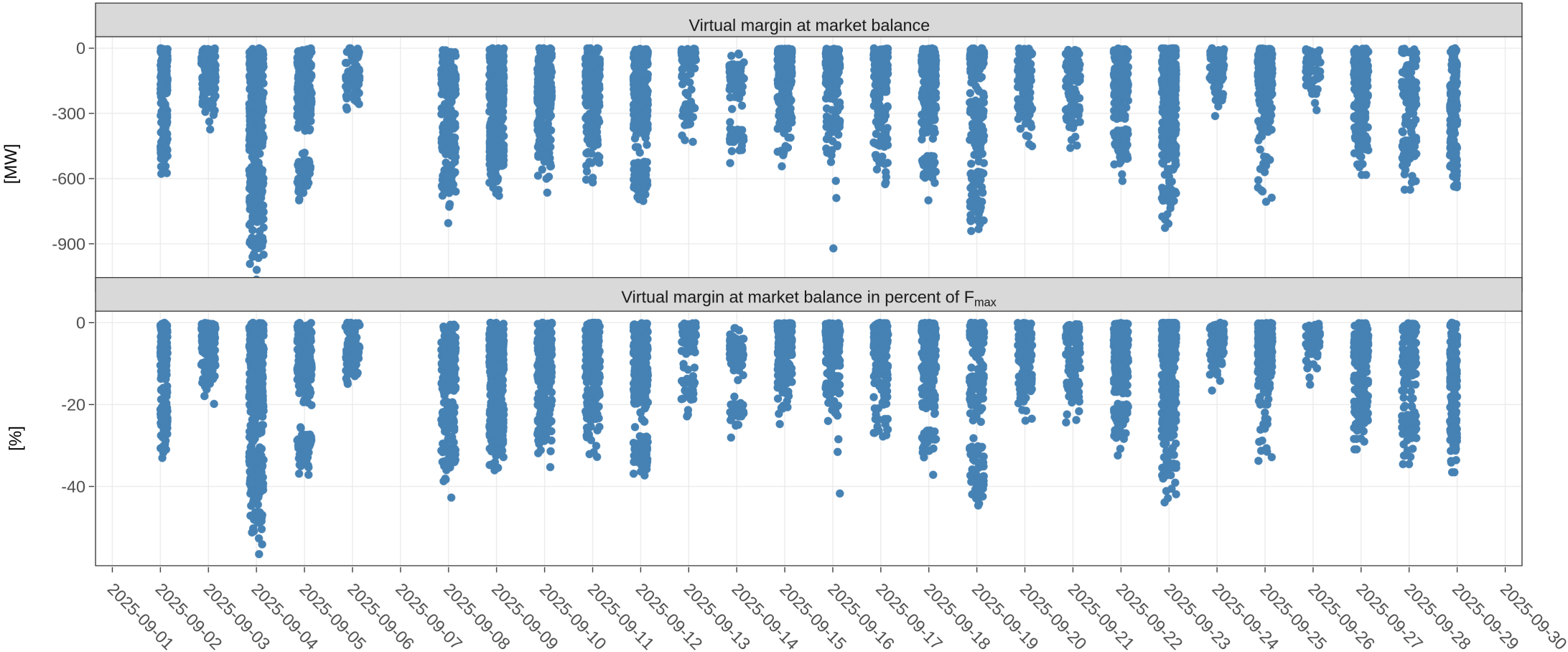
KPI 6b: Virtual margins at market balance D2



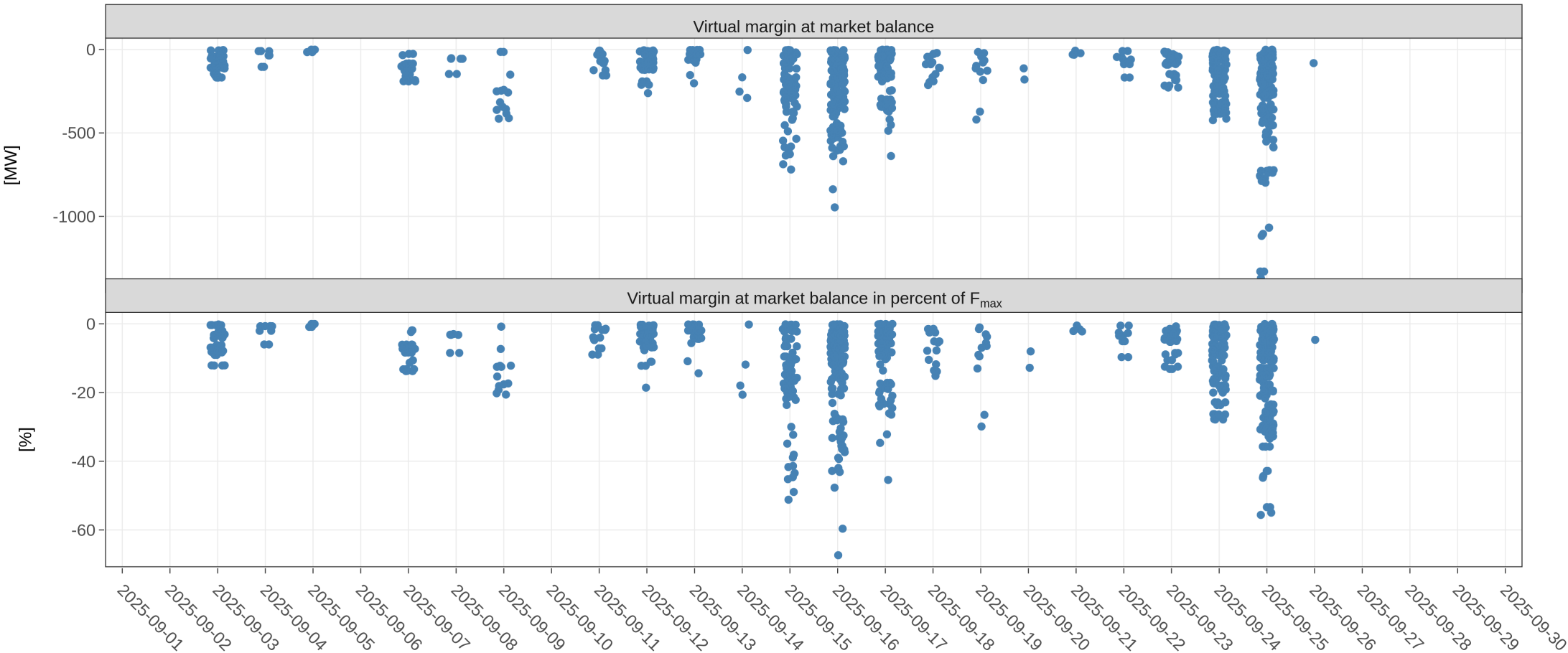
KPI 6b: Virtual margins at market balance D4



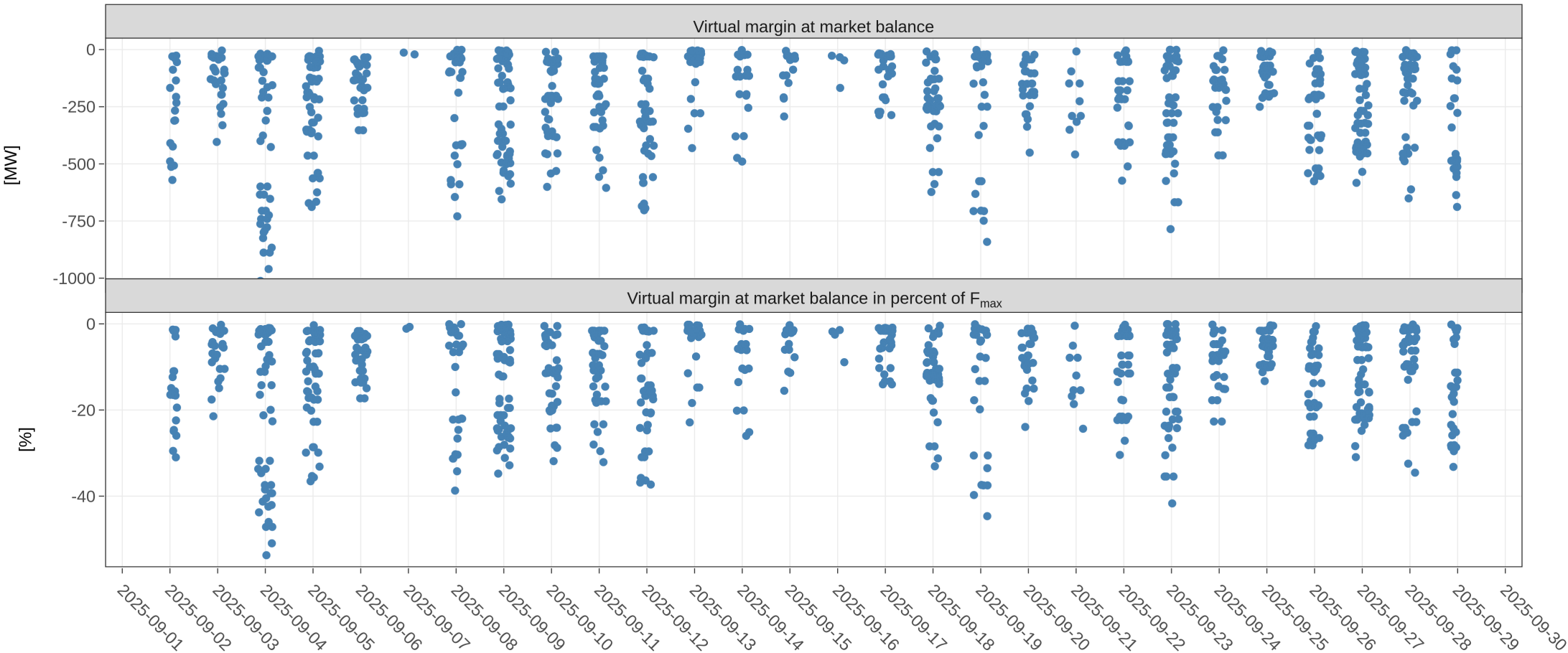
KPI 6b: Virtual margins at market balance D7



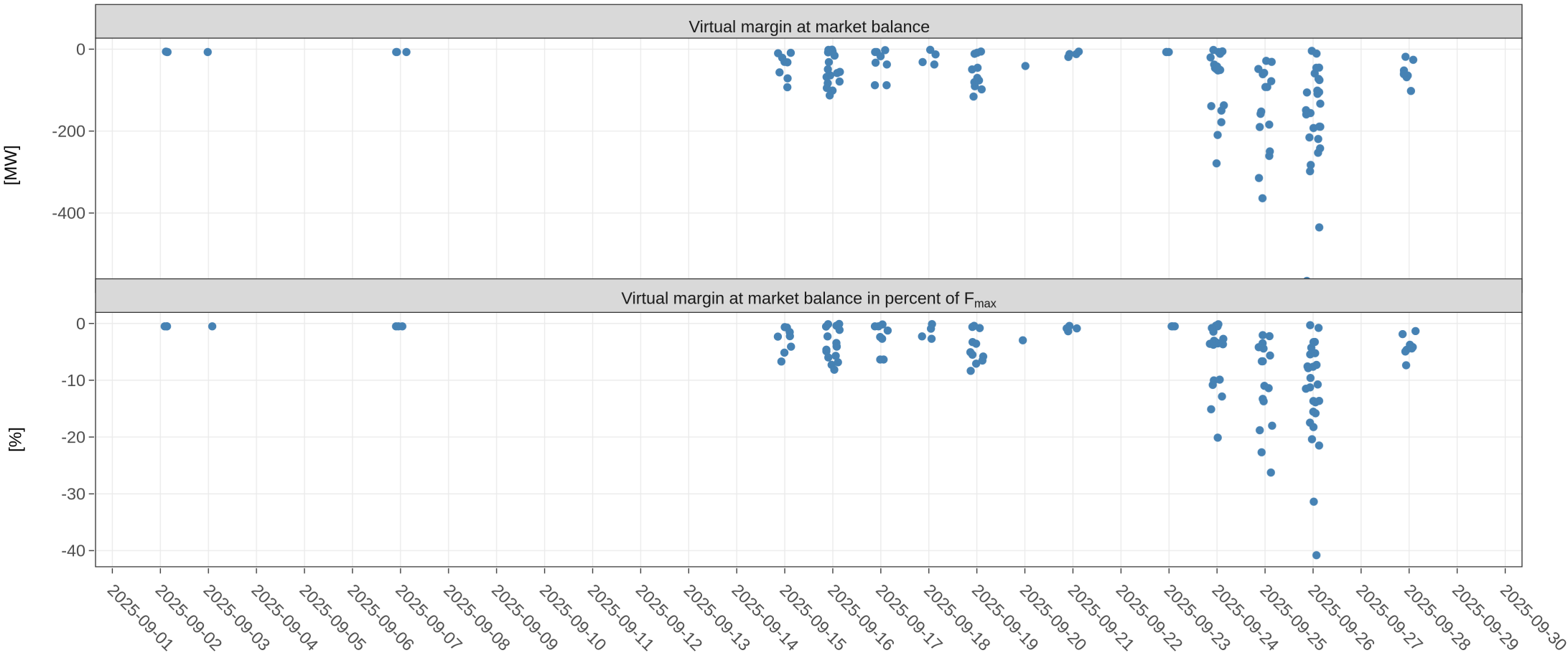
KPI 6b: Virtual margins at market balance D8



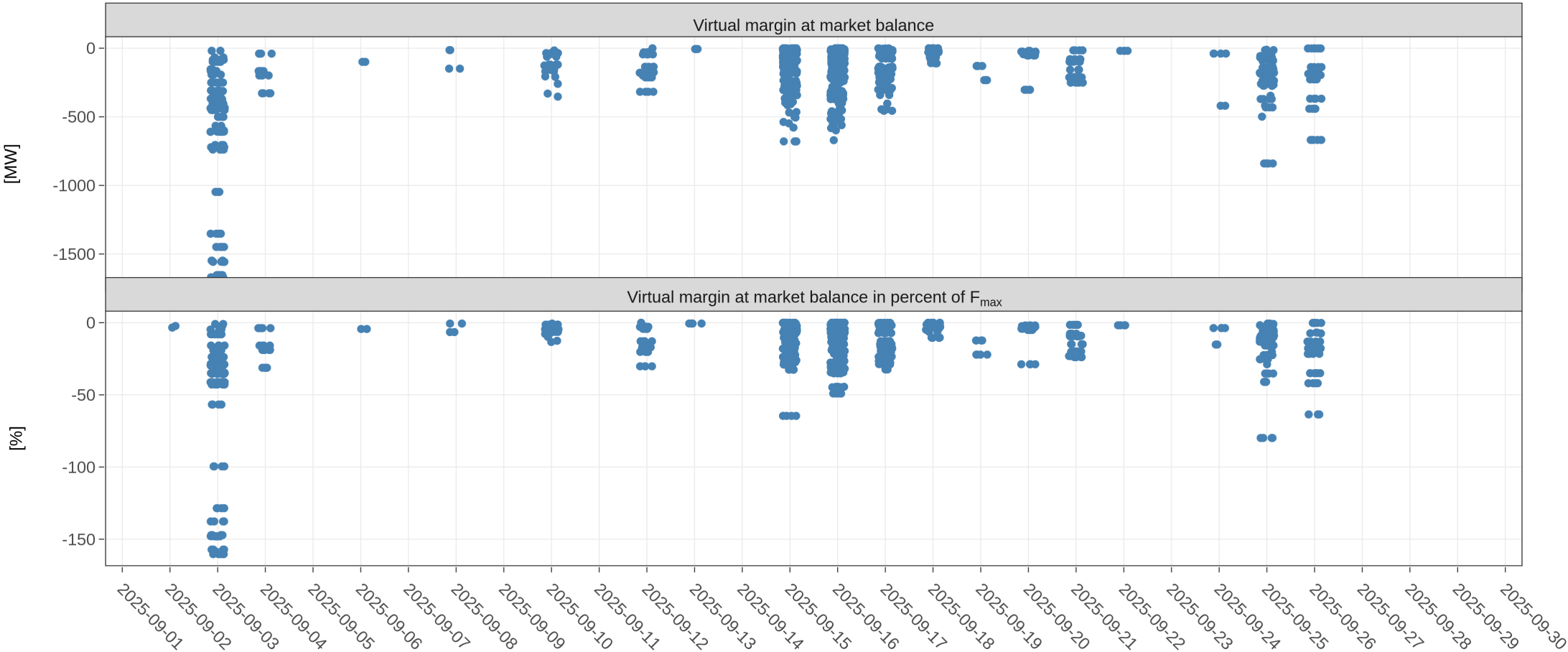
KPI 6b: Virtual margins at market balance FR



KPI 6b: Virtual margins at market balance HU



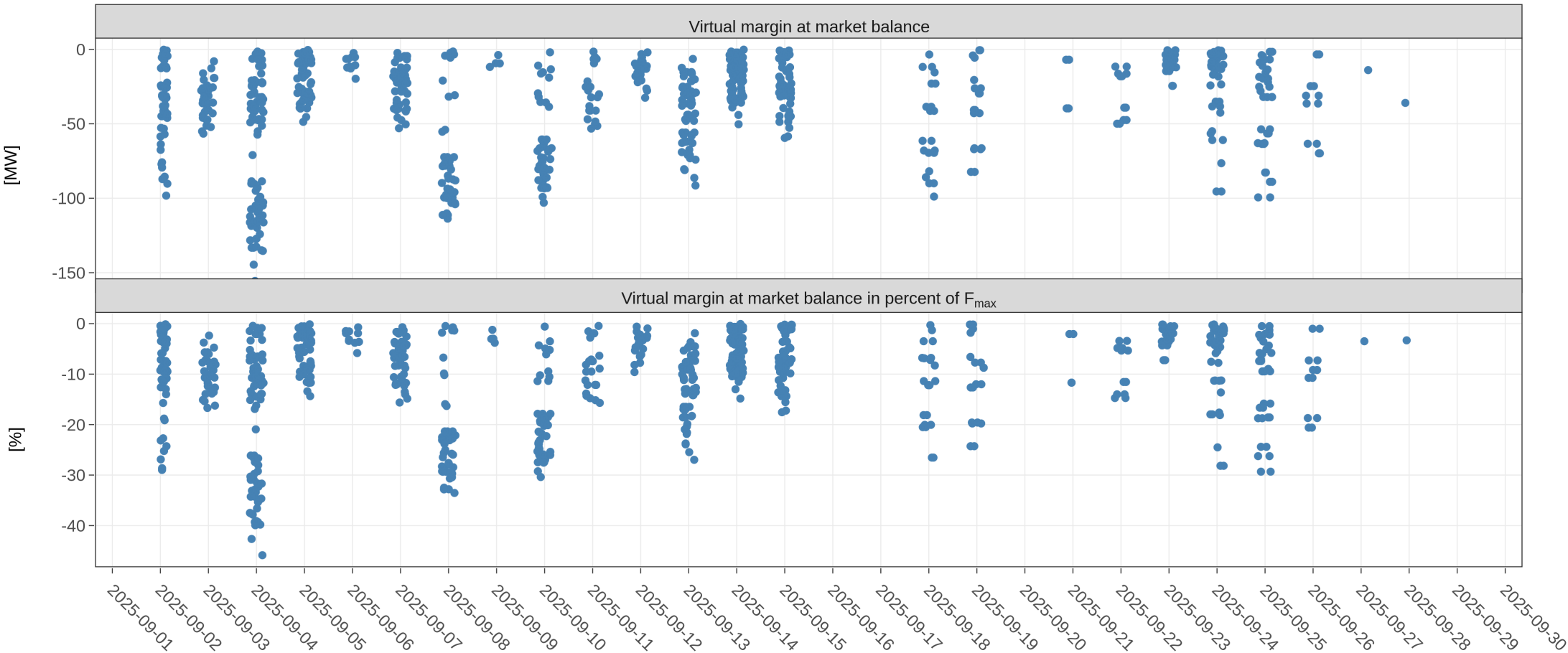
KPI 6b: Virtual margins at market balance NL



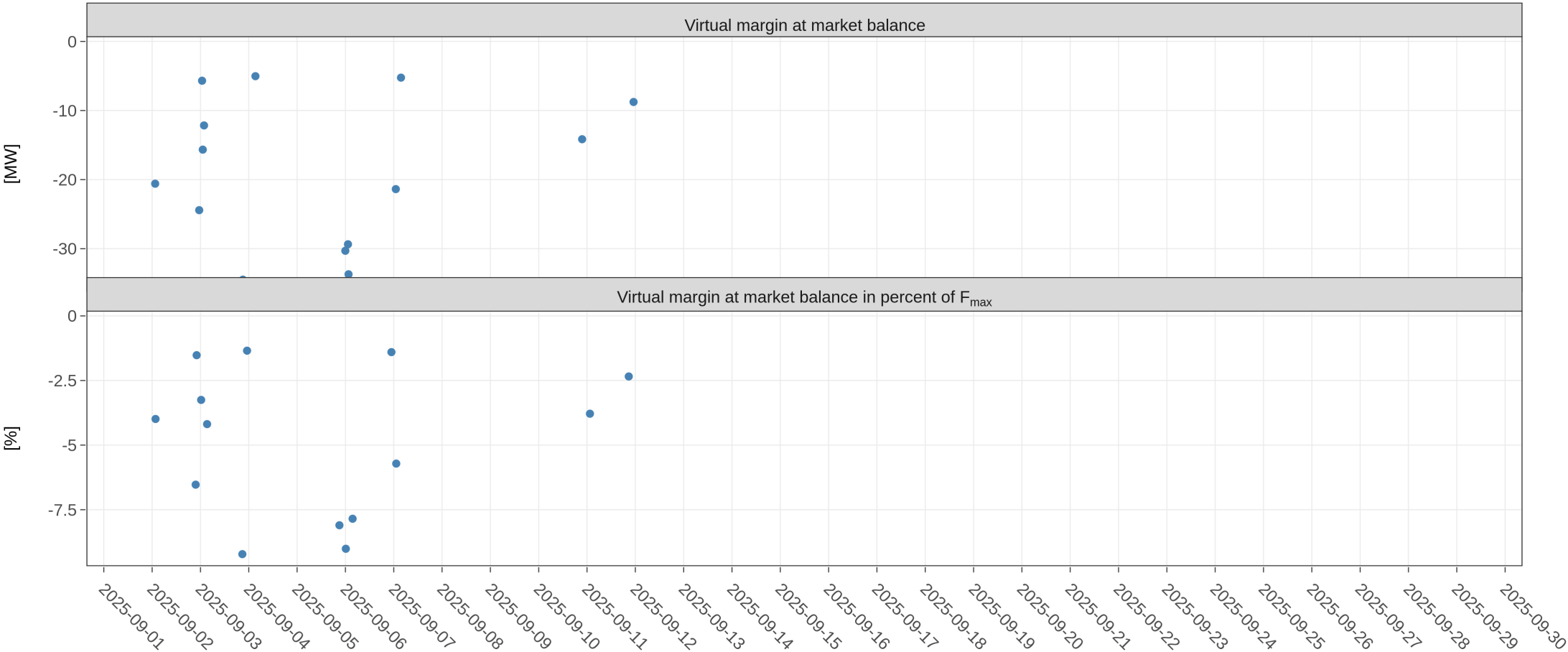
KPI 6b: Virtual margins at market balance PL



KPI 6b: Virtual margins at market balance RO



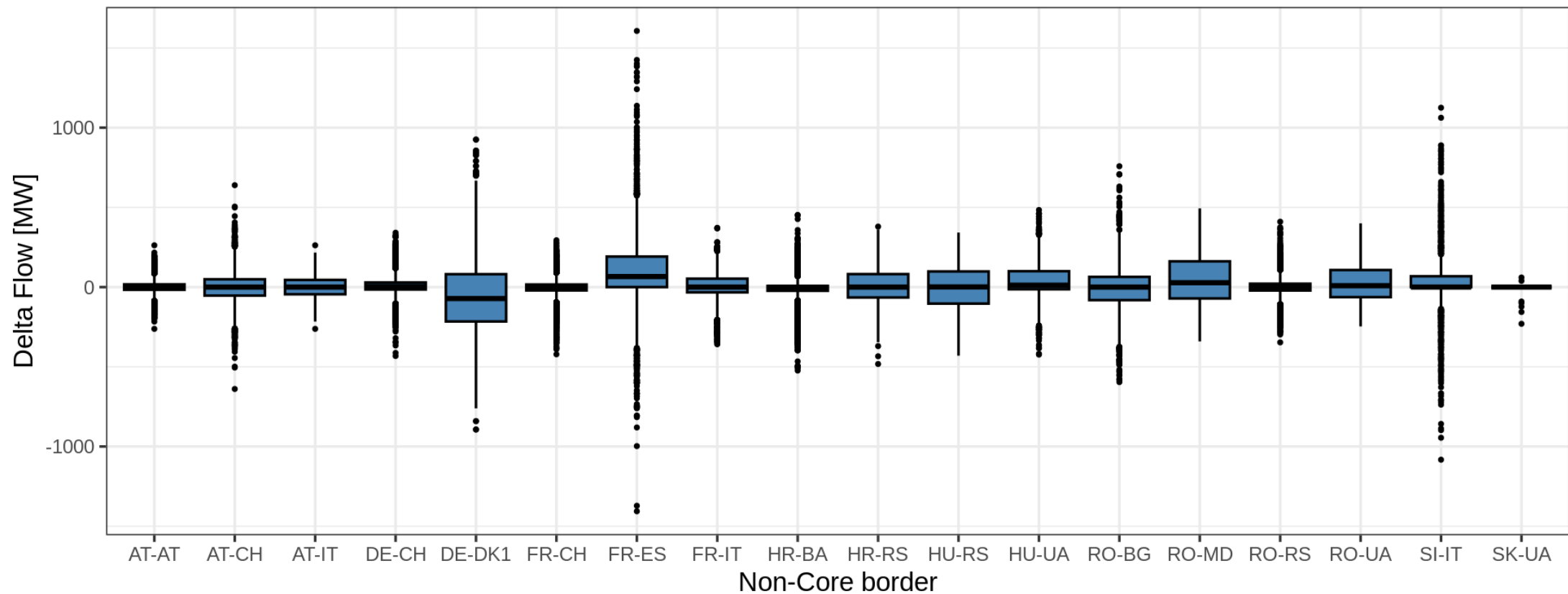
KPI 6b: Virtual margins at market balance SI



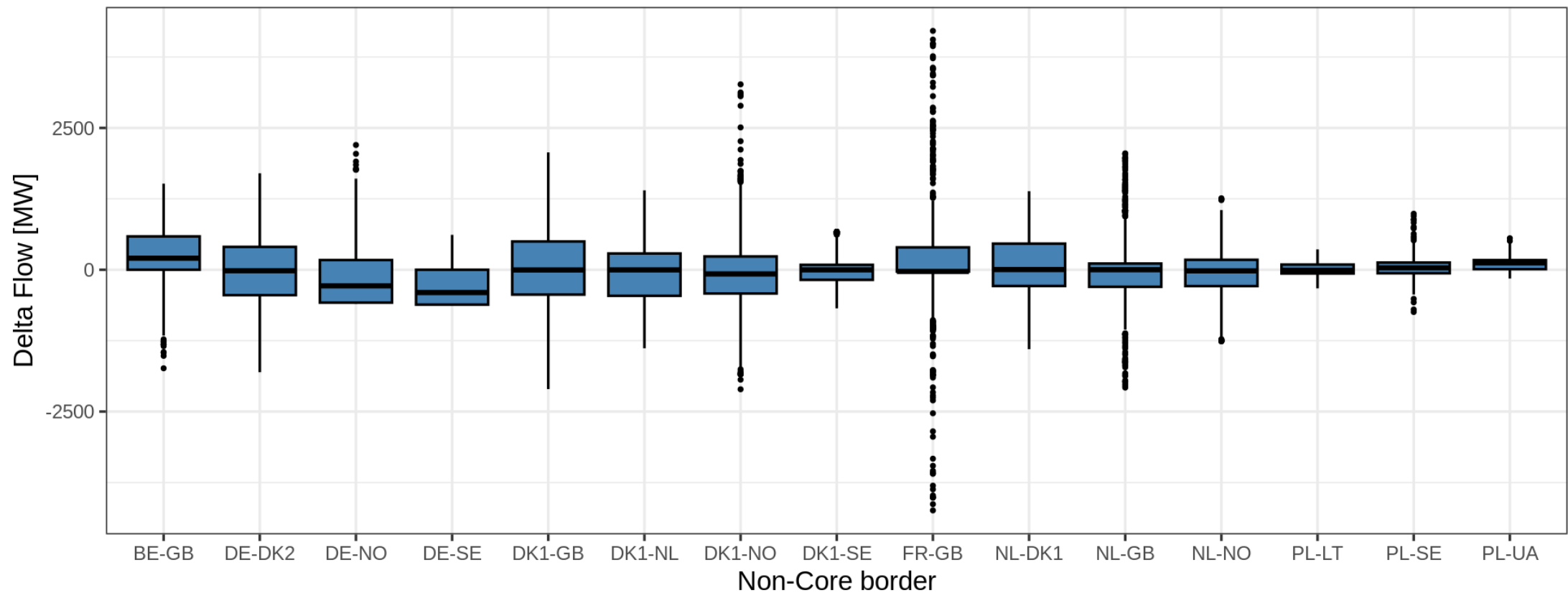
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



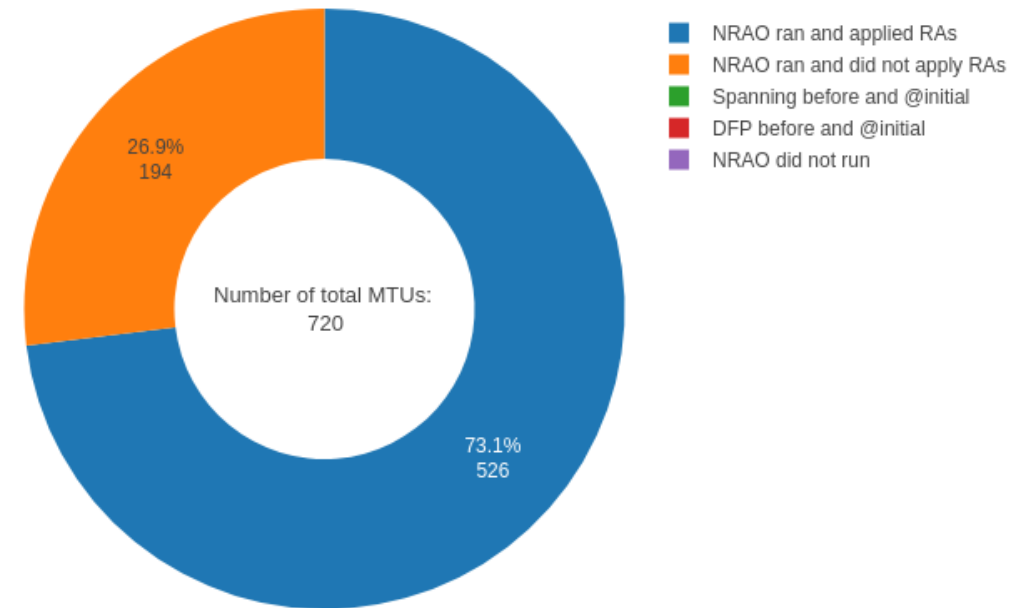
KPI 8: NRAO – Applied Remedial Action



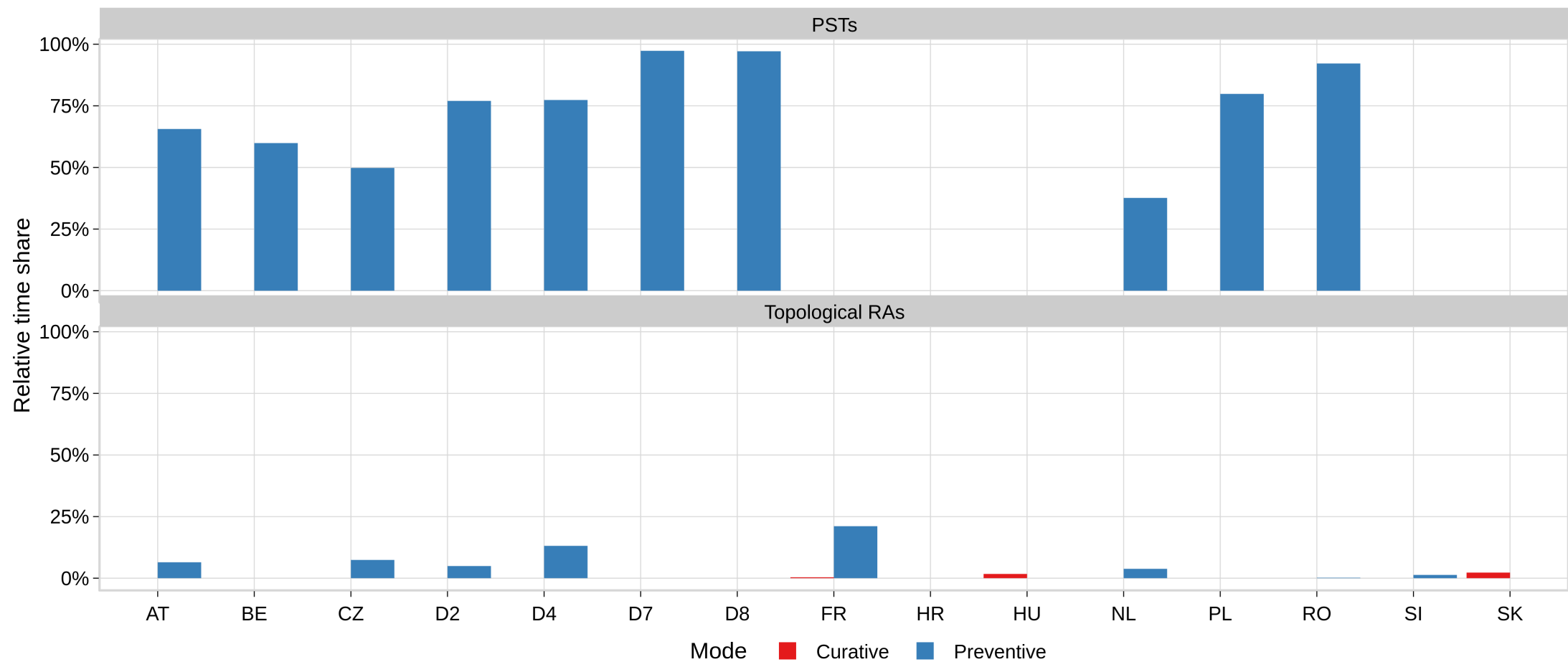
In the following plots, the relative time share relates to the hours labeled 'NRAO Ran and Applied RAs'.

Total MTUs: 720 hours

Category	Hours (%)
NRAO ran and applied RAs	526 hours (73.1%)
NRAO ran and did not apply RAs	194 hours (26.9%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

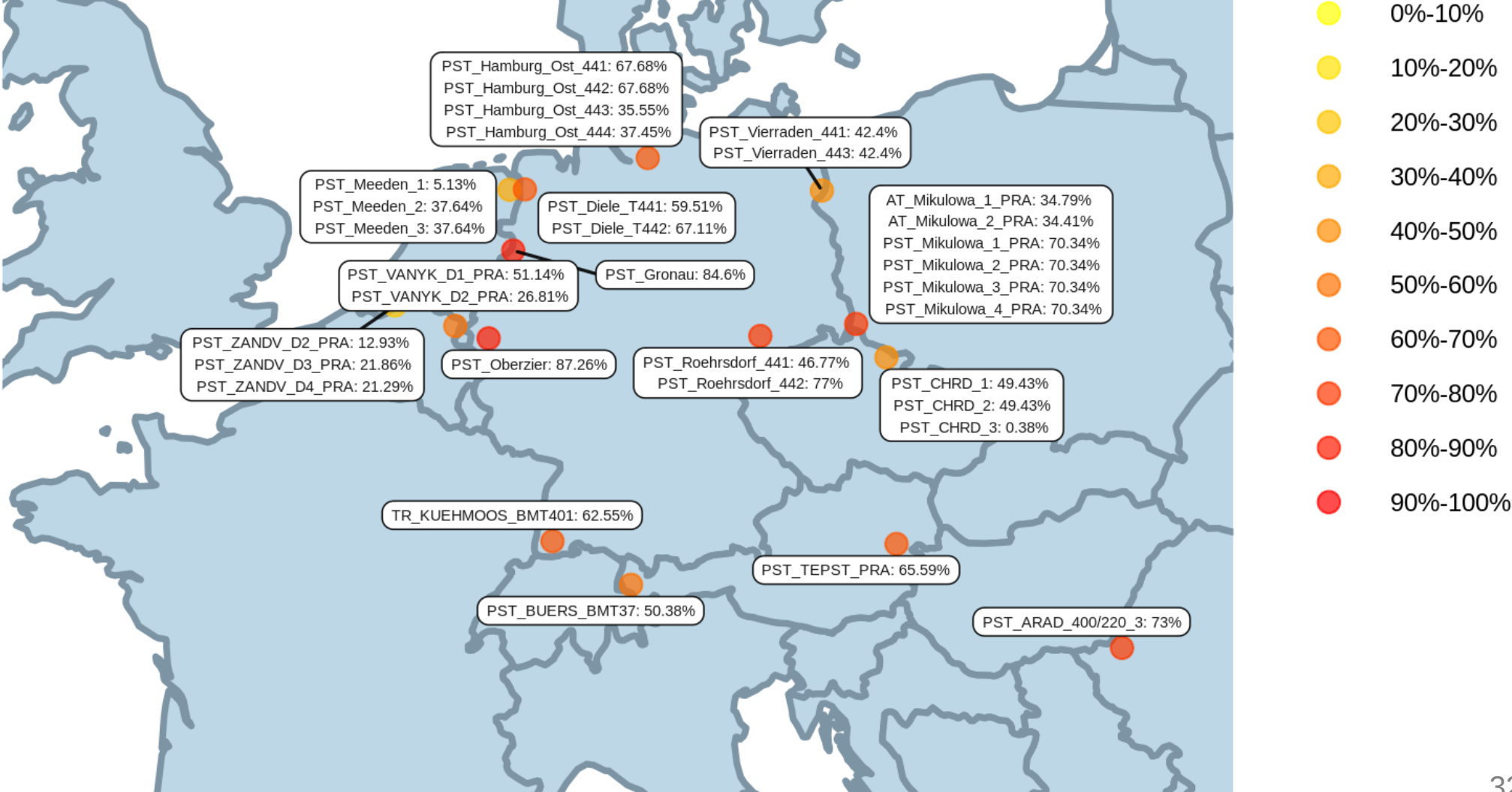


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



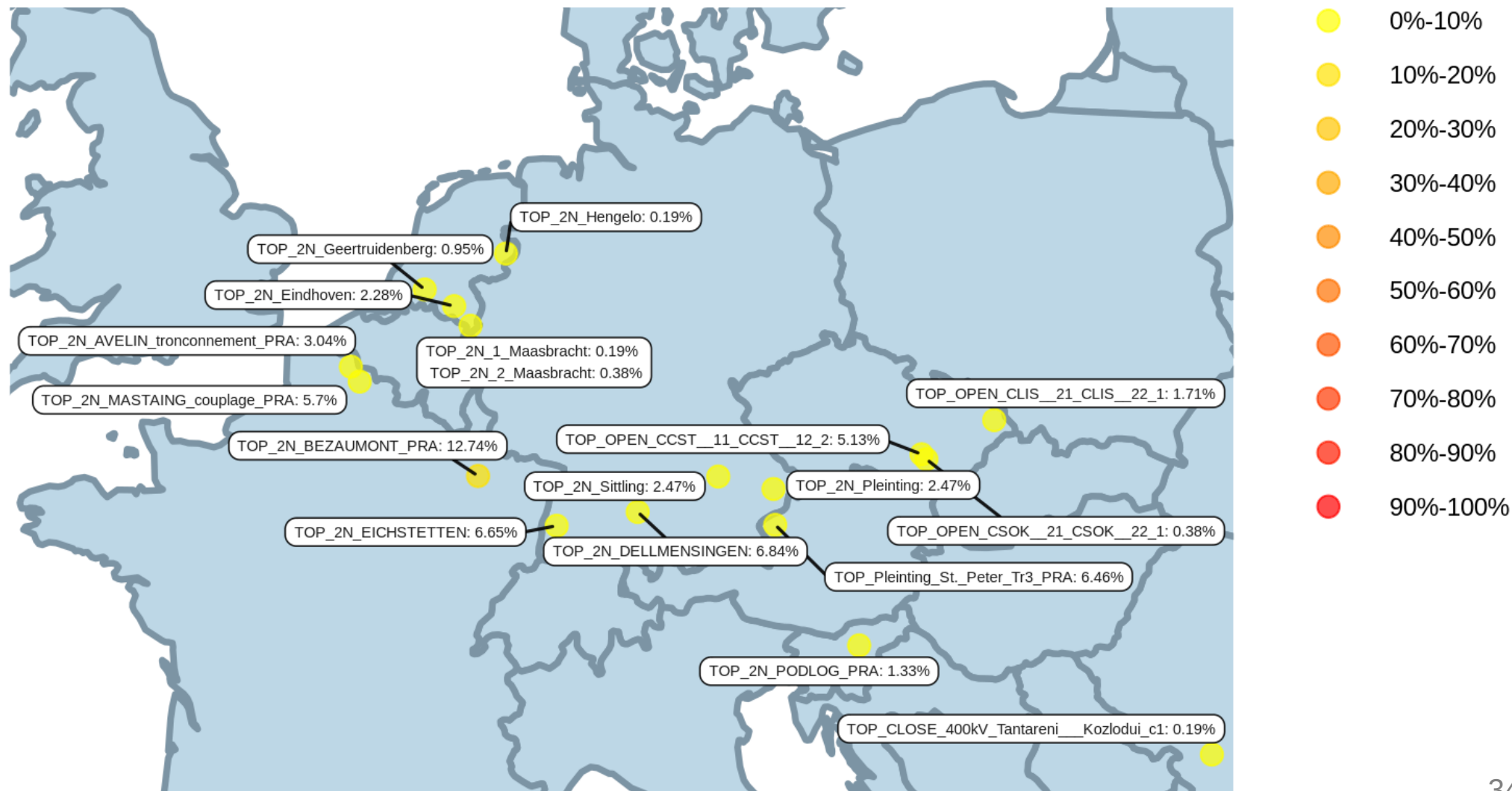
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



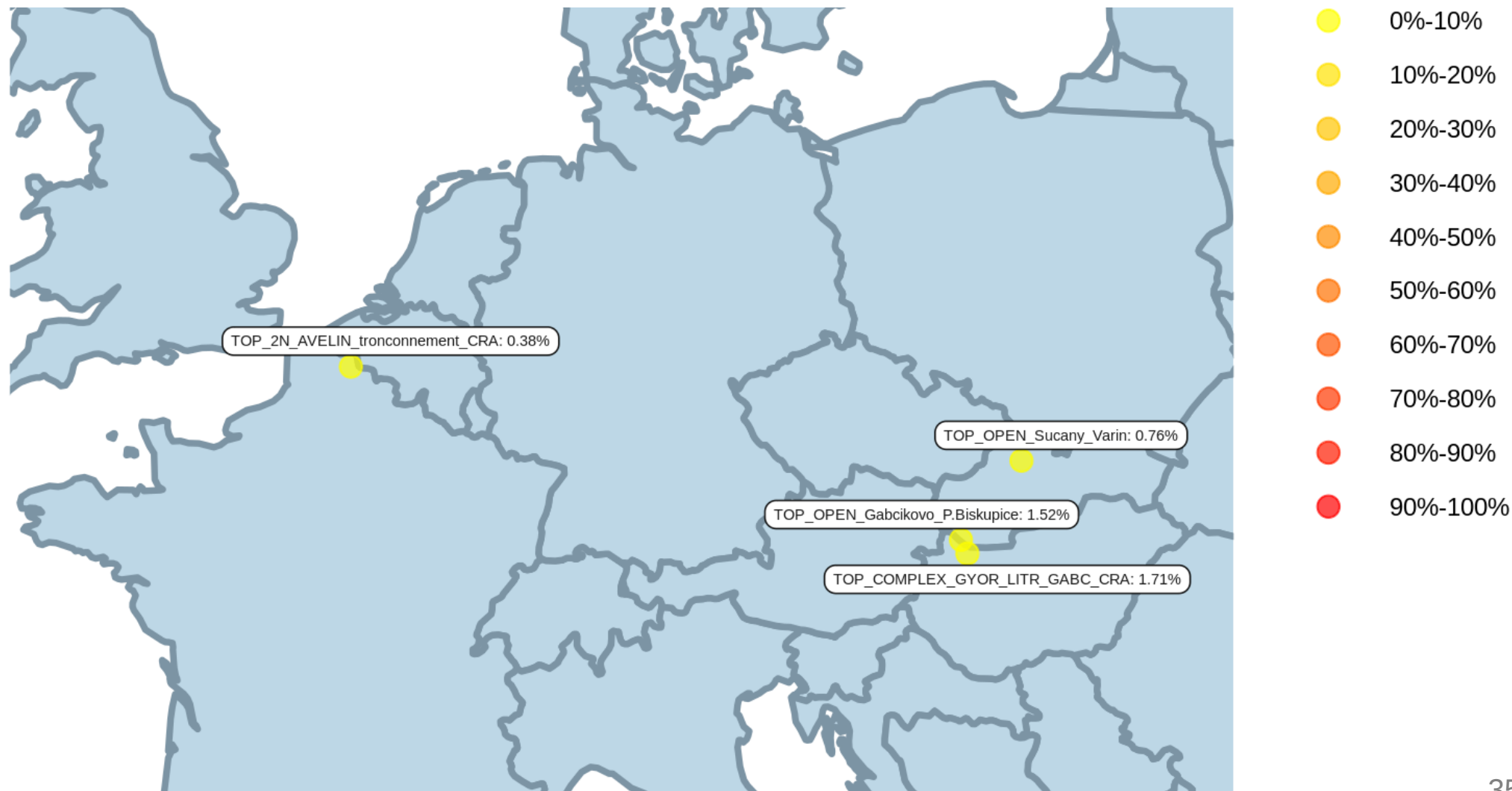
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

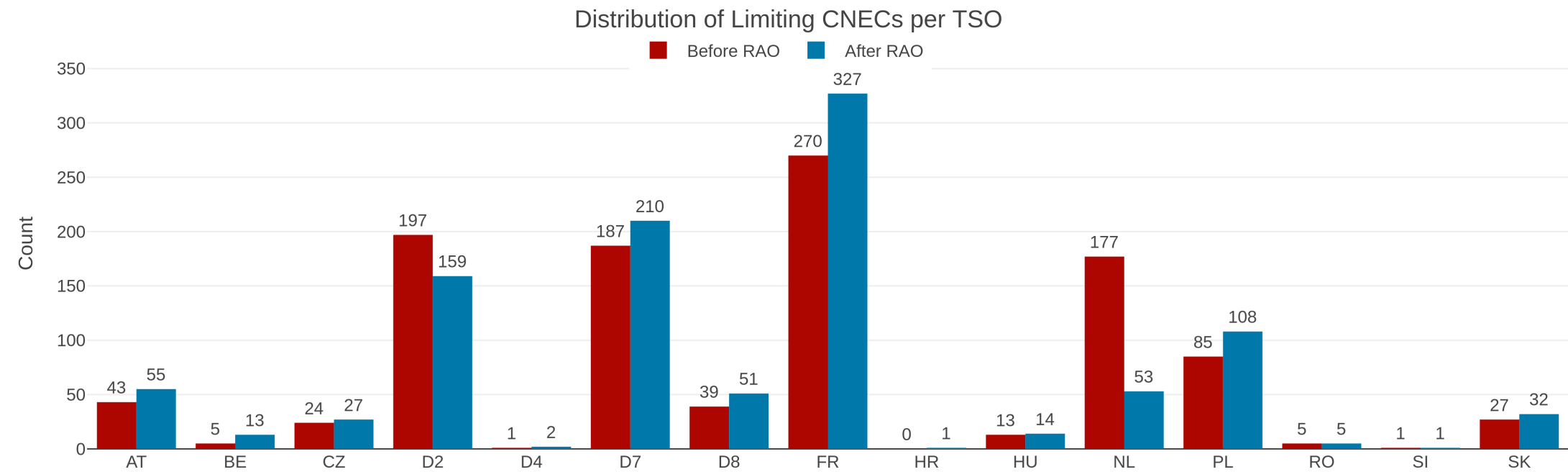
Relative Time Share of Applied Topological RAs in Curative Mode



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.

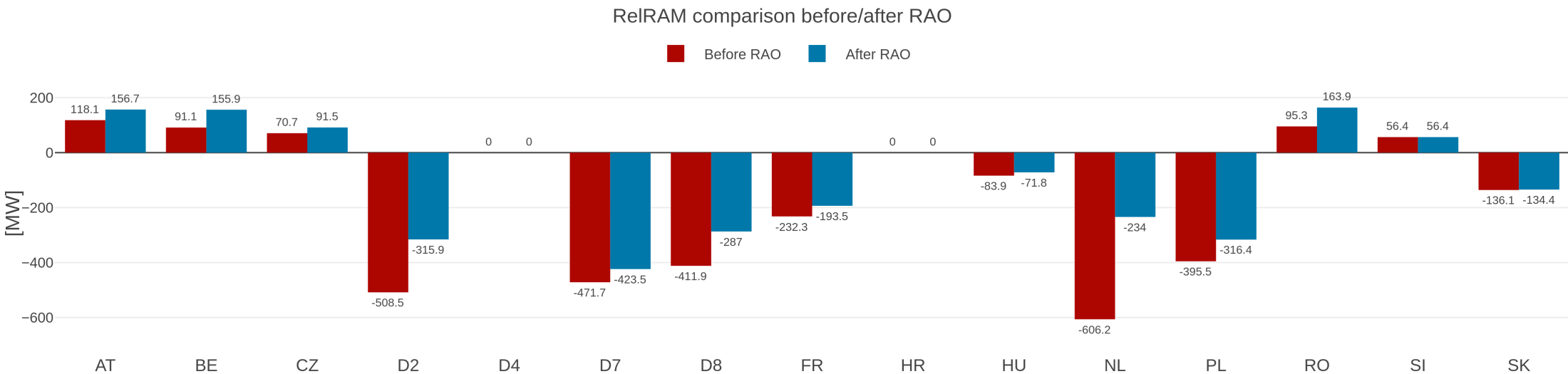
KPI 10: Average variation of relative RAM before and after NRAO



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

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



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 [OPP] [HR]	720	1437	122.03%	88.77%	163.90%	0.2575	0.5547
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	720	751	49.64%	21.39%	95.99%	0.2575	0.5546
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	720	1440	103.48%	82.78%	129.49%	0.1888	0.9938
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	720	1810	41.27%	19.80%	133.70%	0.2452	1.0921
[SK-SK] V.Dur - Levice 1 [DIR]	719	823	46.92%	33.81%	71.13%	0.2738	1.0611
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	713	1777	55.36%	20.92%	131.52%	0.1619	0.5461
[FR-D7] Vigy - Ensdorf VIGY2 S [DIR] [D7]	703	2857	32.17%	19.90%	74.95%	0.2713	0.6967
[SI-HU] Cirkovce - Heviz [OPP] [HU]	703	703	76.05%	62.41%	96.39%	0.2719	1.2534
[CZ-PL] Wielopole - Nosovice [OPP] [PL]	698	1488	113.18%	87.09%	147.55%	0.398	1.3703
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	696	1352	76.96%	62.13%	97.20%	0.1888	0.9938
[SK-HU] R. Sobota - Sajovanka [OPP] [SK]	689	689	85.40%	68.18%	108.80%	0.2734	0.924
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	685	1054	60.87%	23.45%	86.70%	0.398	1.3703
[NL-NL] MEE DRT2 [DIR] [NL]	683	685	54.77%	19.96%	162.07%	0.3563	0.783
[SK-SK] Gabčíkovo - P.Biskupice [DIR]	673	673	95.83%	69.30%	136.90%	0.3578	1.3152
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	671	1205	64.77%	20.03%	101.27%	0.2774	0.6269
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	652	1109	77.90%	20.26%	126.06%	0.1651	0.6305
[BE-BE] Avelgem 380/150 TFO1 [DIR]	639	643	69.76%	39.45%	112.70%	0.1492	0.3398
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	639	657	59.80%	25.59%	86.94%	0.3528	1.2368
[SK-HU] Levice - God [DIR] [HU]	635	701	62.65%	28.57%	79.65%	0.405	1.3156
[HR-SI] 400kV Tumbri - Krsko 1 [OPP] [HR]	633	633	74.36%	64.21%	88.05%	0.3261	0.7993

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]	298	398	1220.69	24.77%	19.90%	51.27%	0.2713
[FR-FR] Creys - Saint-Vulbas 2 [OPP]	173	173	789.41	25.37%	19.99%	38.36%	0.1446
[D7-FR] Enseldorf - Vigy VIGY2 S [OPP] [FR]	172	173	434.81	27.51%	19.96%	53.93%	0.254
[D8-PL] Mikulowa PST1 [DIR] [PL]	128	128	1007.54	53.18%	40.30%	63.79%	0.39
[SK-HU] Levice - God [DIR] [HU]	113	113	597.22	57.79%	29.22%	70.42%	0.4022
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	104	106	955.45	38.39%	21.31%	80.65%	0.1596
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	103	106	671.58	65.11%	20.26%	105.35%	0.1651
[SK-SK] V.Dur - Levice 1 [DIR]	93	93	749.67	41.75%	33.81%	48.80%	0.2738
[BE-BE] Avelgem 380/150 TFO1 [DIR]	87	87	687.27	59.97%	39.45%	83.79%	0.129
[NL-NL] MEE DRT2 [DIR] [NL]	77	77	235.2	25.13%	19.96%	64.26%	0.2775
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	76	76	599.97	53.65%	19.93%	72.67%	0.3492
[RO-RO] Paroseni - Targu Jiu Nord [OPP]	58	58	997.93	48.20%	22.76%	92.95%	0.1086
[D2-D2] Altheim - Sittling 219 [OPP]	45	45	849.91	69.38%	28.16%	106.30%	0.0938
[NL-BE] PST Zandvliet 3 [DIR] [BE]	32	32	214.98	88.76%	63.40%	106.56%	0.4658
[AT-AT] Zaya 2 - Zaya 1 ZYRHU41 [DIR]	29	29	442.76	61.61%	45.32%	82.55%	0.1497
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	27	27	609.39	56.79%	23.45%	67.16%	0.3974
[D8-PL] Krajnik - Vierraden 1 [OPP] [PL]	24	24	293.44	47.60%	19.81%	59.45%	0.3552
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	23	23	673.95	21.60%	19.99%	26.51%	0.1442
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	22	22	69.26	140.86%	110.43%	161.23%	0.1855
[HU-HU] Gonyu - Gyor [DIR]	19	19	113.93	38.33%	0.00%	68.25%	0.2739

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	268
AC < 0 MW	110
AC = 0 MW	157
AC > 0 MW	1

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-1629.1	4298.16
Min.	-9599.0	0.00
Max.	0.0	12850.00

