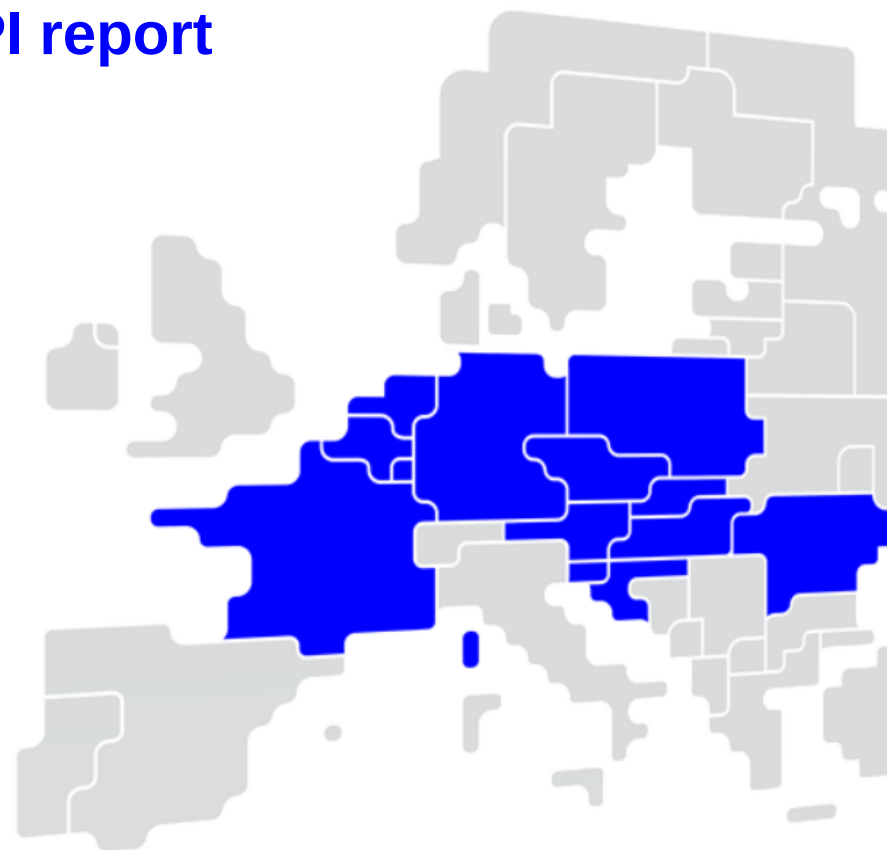




Core FB MC Operational KPI report

May 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

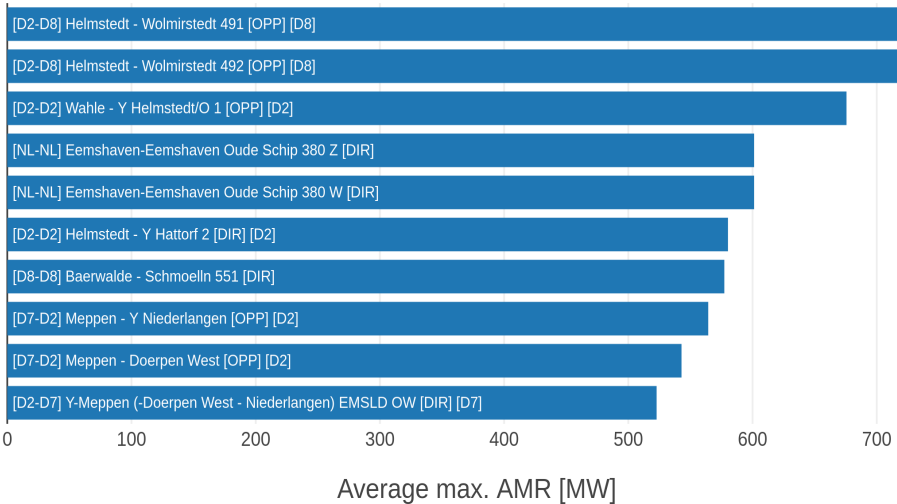
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
- KPI 10: Average variation of relative RAM before and after NRAO

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)
[D2-D8] Helmstedt - Wolmirstedt 491 [OPP] [D8]	718.17	28.80%	24.15%
[D2-D8] Helmstedt - Wolmirstedt 492 [OPP] [D8]	717.65	28.78%	24.17%
[D2-D2] Wahle - Y Helmstedt/O 1 [OPP] [D2]	675.63	29.36%	24.58%
[NL-NL] Eemshaven-Eemshaven Oude Schip 380 W [DIR]	601.26	21.70%	2.68%
[NL-NL] Eemshaven-Eemshaven Oude Schip 380 Z [DIR]	601.26	21.70%	2.68%
[D2-D2] Helmstedt - Y Hattorf 2 [DIR] [D2]	580.21	26.59%	22.02%
[D8-D8] Baerwalde - Schmoelln 551 [DIR]	577.30	23.15%	22.34%
[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	564.32	29.25%	20.60%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	542.82	28.13%	19.58%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	522.74	20.96%	12.90%

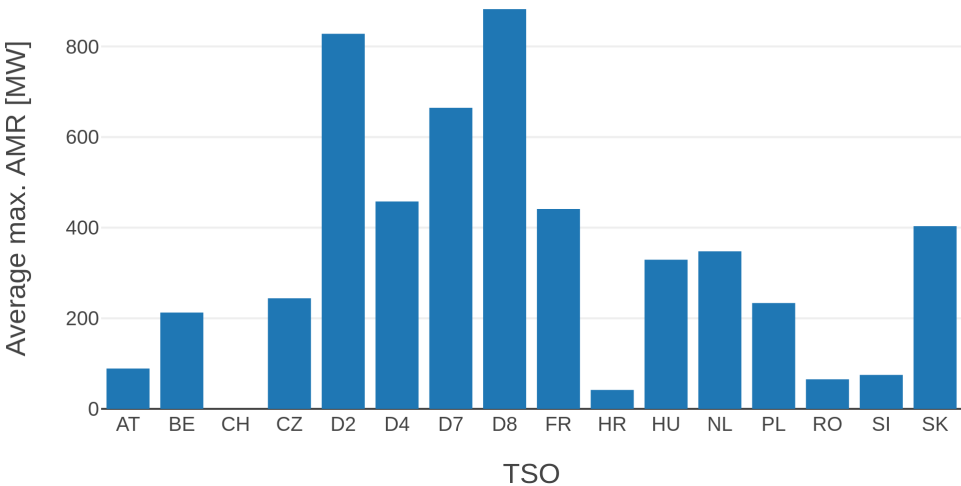


KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	89.03
BE	212.61
CH	0.00
CZ	243.99
D2	828.03
D4	457.82
D7	664.61
D8	882.48
FR	441.39
HR	41.71

TSO	Average maximum AMR per TSO
HU	329.36
NL	347.87
PL	233.58
RO	65.15
SI	74.98
SK	403.27



KPI 3: Share of MTUs with intervention per TSO



Total BDs

31

Total MTUs

744

MTUs without IVA

49

Share of distinct
MTUs without IVA

6.59%

MTUs with IVA

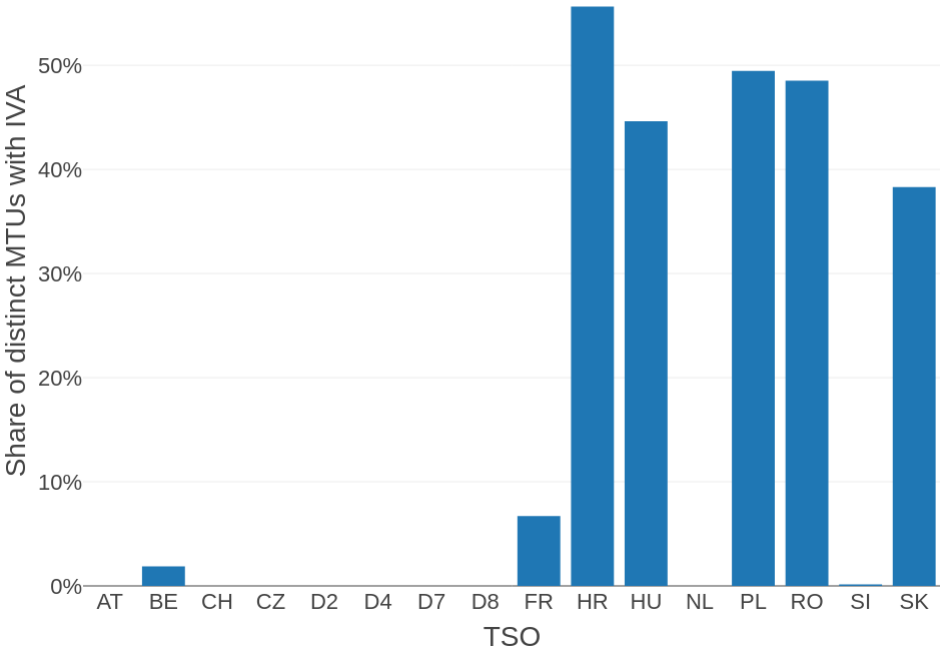
695

Share of distinct
MTUs with IVA

93.4%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.00%	0
BE	1.88%	14
CH	0.00%	0
CZ	0.00%	0
D2	0.00%	0
D4	0.00%	0
D7	0.00%	0
D8	0.00%	0
FR	6.72%	50
HR	55.65%	414

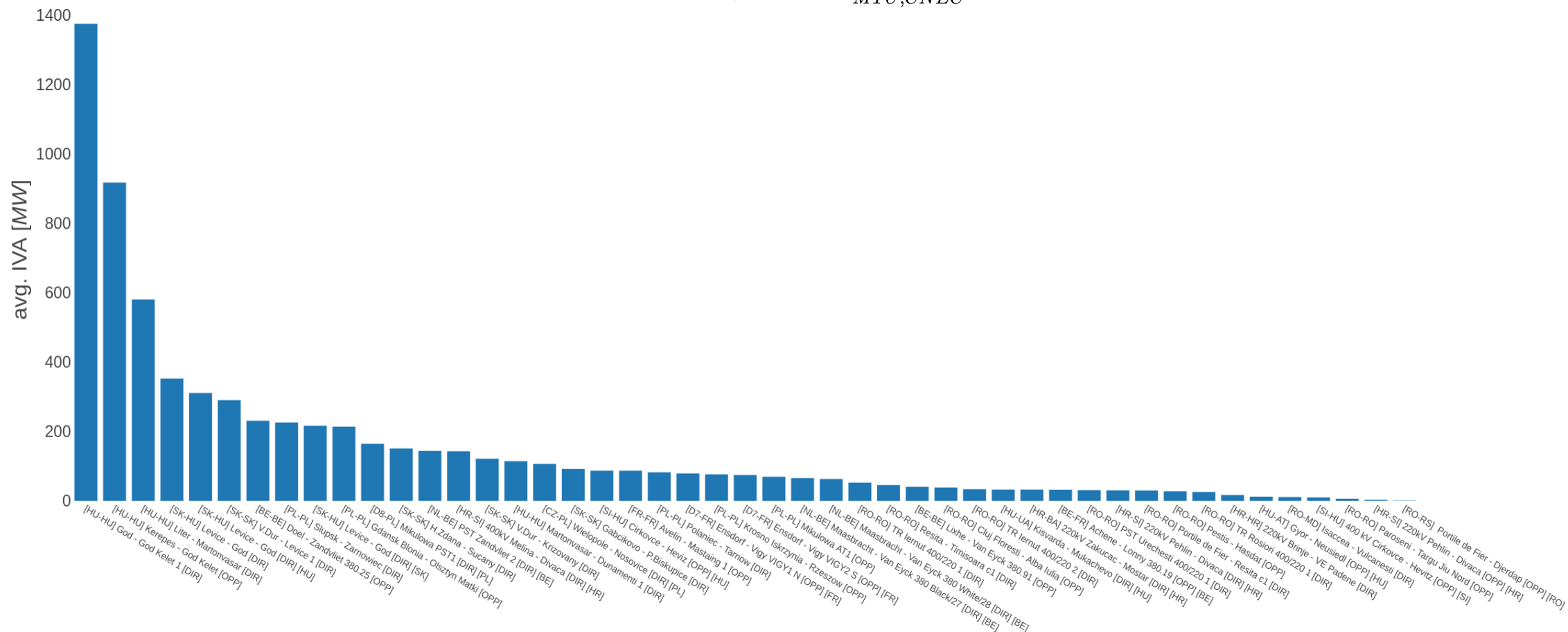
TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
HU	44.62%	332
NL	0.00%	0
PL	49.46%	368
RO	48.52%	361
SI	0.13%	1
SK	38.31%	285



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



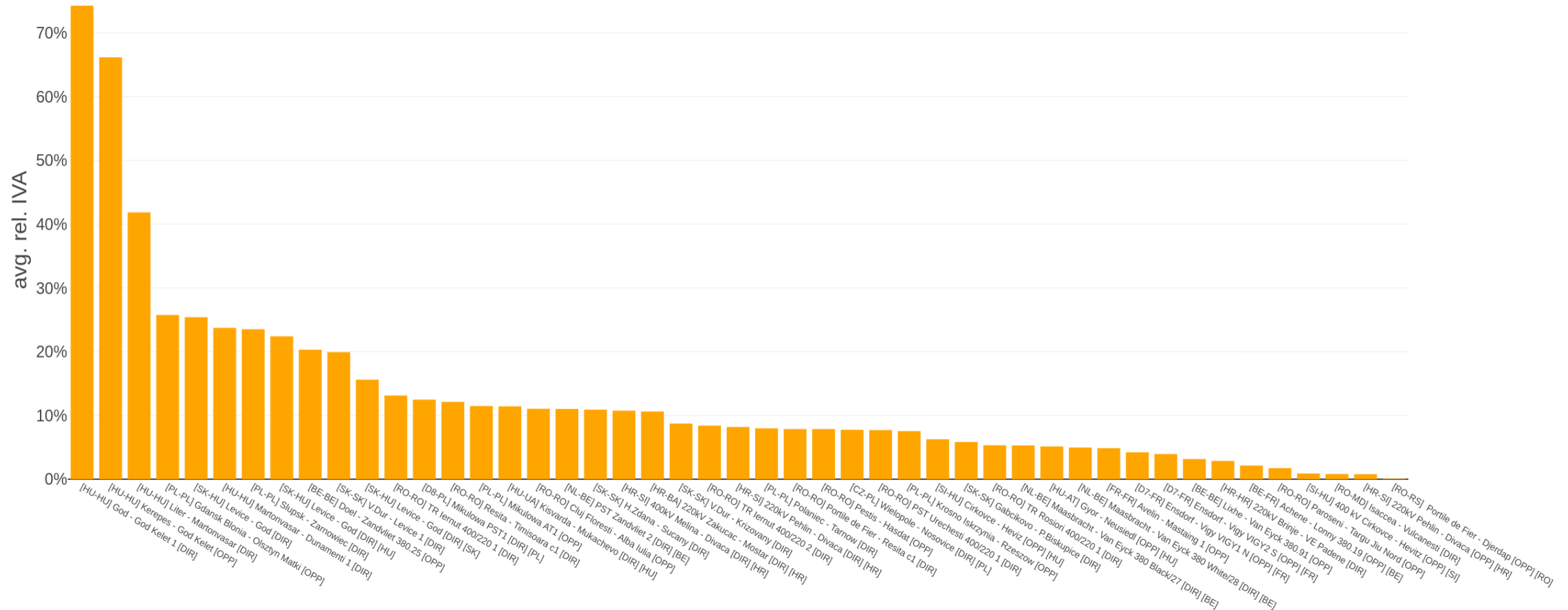
$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]$$



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



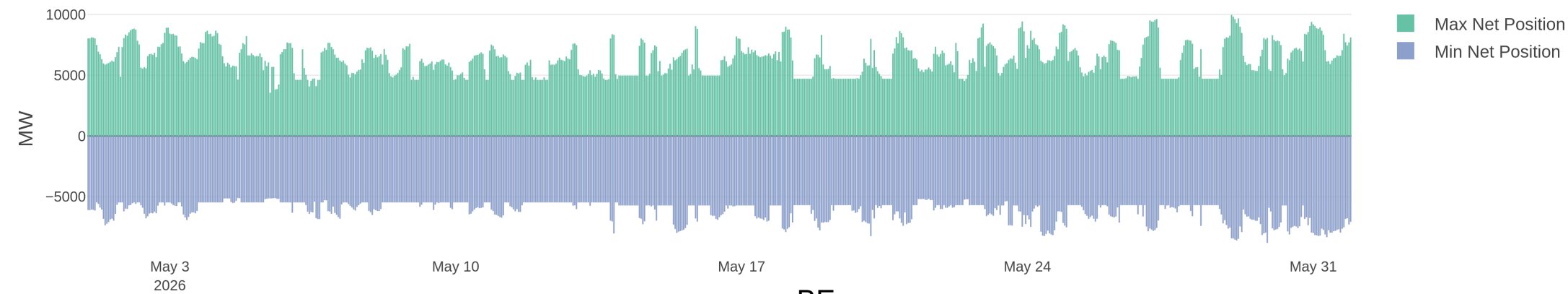
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]}{F_{maxCNEC, MTU}[IVA_{CNEC, MTU} > 0]}$$



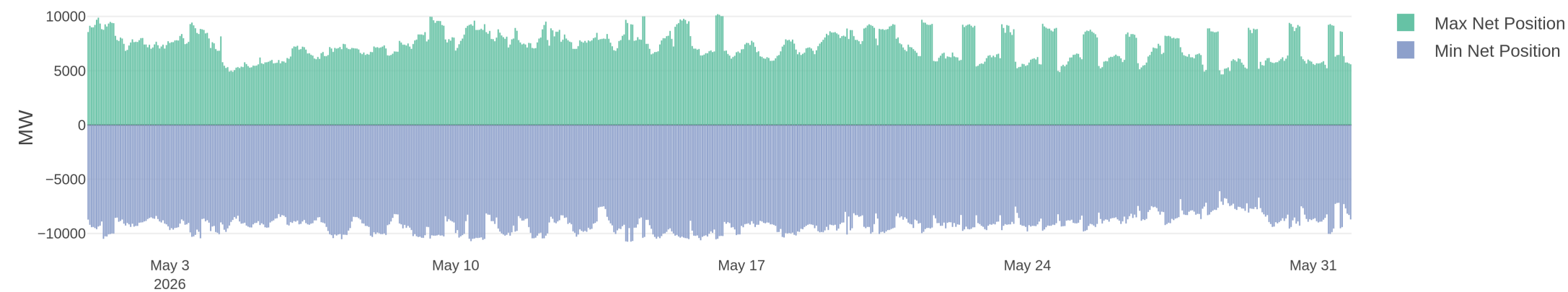
KPI 5: Min & max net positions per BZ hub



AT



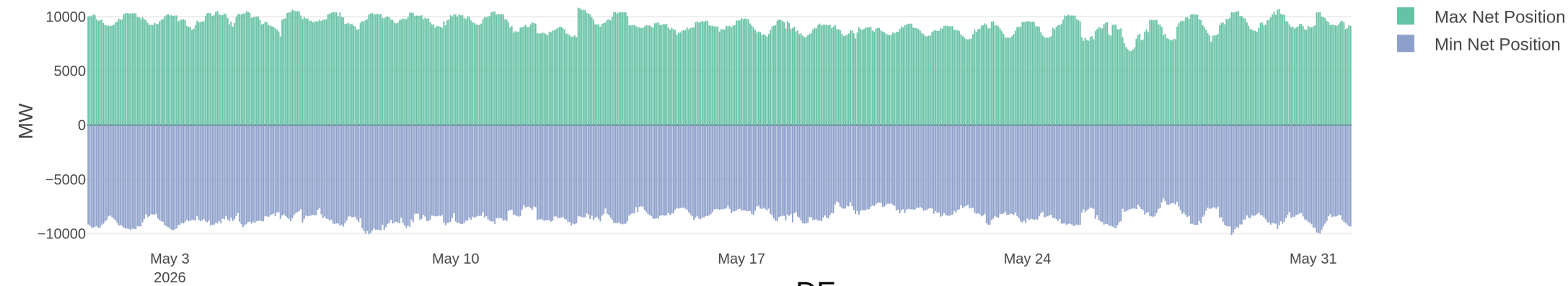
BE



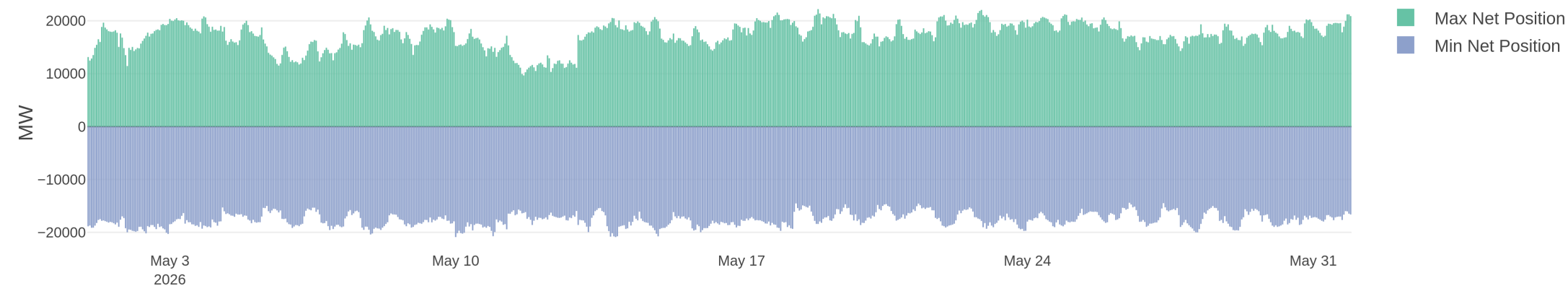
KPI 5: Min & max net positions per BZ hub



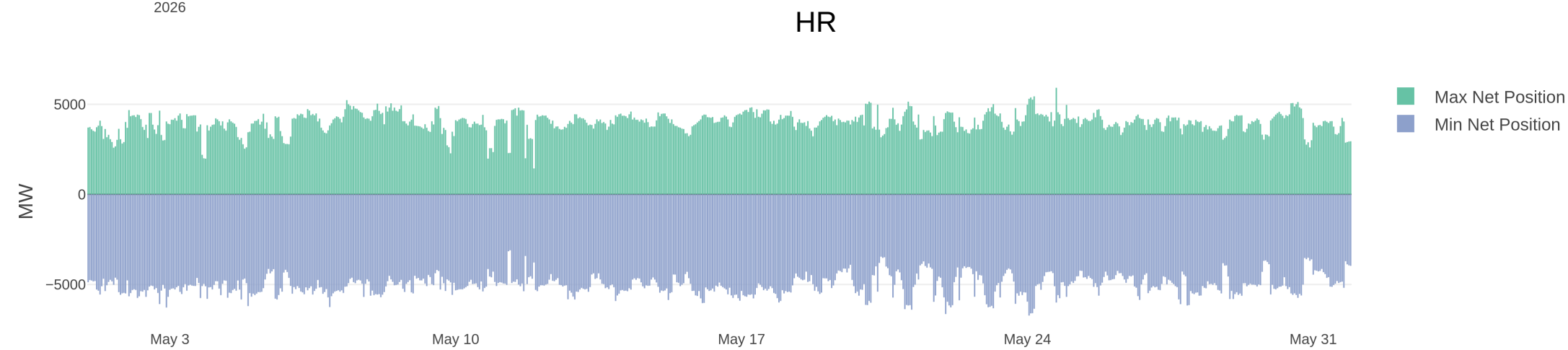
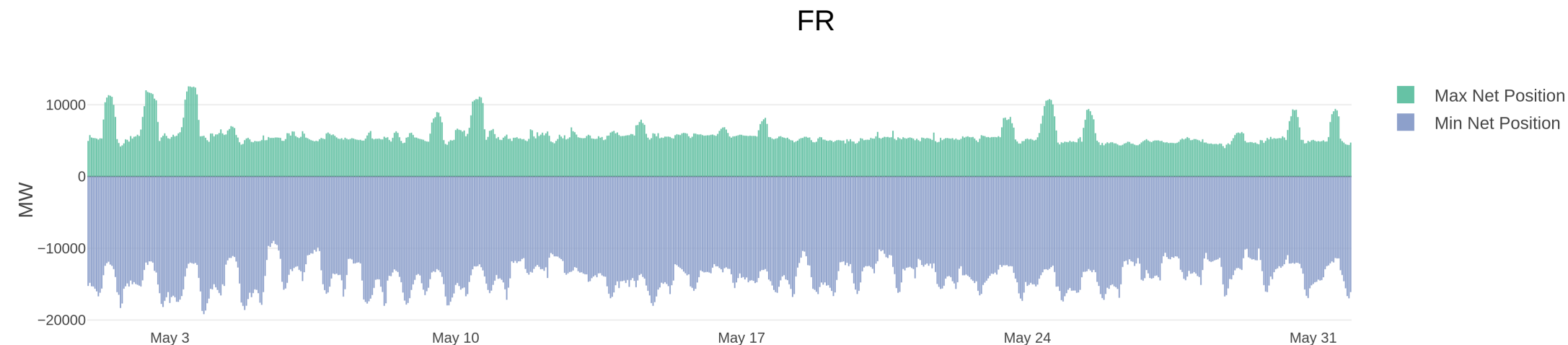
CZ



DE



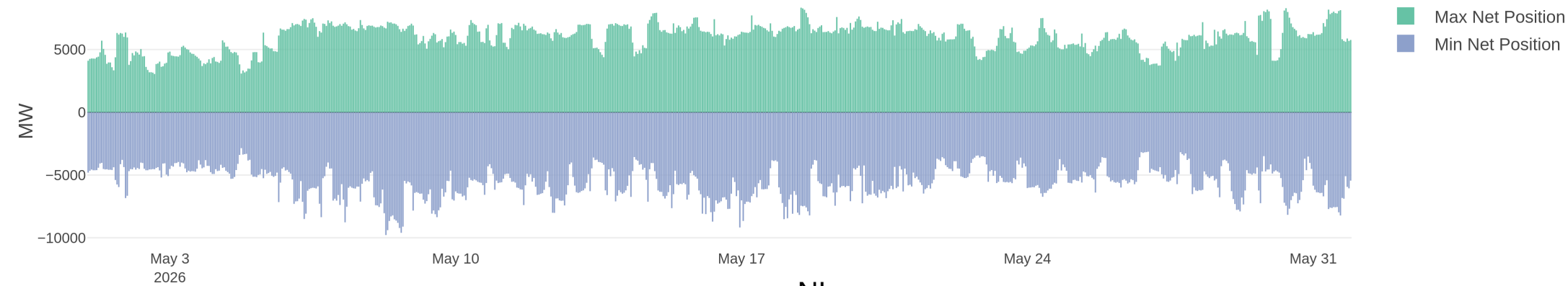
KPI 5: Min & max net positions per BZ hub



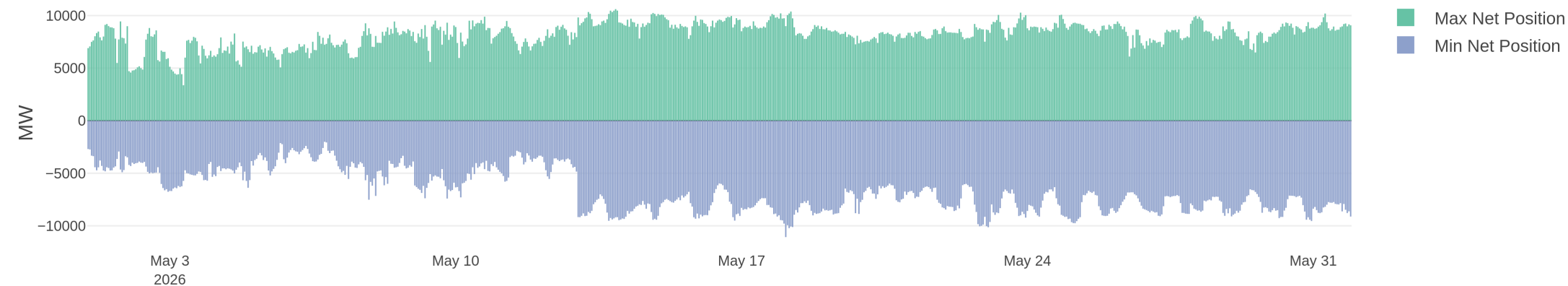
KPI 5: Min & max net positions per BZ hub



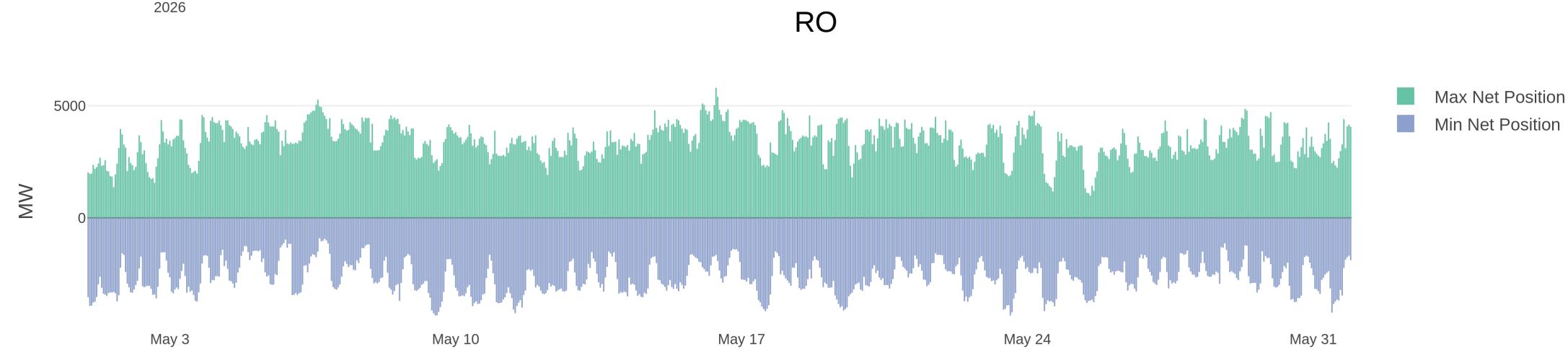
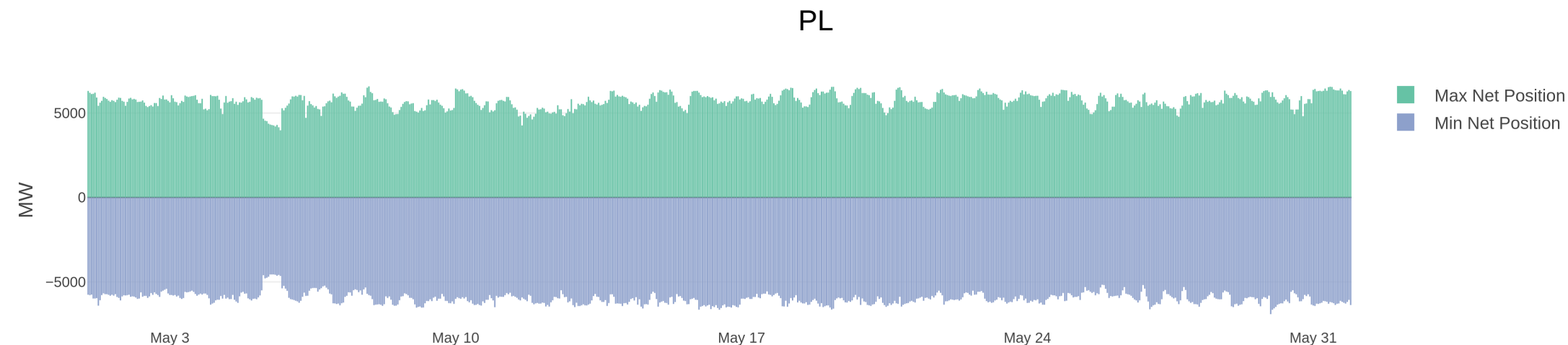
HU



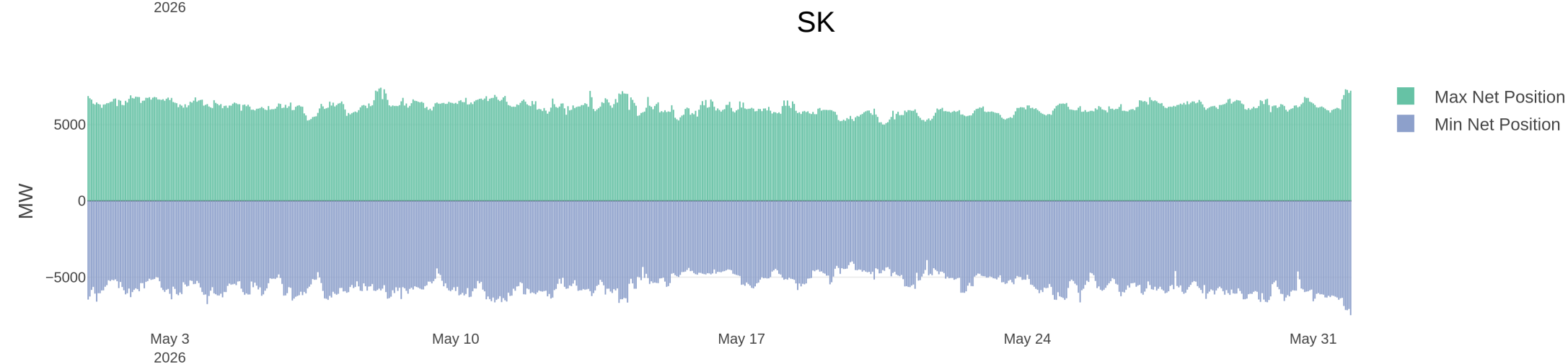
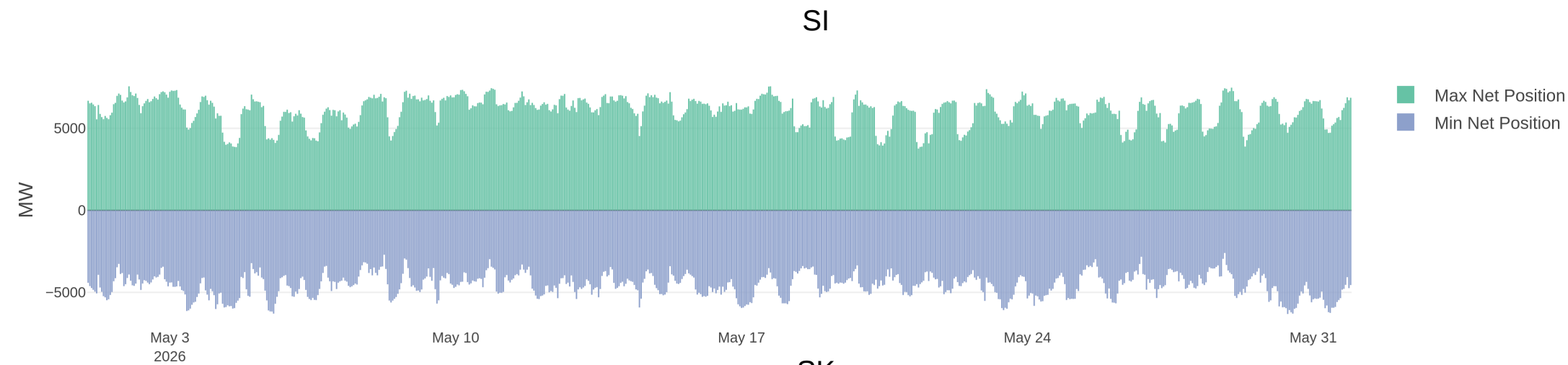
NL



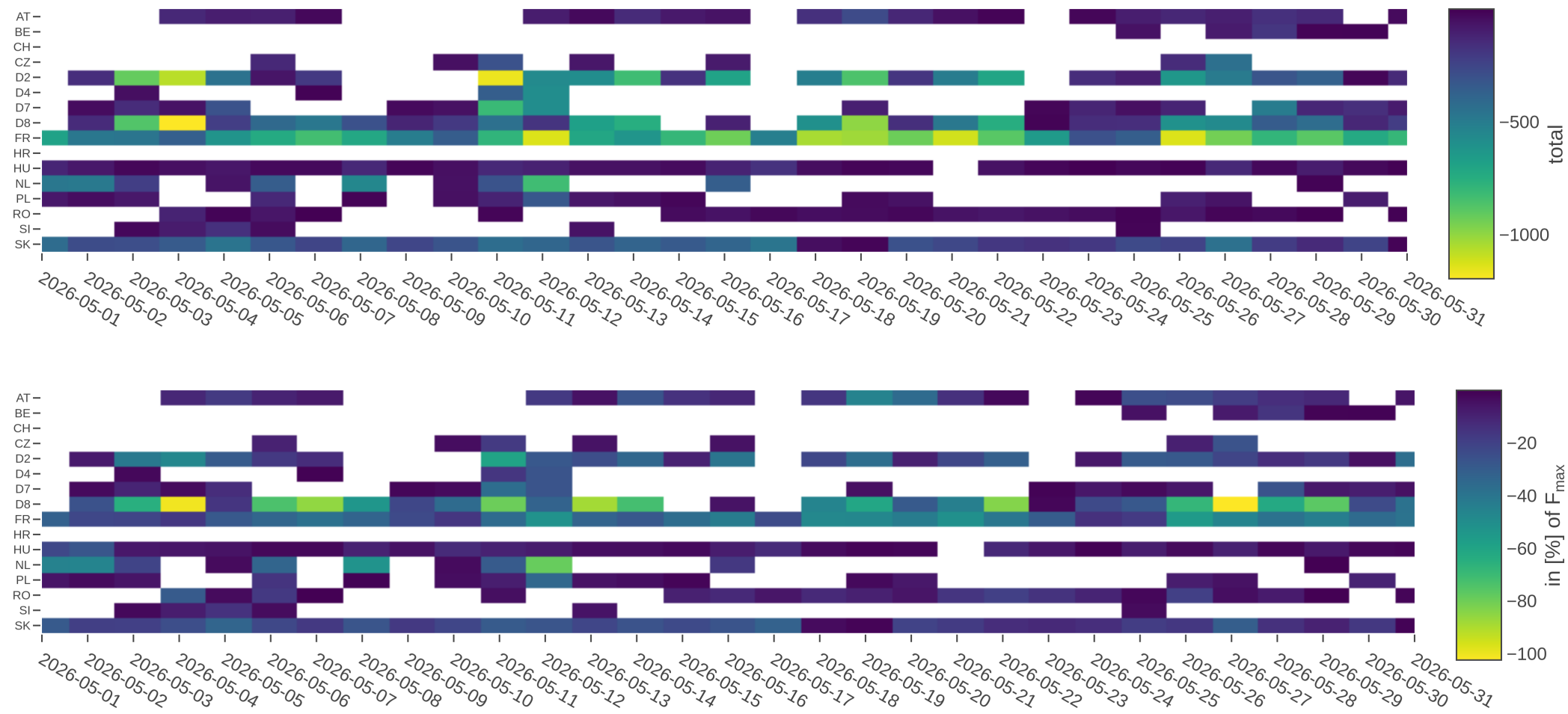
KPI 5: Min & max net positions per BZ hub



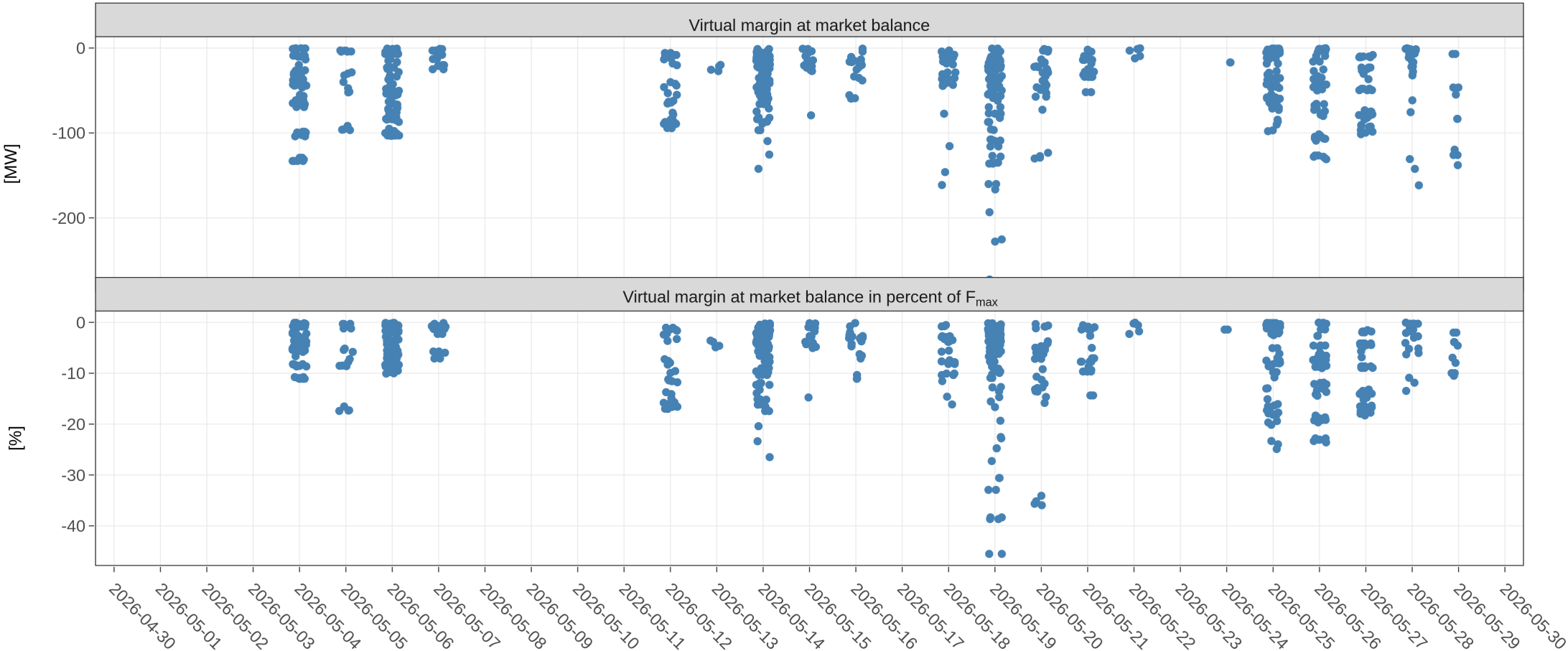
KPI 5: Min & max net positions per BZ hub



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



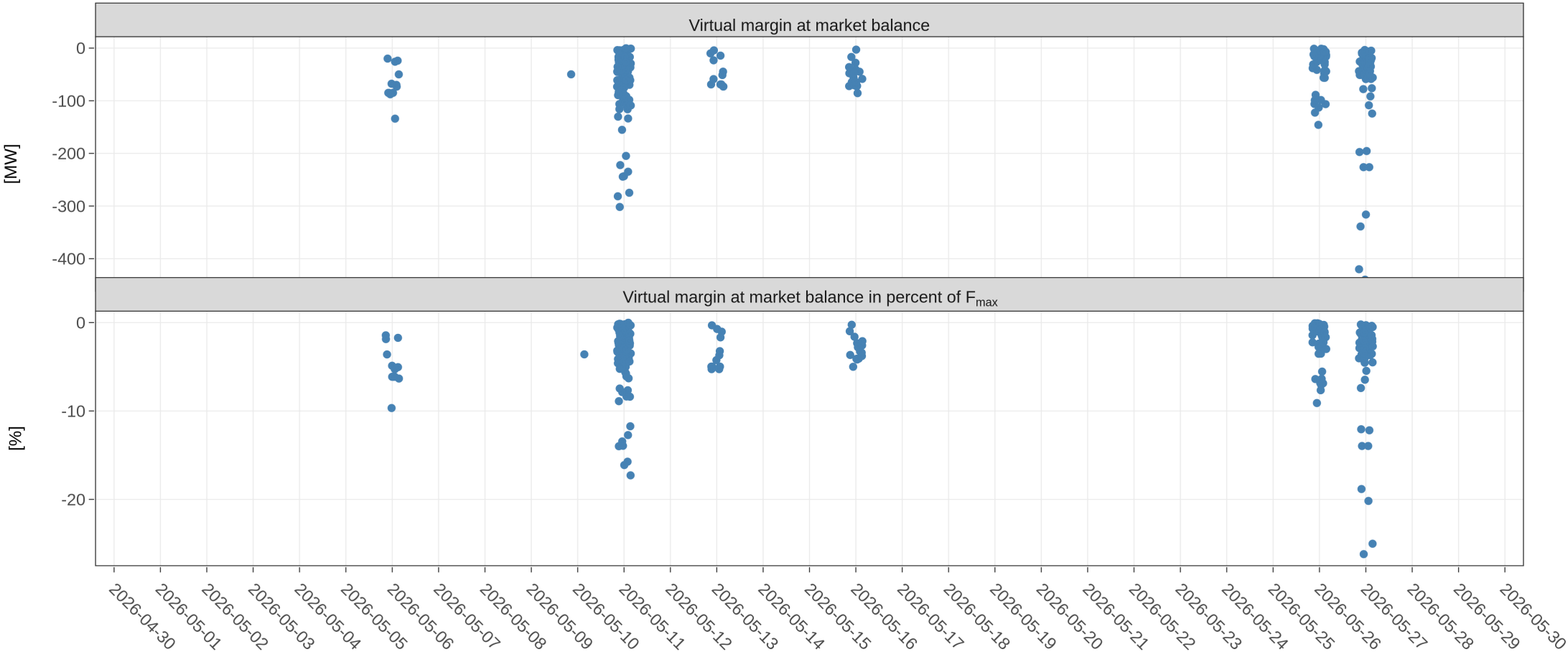
KPI 6b: Virtual margins at market balance AT



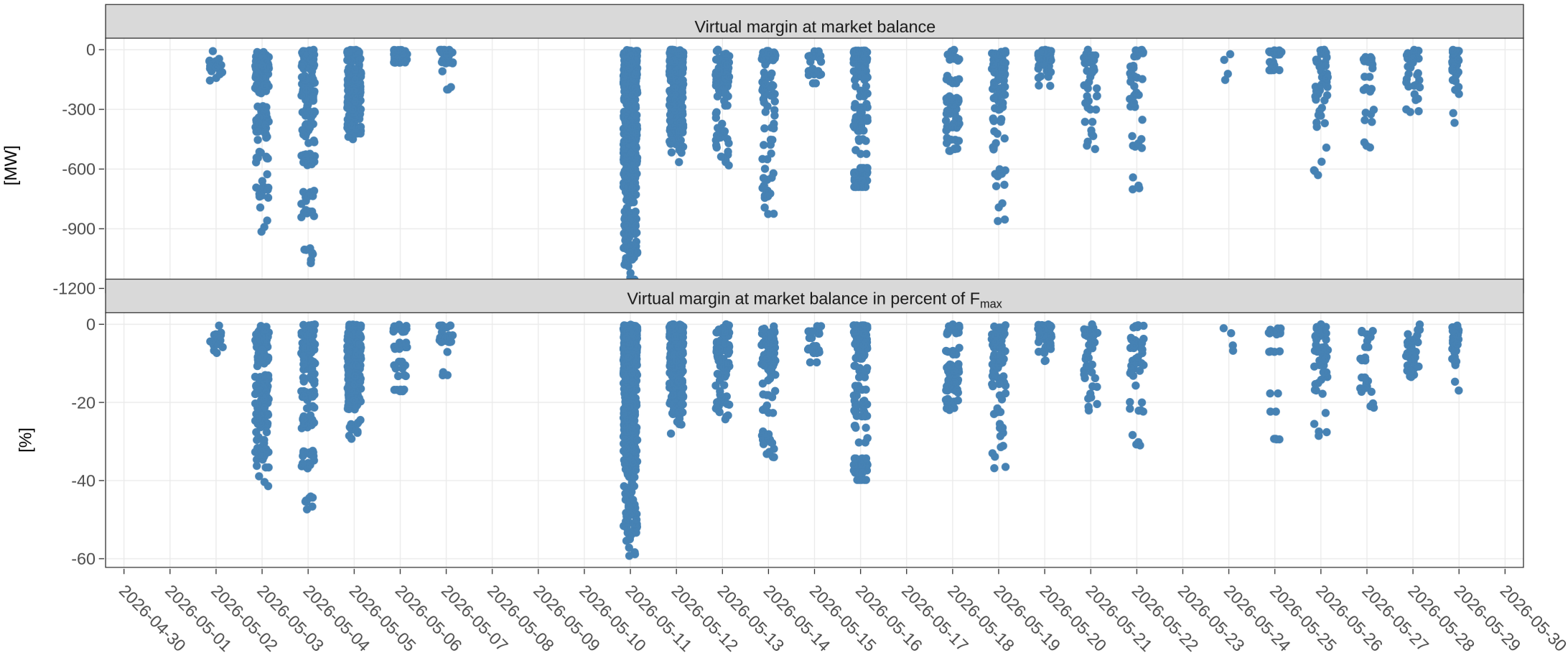
KPI 6b: Virtual margins at market balance BE



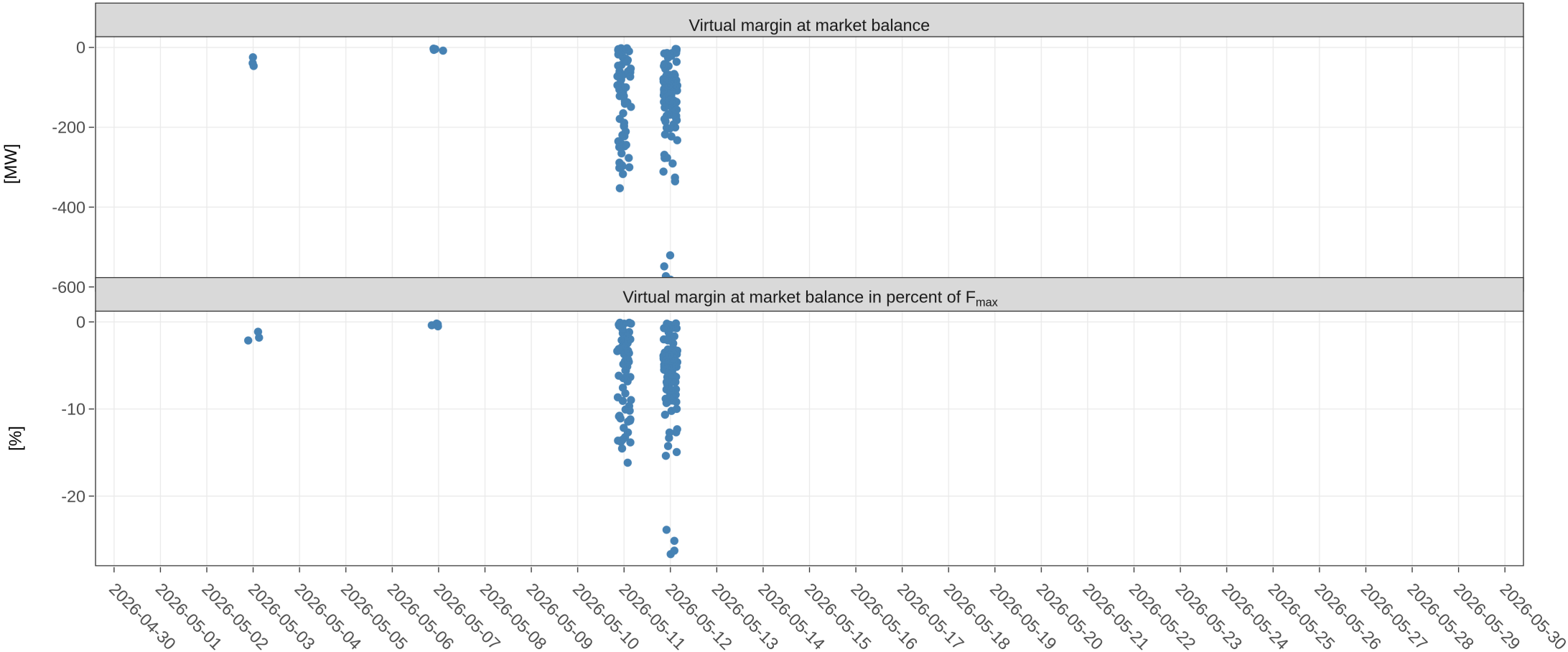
KPI 6b: Virtual margins at market balance CZ



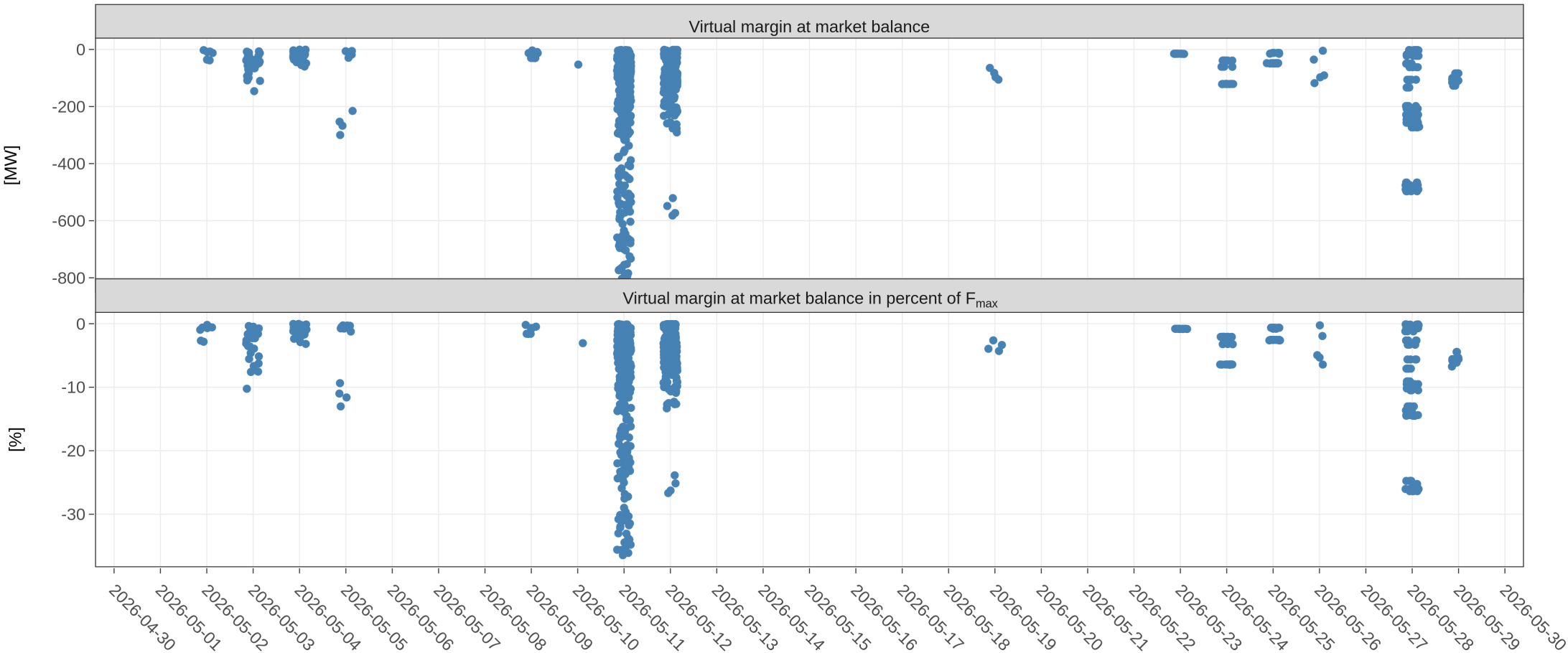
KPI 6b: Virtual margins at market balance D2



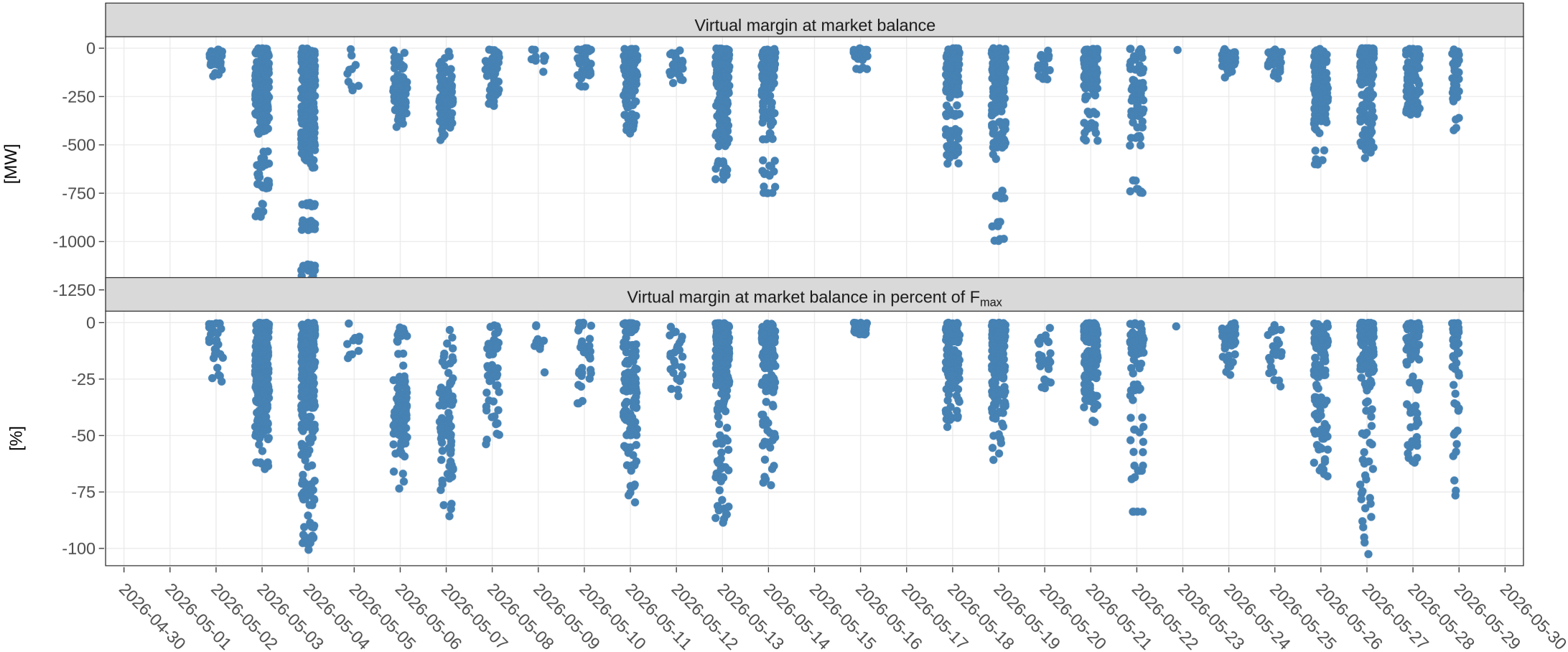
KPI 6b: Virtual margins at market balance D4



KPI 6b: Virtual margins at market balance D7



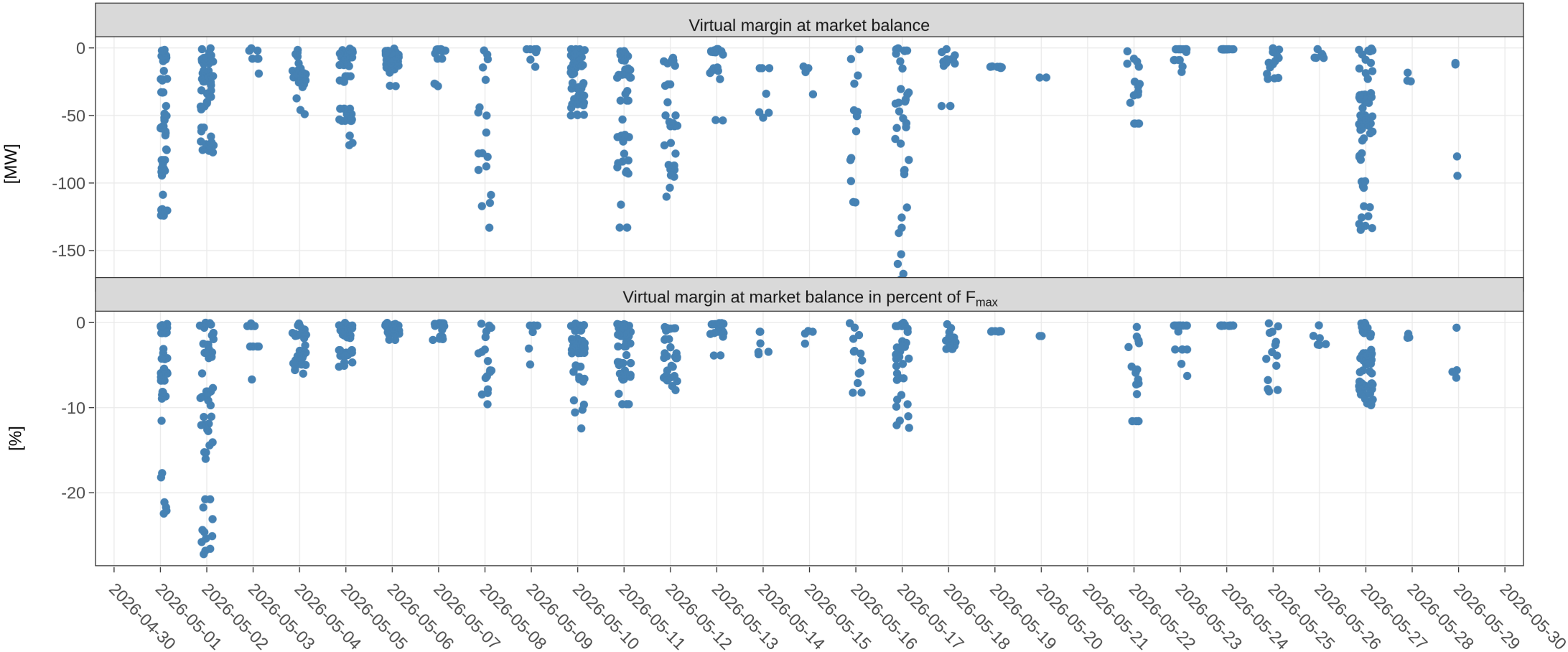
KPI 6b: Virtual margins at market balance D8



KPI 6b: Virtual margins at market balance FR



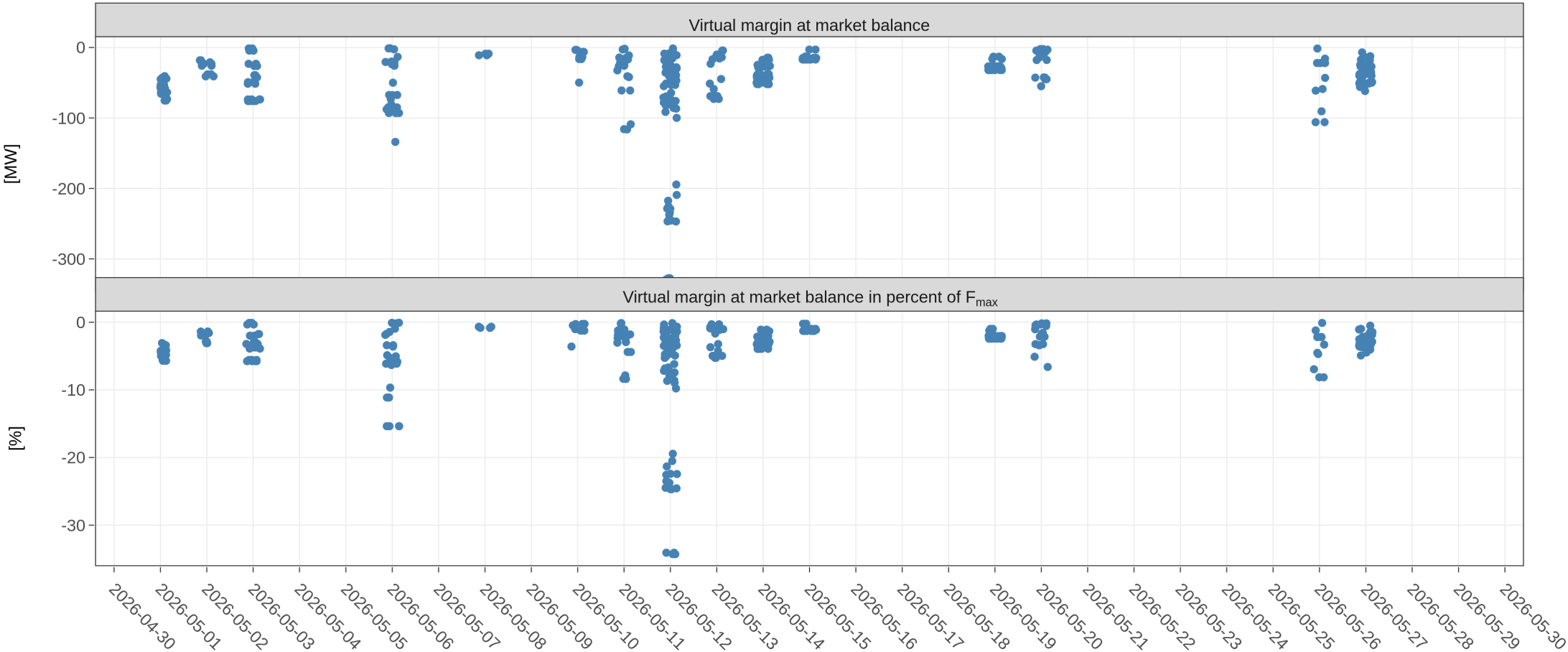
KPI 6b: Virtual margins at market balance HU



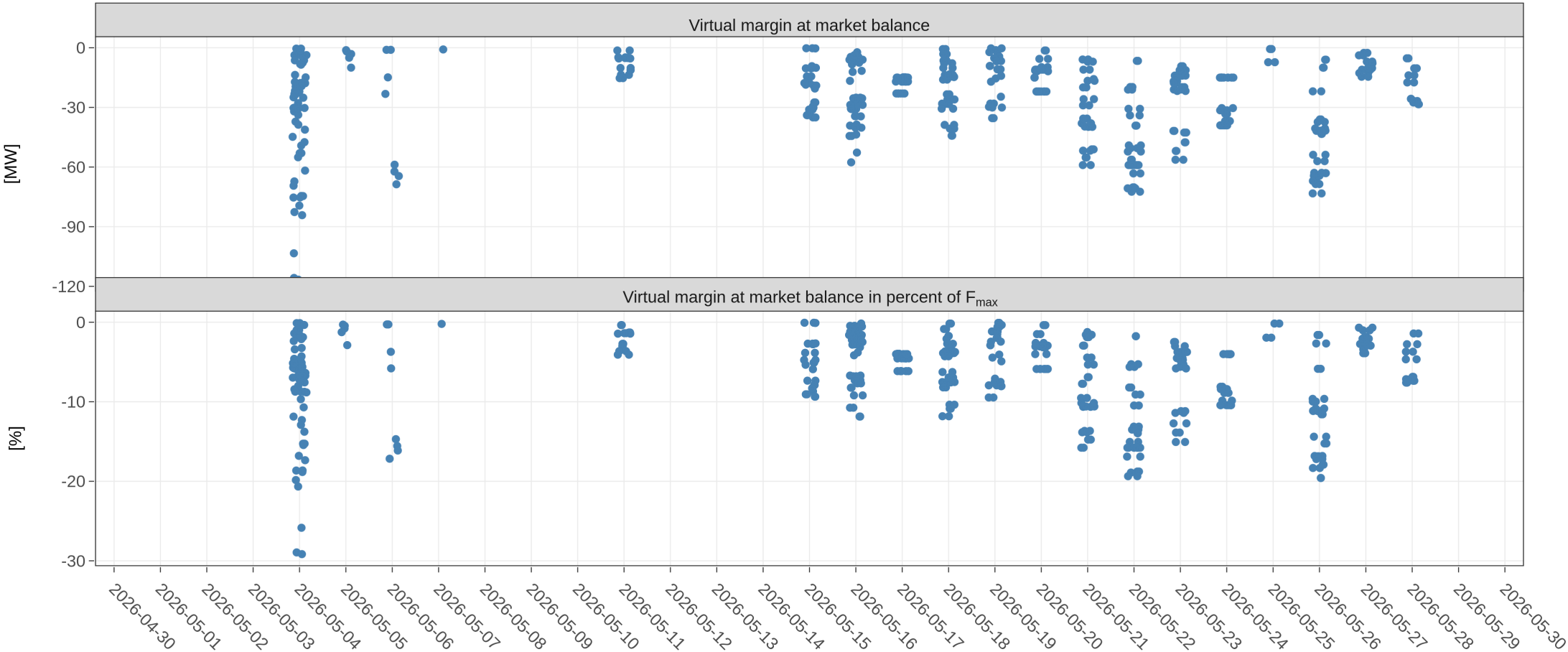
KPI 6b: Virtual margins at market balance NL



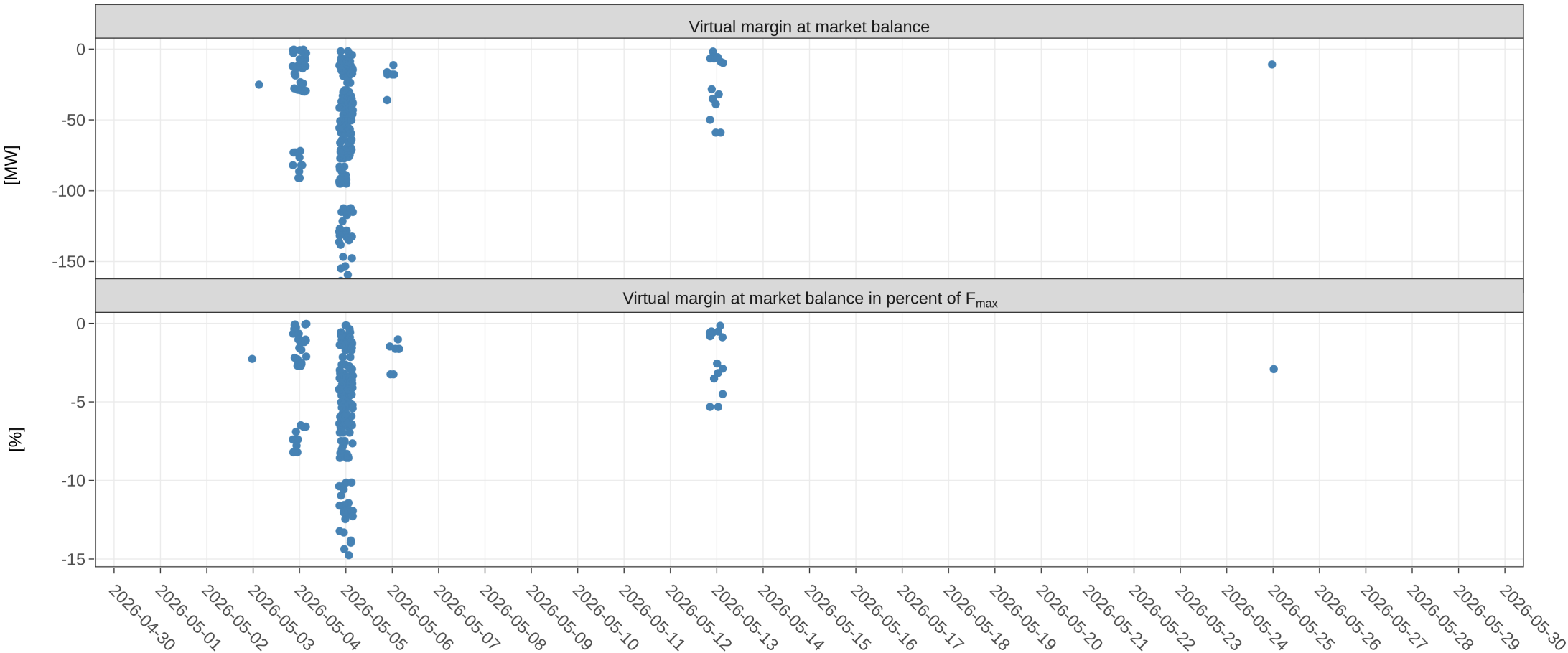
KPI 6b: Virtual margins at market balance PL



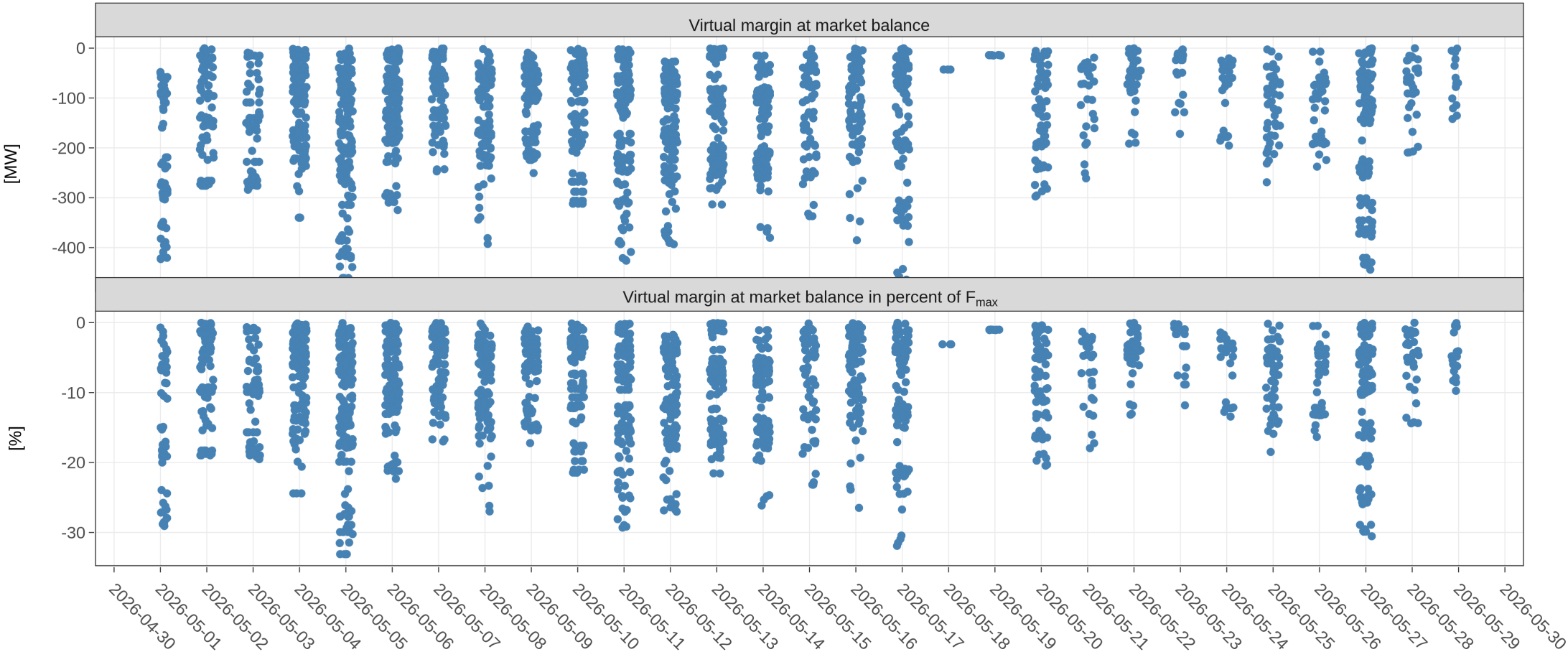
KPI 6b: Virtual margins at market balance RO



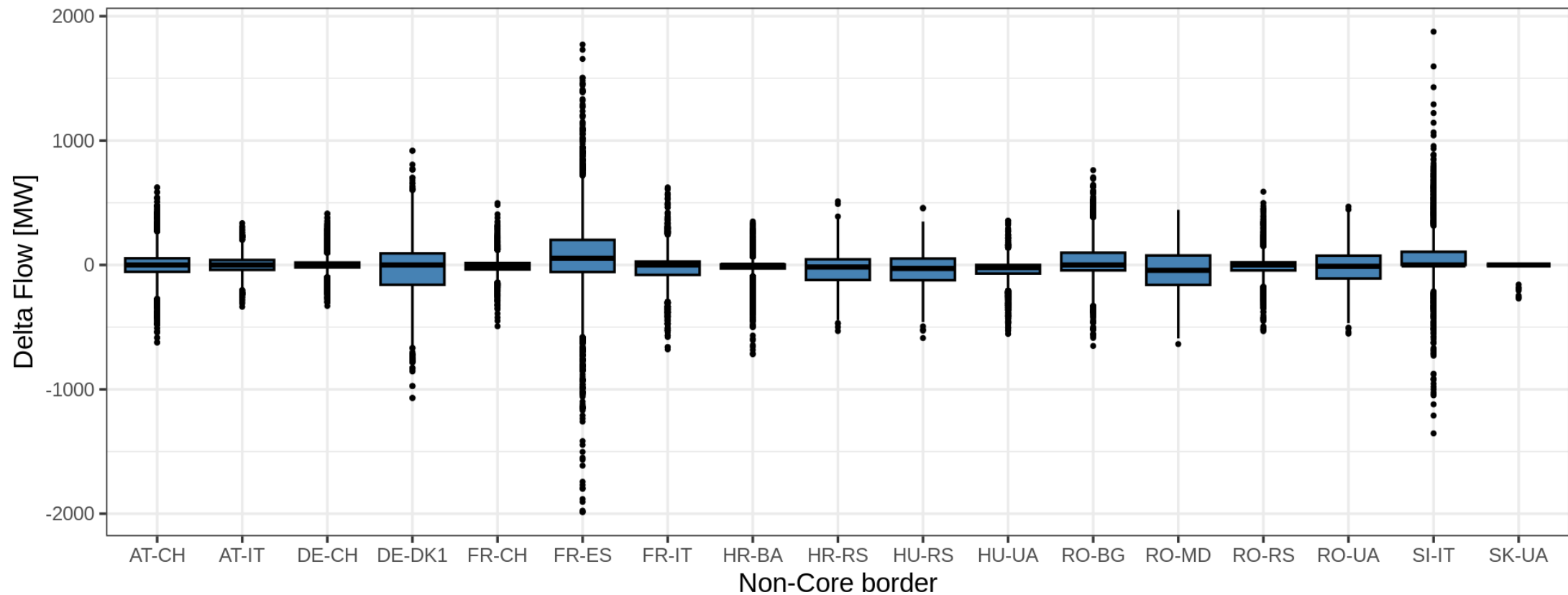
KPI 6b: Virtual margins at market balance SI



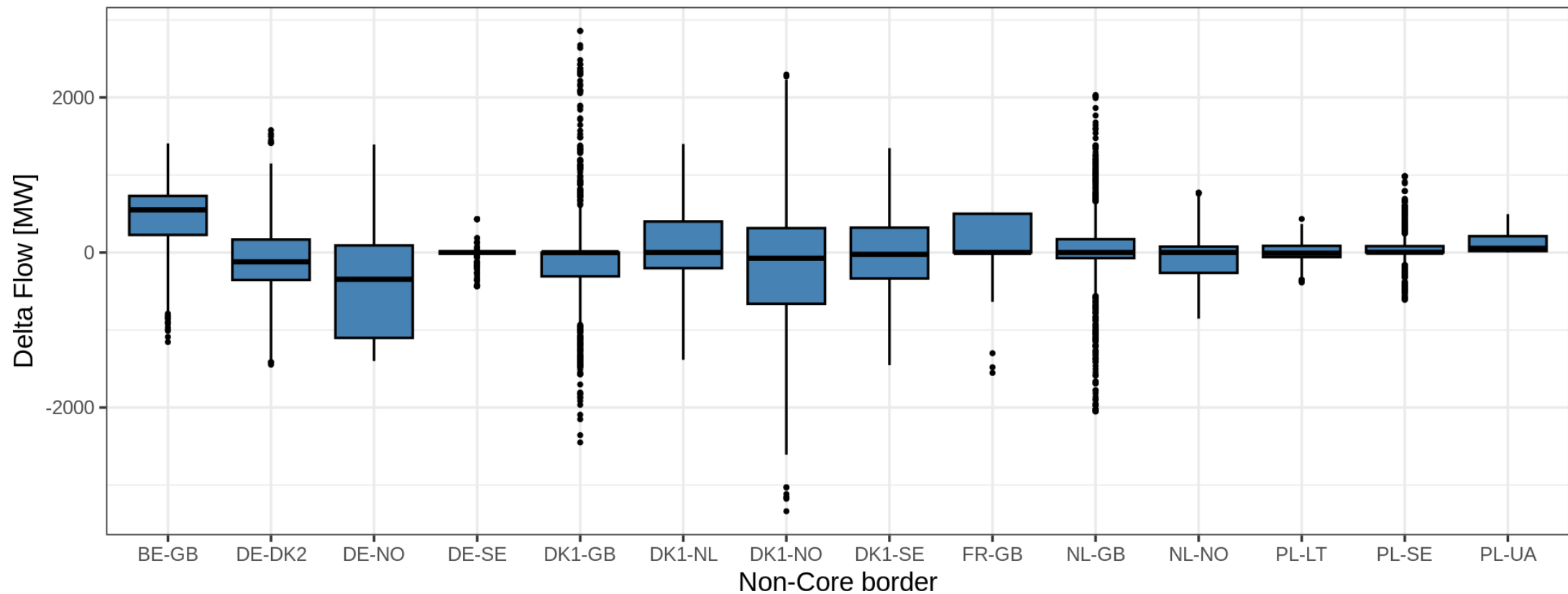
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



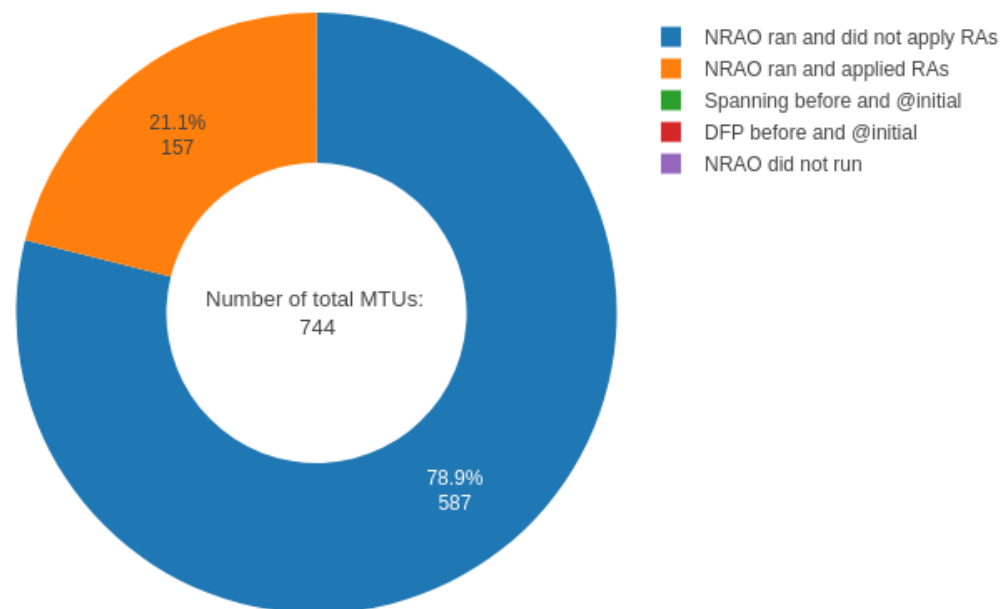
KPI 8: NRAO – Applied Remedial Action



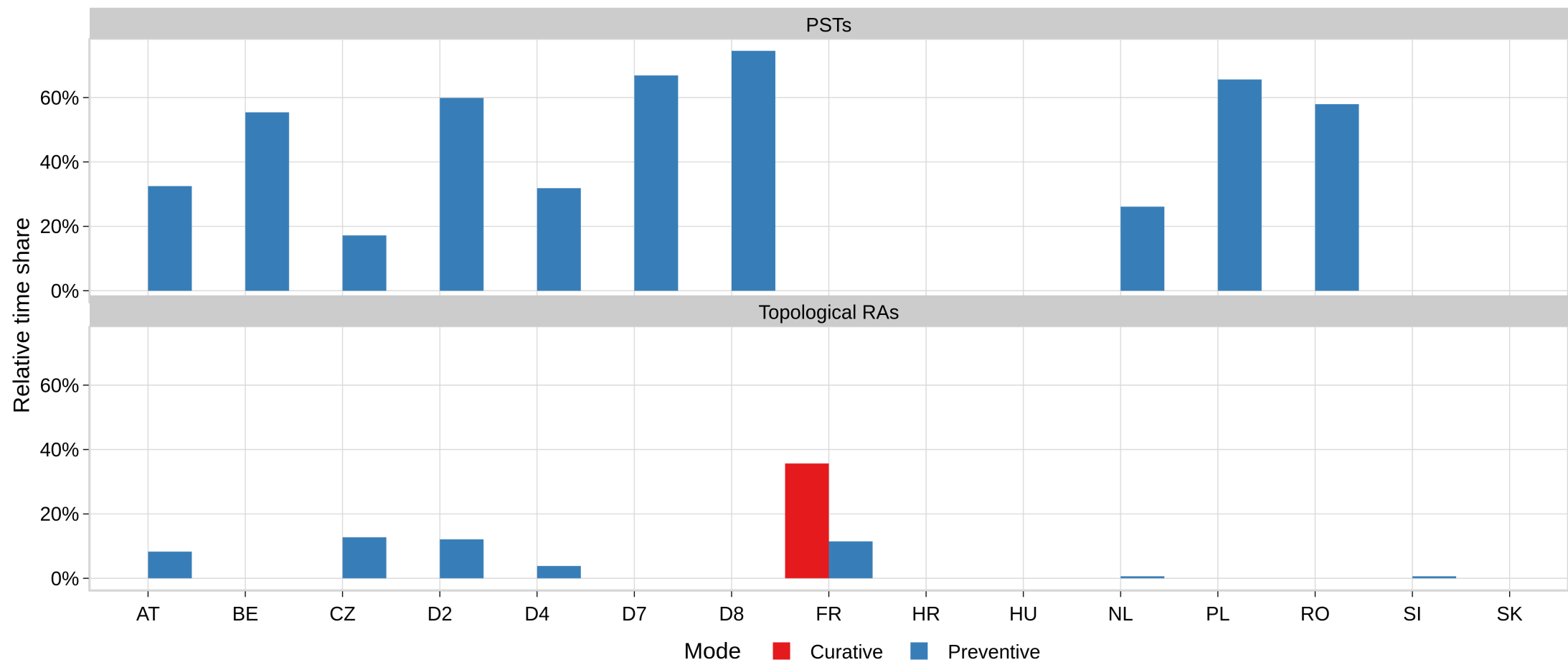
In the following plots, the relative time share relates to the hours labeled 'NRAO Ran and Applied RAs'.

Total MTUs: 744 hours

Category	Hours (%)
NRAO ran and did not apply RAs	587 hours (78.9%)
NRAO ran and applied RAs	157 hours (21.1%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

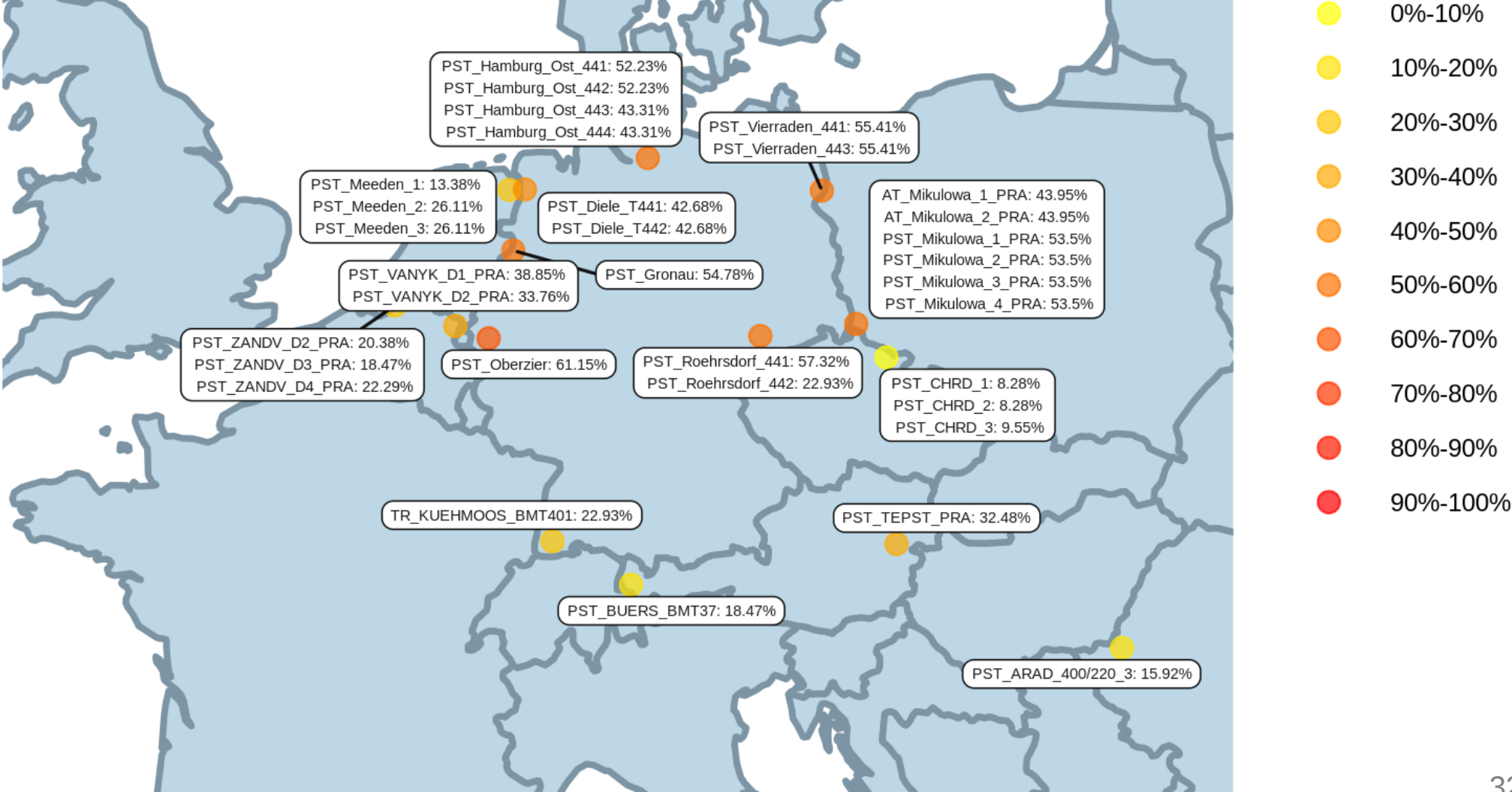


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

Relative Time Share of Applied PSTs in Preventive Mode



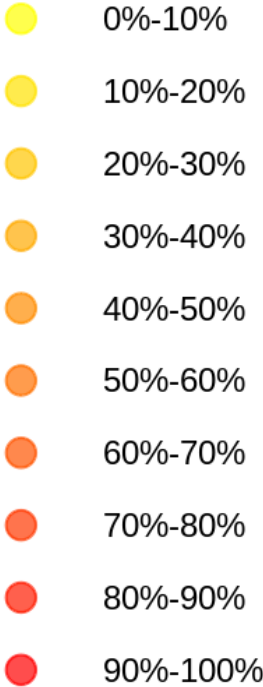
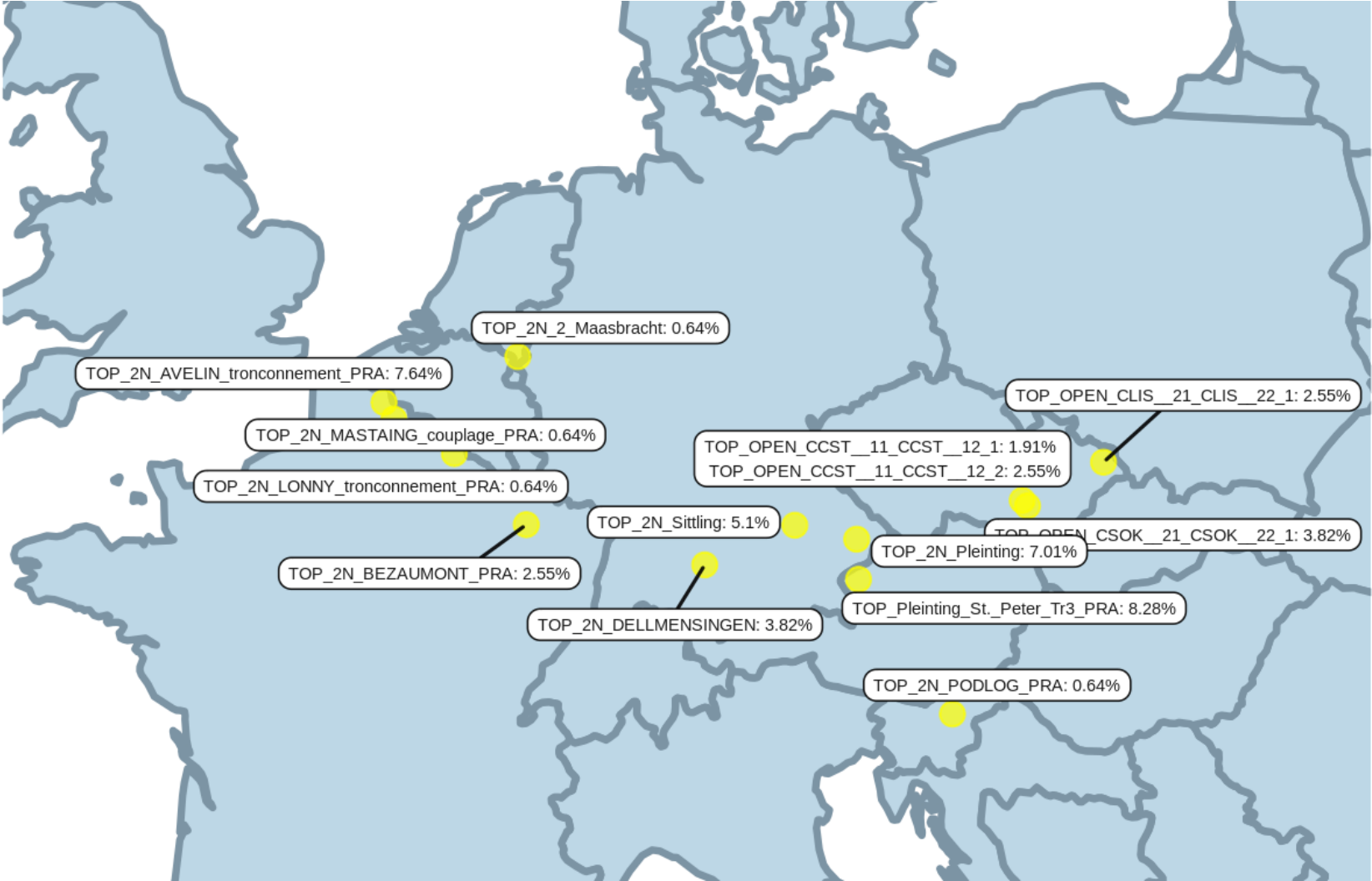
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied PSTs in Curative Mode



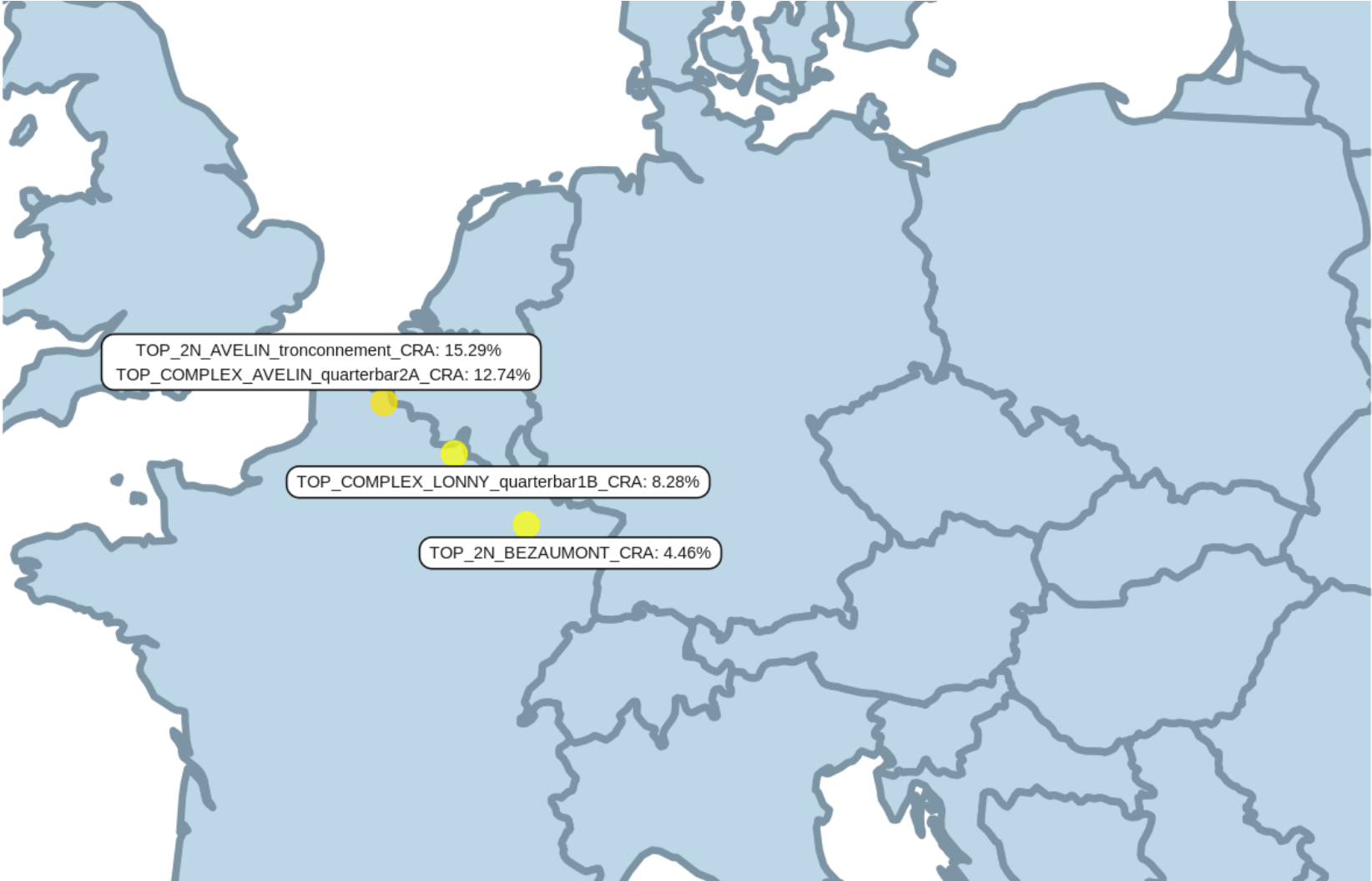
KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

Relative Time Share of Applied Topological RAs in Preventive Mode



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

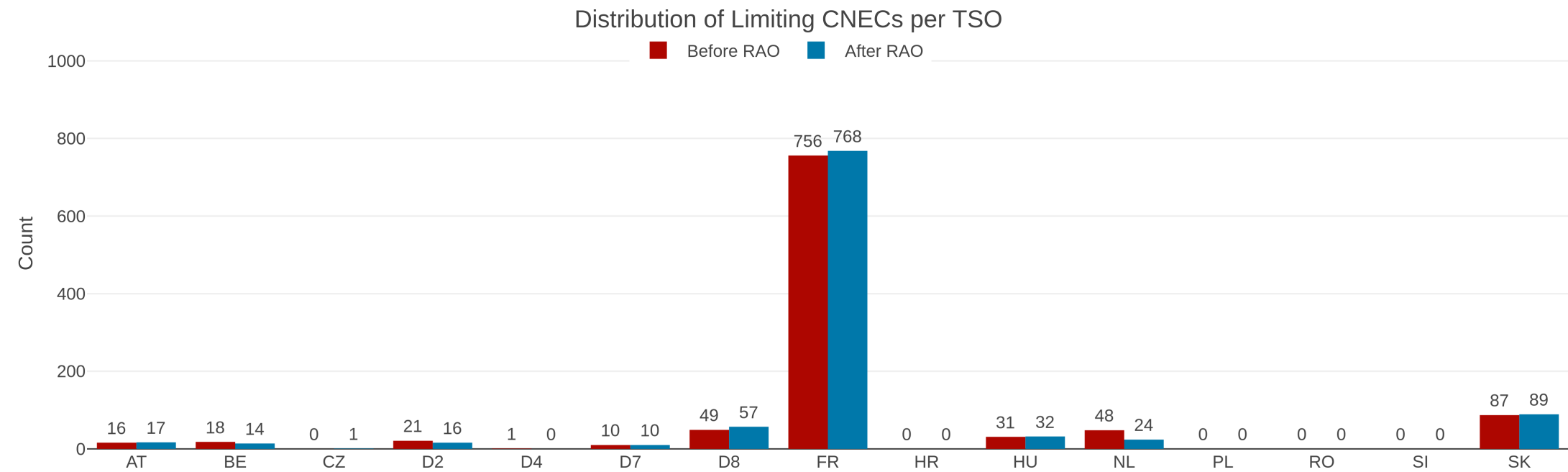
Relative Time Share of Applied Topological RAs in Curative Mode



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.

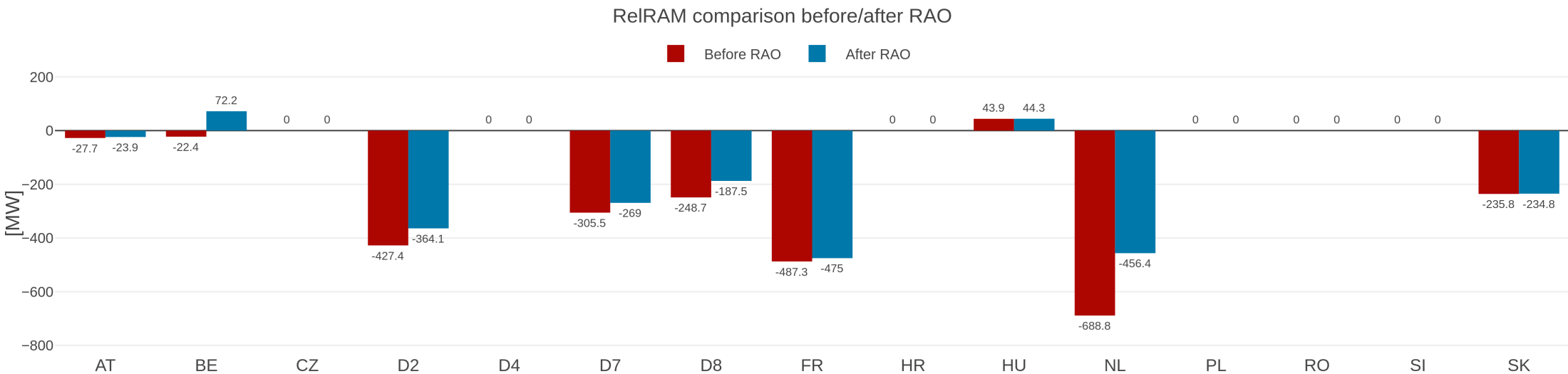
KPI 10: Average variation of relative RAM before and after NRAO



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]	744	1555	99.55%	64.01%	131.29%	0.3699	1.4475
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	744	1417	108.87%	79.41%	154.28%	0.2552	0.5901
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	744	1548	74.56%	55.09%	103.88%	0.2941	1.2185
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	744	793	64.42%	29.95%	98.93%	0.2552	0.5901
[CZ-SK] Nosovice - Varin [DIR] [CZ]	744	1135	74.40%	48.74%	111.58%	0.3699	1.4475
[SI-HU] Cirkovce - Heviz [OPP] [HU]	744	744	74.01%	57.14%	95.53%	0.3019	1.4358
[CZ-SK] Liskovec - P. Bystrica [OPP] [CZ]	743	743	100.21%	78.38%	119.31%	0.0858	0.3121
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	743	1464	80.09%	22.87%	158.13%	0.2676	0.863
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	742	1722	64.99%	19.80%	126.70%	0.2712	1.111
[SK-HU] Gabcikovo - Gyor [OPP] [HU]	736	1134	91.54%	61.47%	125.83%	0.3034	1.2266
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	736	1413	107.62%	76.10%	134.90%	0.2941	1.2185
[D8-PL] Mikulowa PST1 [DIR] [PL]	736	736	60.63%	26.59%	99.24%	0.3949	1.5047
[CZ-SK] Sokolnice - Senica [DIR] [CZ]	732	735	75.89%	55.63%	95.45%	0.3085	1.2459
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	729	729	60.90%	32.54%	95.60%	0.3452	1.4375
[D8-D8] Reuter - Mitte 903 [OPP]	727	727	80.18%	41.16%	124.91%	0.114	0.43
[HU-UA] Kisvarda - Mukachevo [DIR] [HU]	725	829	53.97%	19.01%	85.21%	0.1099	0.2842
[SK-SK] H.Zdana - Sucany [DIR]	722	1005	78.34%	35.21%	92.42%	0.2912	1.0606
[CZ-PL] Wielopole - Nosovice [OPP] [PL]	718	1548	111.47%	82.18%	141.78%	0.3554	1.2706
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	708	717	69.47%	49.62%	82.73%	0.2837	0.9034
[CZ-SK] Nosovice - Varin [OPP] [SK]	700	751	98.19%	63.34%	118.20%	0.3569	1.3298

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]	478	478	1121.91	21.83%	19.97%	39.10%	0.1444
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	245	266	642.16	80.52%	51.23%	108.76%	0.3006
[BE-BE] Achene - Gramme 380.10 [DIR]	156	177	975.86	79.56%	55.59%	105.64%	0.3196
[SK-HU] Levice - God [DIR] [HU]	120	120	1190.92	31.30%	17.89%	52.02%	0.3225
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	112	112	1028.4	20.94%	19.97%	41.28%	0.143
[SK-SK] V.Dur - Levice 1 [DIR]	93	93	604.03	41.41%	19.24%	68.87%	0.3248
[NL-NL] MEE DRT2 [DIR] [NL]	49	49	389.76	55.51%	19.96%	88.21%	0.3155
[BE-FR] Avelgem - Avelin 80 [OPP] [FR]	45	45	372.74	66.72%	53.96%	77.49%	0.3415
[HU-UA] Kisvarda - Mukachevo [DIR] [HU]	38	38	6314.84	33.30%	19.01%	59.15%	0.0863
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	37	39	611.54	68.66%	31.13%	131.49%	0.2597
[FR-D7] Vigy - Enseldorf VIGY1 N [DIR] [D7]	31	34	1228.7	29.54%	19.96%	51.75%	0.2257
[RO-RO] Resita - Timisoara c1 [DIR]	30	30	1643.12	31.55%	20.86%	63.64%	0.0891
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	29	29	217.27	54.65%	40.76%	74.23%	0.3206
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	24	24	527.06	72.92%	56.18%	81.70%	0.2684
[BE-FR] Avelgem - Avelin 380.80 [OPP] [BE]	23	23	718.66	58.26%	47.63%	68.72%	0.3282
[BE-BE] Doel - Zandvliet 380.25 [OPP]	23	23	129.46	80.70%	50.44%	98.88%	0.2565
[HU-HU] Martonvasar - Dunamenti 1 [DIR]	22	22	3744.04	29.21%	12.42%	50.93%	0.0913
[D8-PL] Mikulowa PST1 [DIR] [PL]	22	22	310.67	43.25%	33.71%	62.88%	0.2867
[D2-D2] Diele - Doerpen West [DIR]	22	22	374.17	68.13%	49.32%	86.78%	0.266
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	21	21	454.58	56.82%	37.43%	83.43%	0.1238

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 = $500\text{MW}/0.4 = 1250\text{MW}$

KPI 13 : Allocation Constraints - Poland



	# MTUs
AC was limiting MC	381
AC < 0 MW	60
AC = 0 MW	294
AC > 0 MW	27

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-2034.32	5217.8
Min.	-9205.00	0.0
Max.	0.00	17042.0

