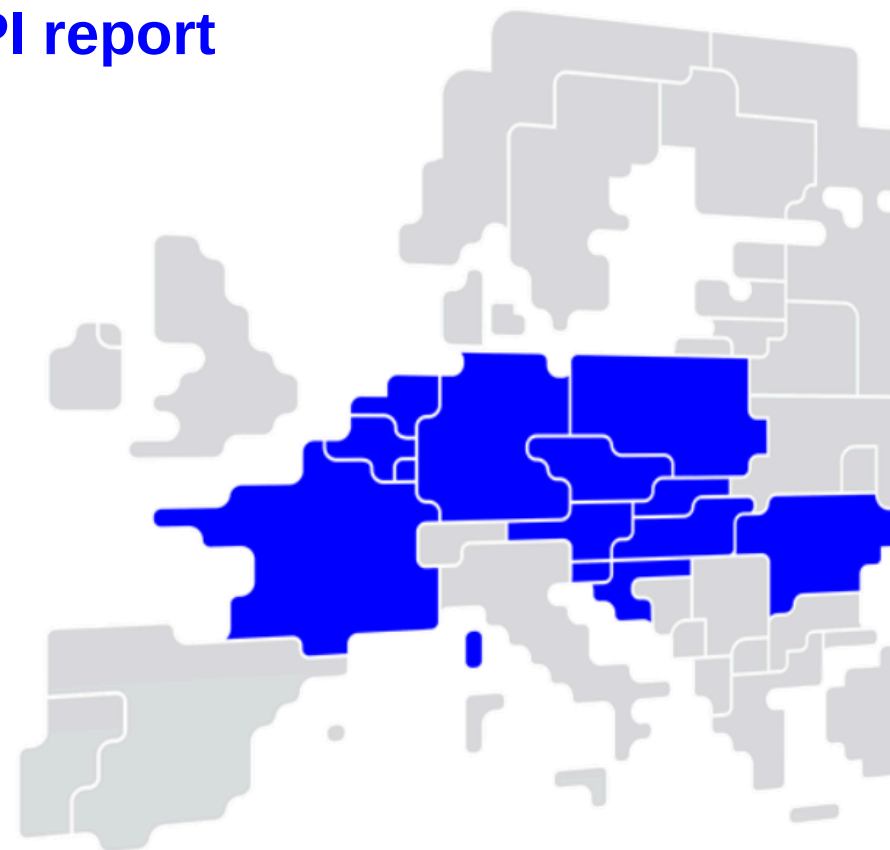




Core FB MC Operational KPI report

February 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

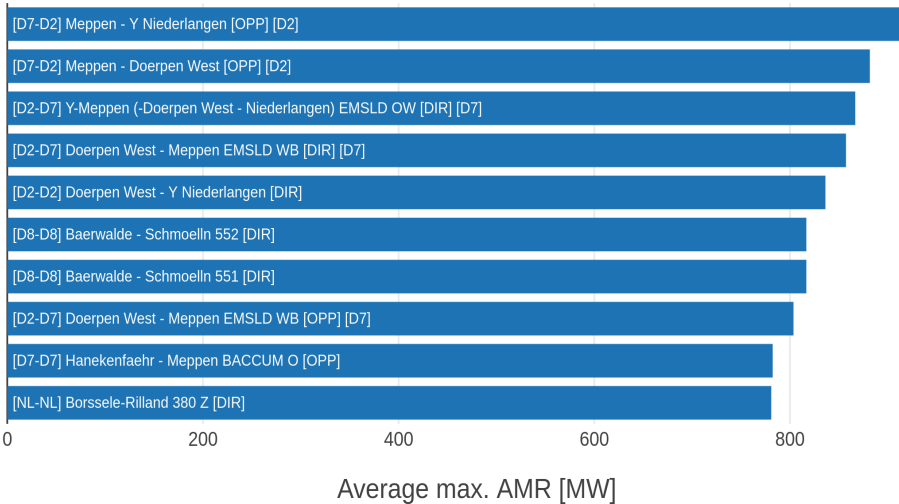
- KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode
- KPI 9: Most limiting CNEC per TSO (NRAO)
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Market Impact Assessment

- 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]	911.79	44.30%	35.80%
[D7-D2] Meppen - Doerpen West [OPP] [D2]	881.66	42.85%	31.18%
[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	866.73	36.79%	28.36%
[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	857.28	36.39%	24.64%
[D2-D2] Doerpen West - Y Niederlangen [DIR]	836.26	40.64%	31.99%
[D8-D8] Baerwalde - Schmoelln 551 [DIR]	816.75	32.75%	32.70%
[D8-D8] Baerwalde - Schmoelln 552 [DIR]	816.75	32.75%	32.70%
[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	803.59	34.11%	22.99%
[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	782.33	32.57%	24.57%
[NL-NL] Borssele-Rilland 380 Z [DIR]	780.88	28.58%	25.73%

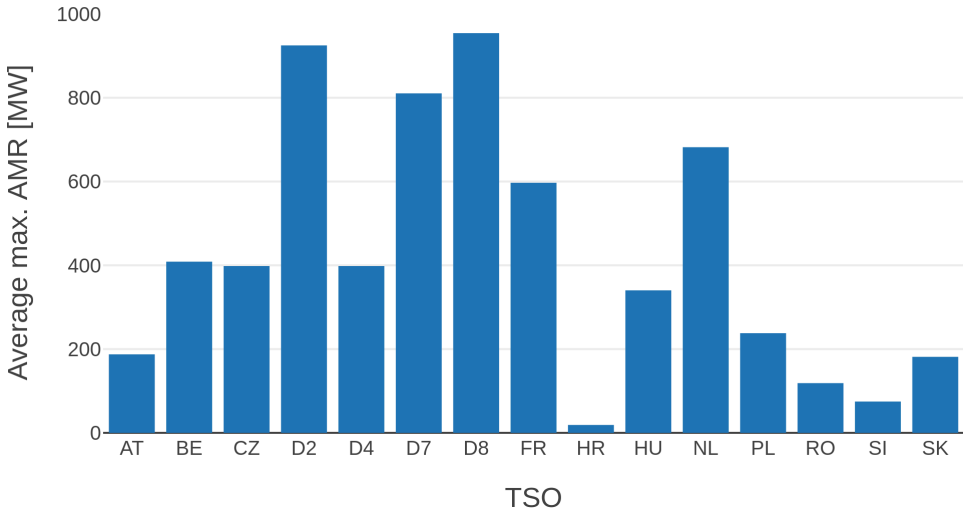


KPI 2: Average maximum AMR per TSO



TSO	Average maximum AMR per TSO
AT	187.49
BE	408.81
CZ	398.35
D2	925.09
D4	398.32
D7	810.41
D8	954.35
FR	597.01
HR	18.86
HU	340.29

TSO	Average maximum AMR per TSO
NL	682.06
PL	238.04
RO	118.67
SI	74.88
SK	181.52



KPI 3: Share of MTUs with intervention per TSO



Total BDs
28

Total MTUs
672

MTUs without IVA
163

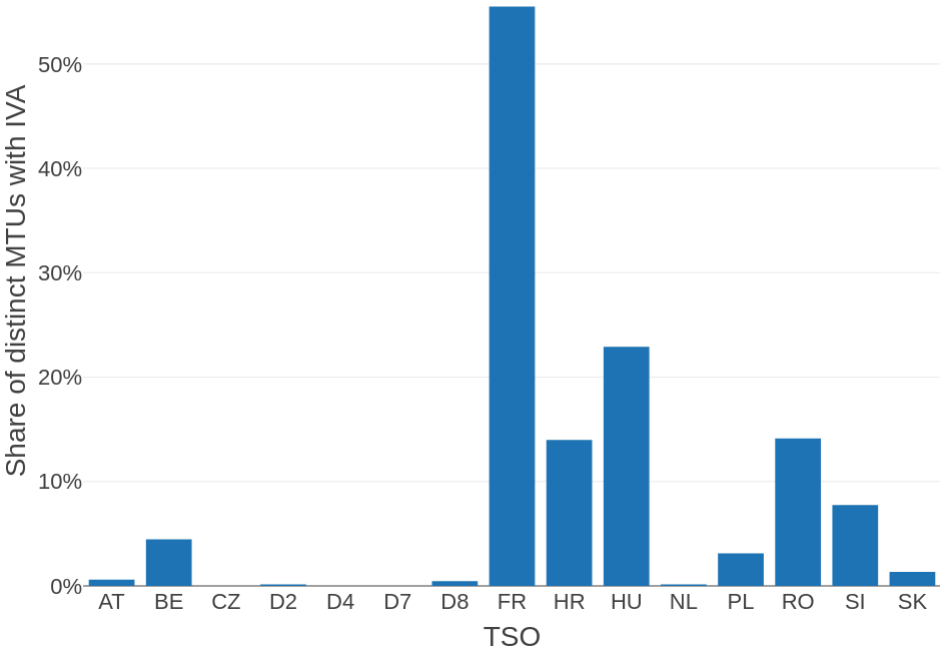
Share of distinct MTUs without IVA
24.26%

MTUs with IVA
509

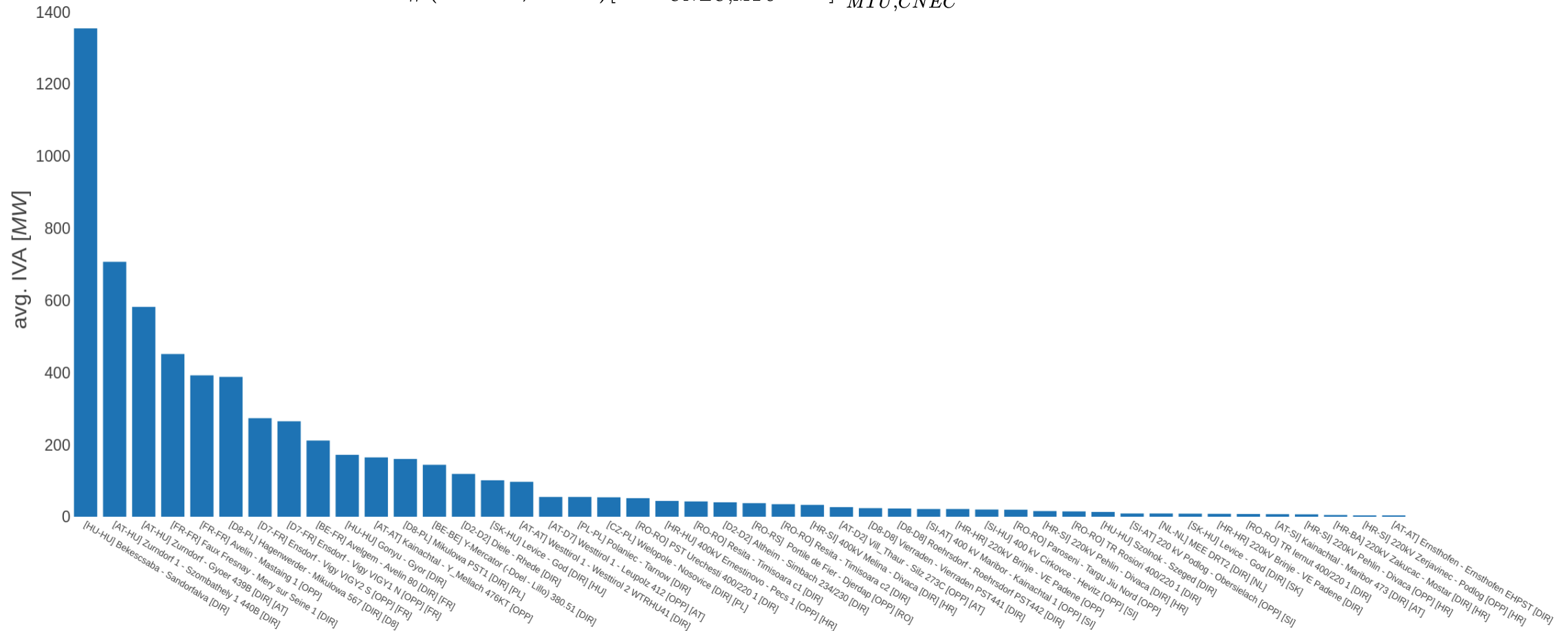
Share of distinct MTUs with IVA
75.7%

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
AT	0.60%	4
BE	4.46%	30
CZ	0.00%	0
D2	0.15%	1
D4	0.00%	0
D7	0.00%	0
D8	0.45%	3
FR	55.51%	373
HR	13.99%	94
HU	22.92%	154

TSO	Share of distinct MTUs with IVA	Distinct MTUs with IVA
NL	0.15%	1
PL	3.12%	21
RO	14.14%	95
SI	7.74%	52
SK	1.34%	9

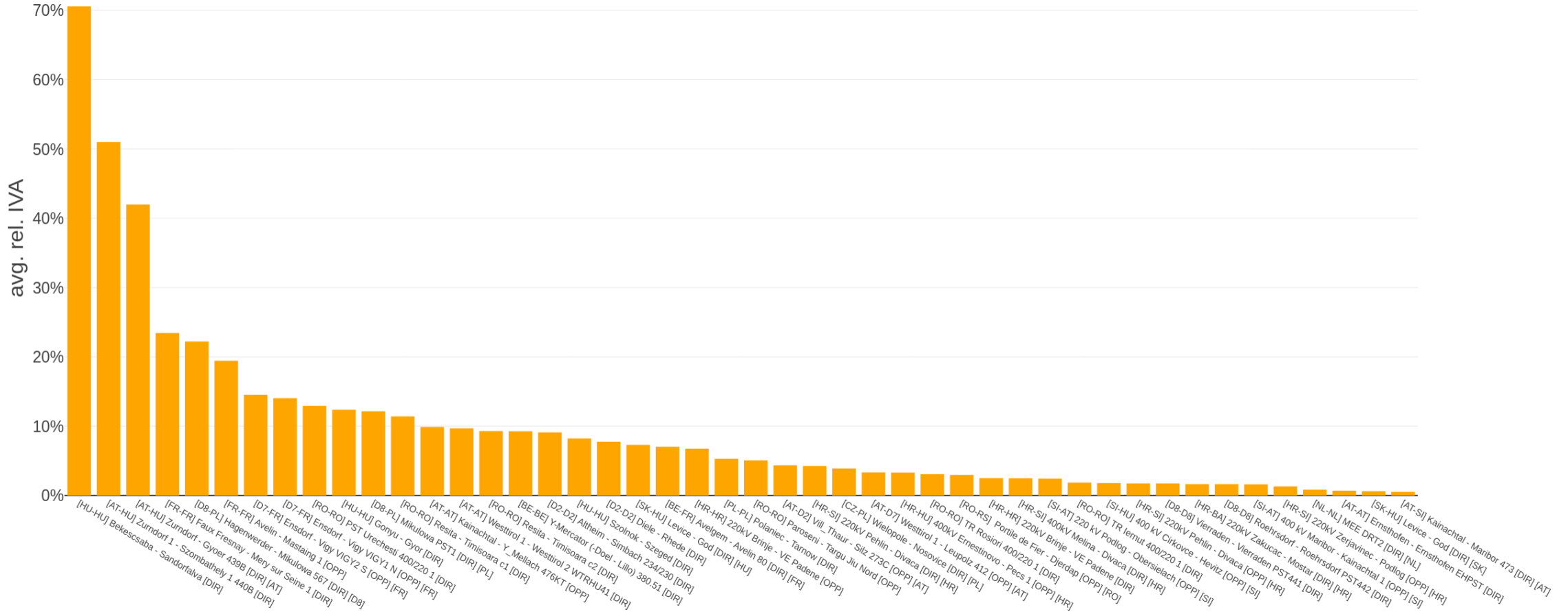


$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]$$



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

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



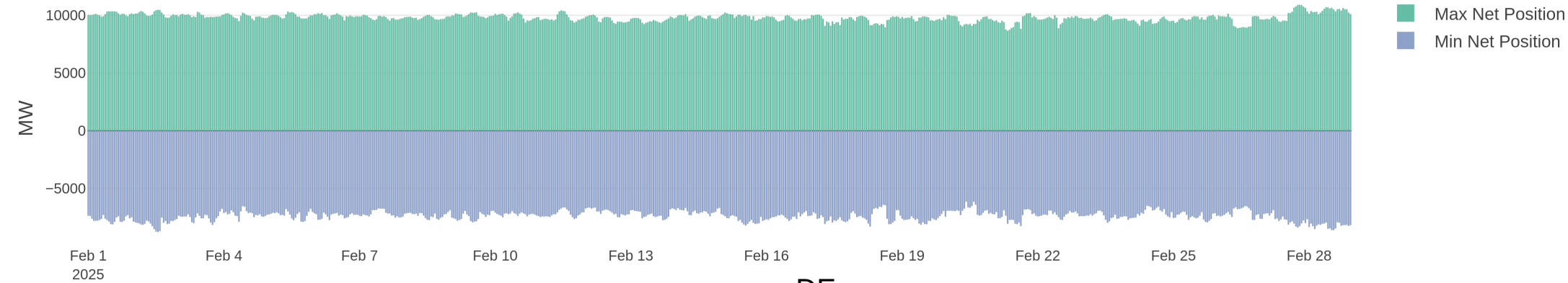
KPI 5: Min & max net positions per BZ hub



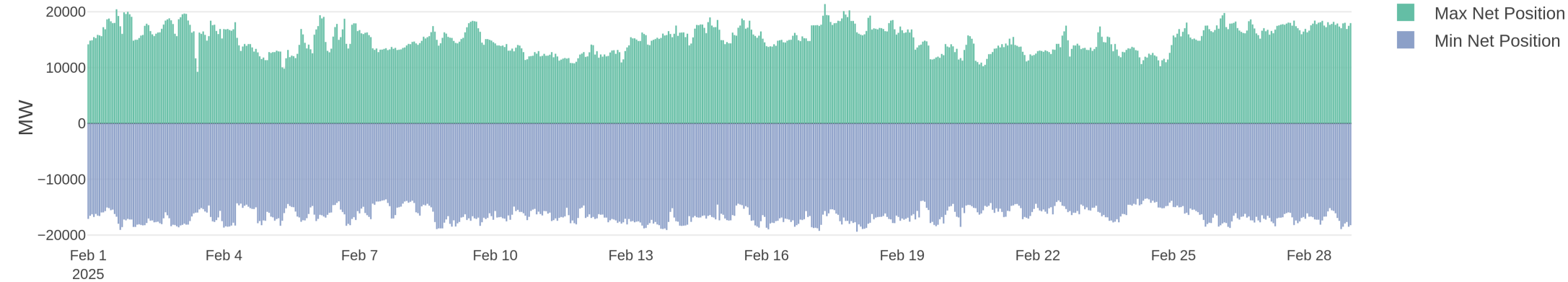
KPI 5: Min & max net positions per BZ hub



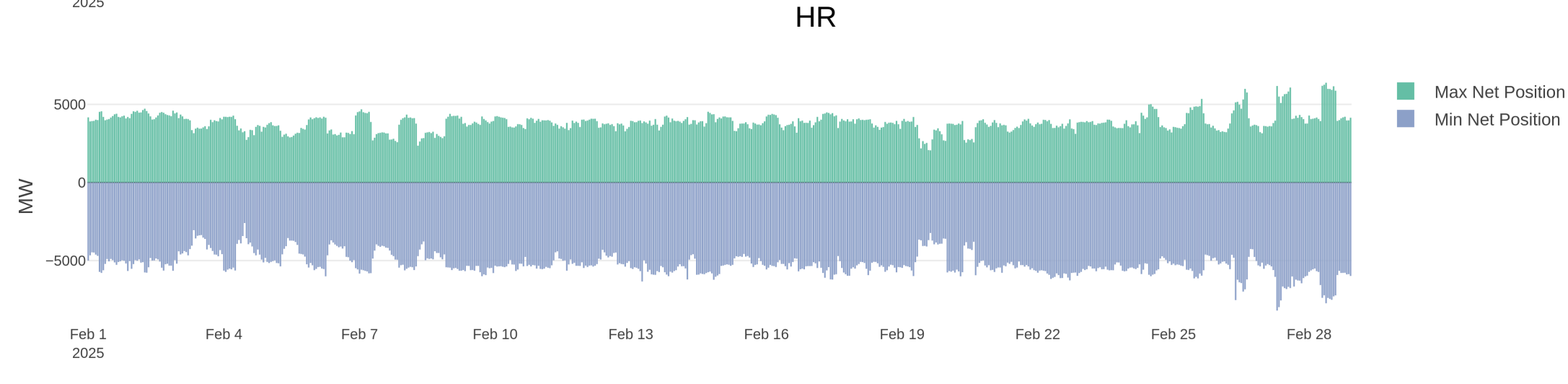
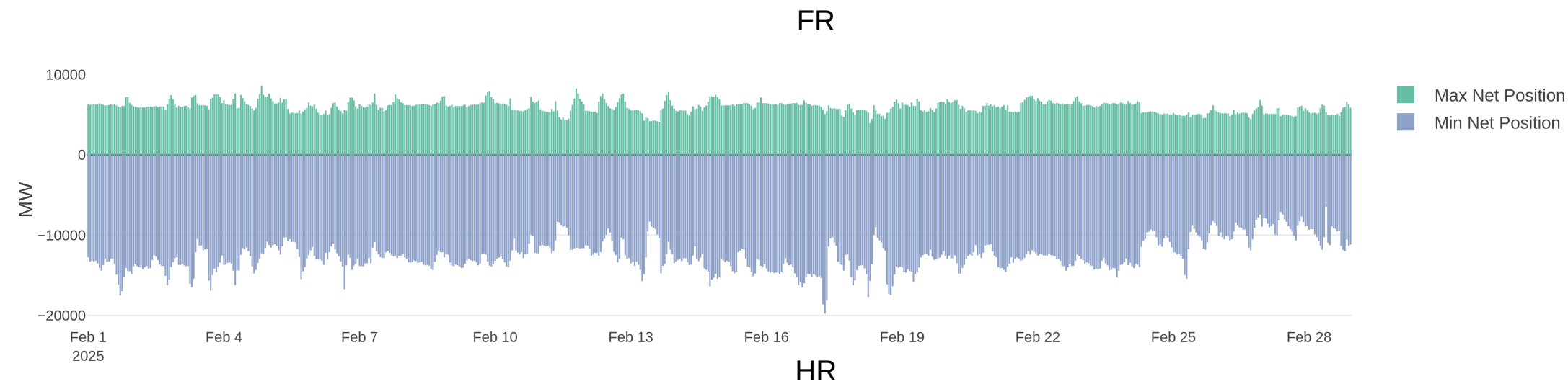
CZ



DE



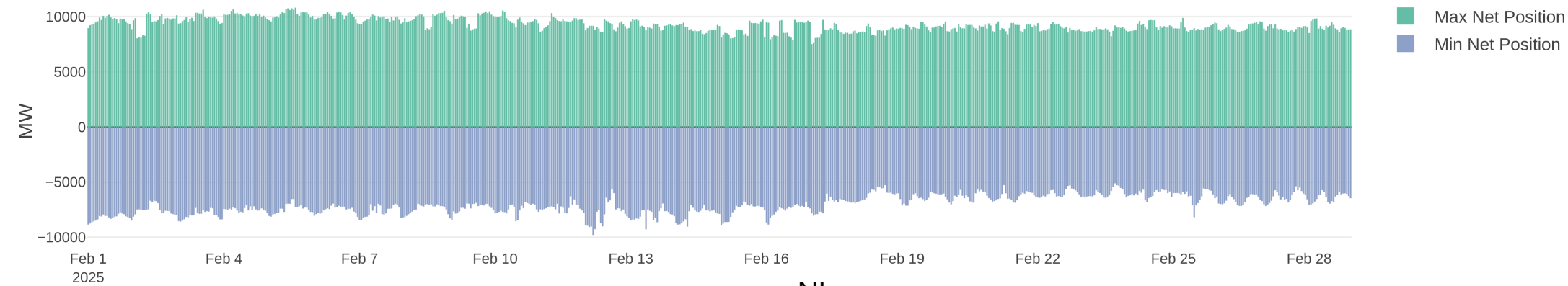
KPI 5: Min & max net positions per BZ hub



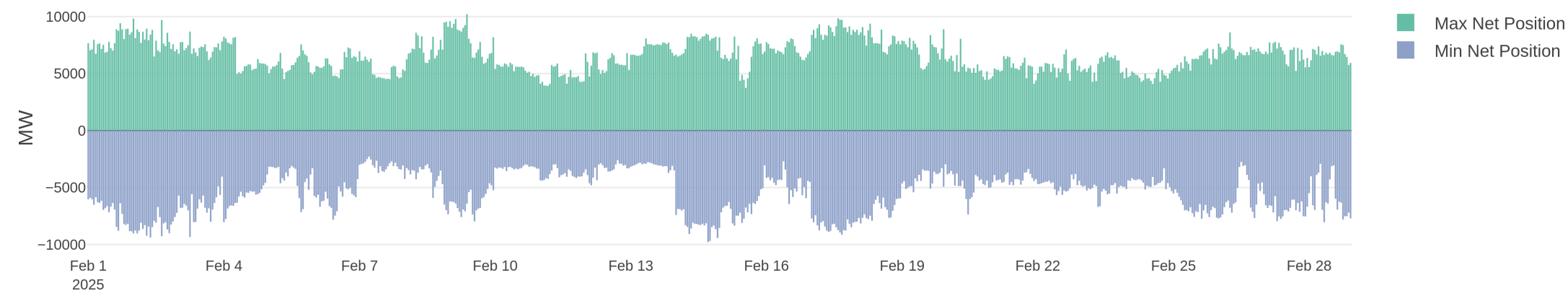
KPI 5: Min & max net positions per BZ hub



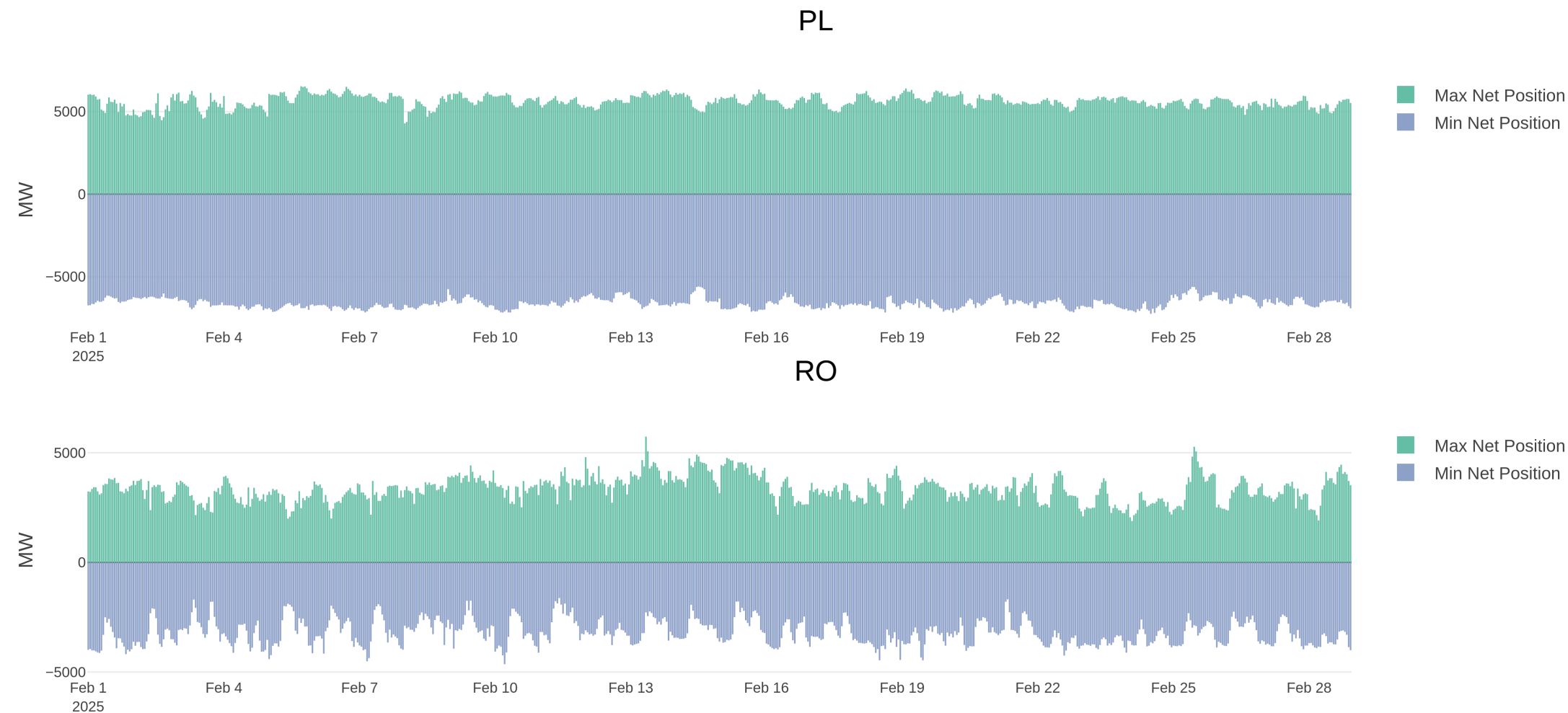
HU



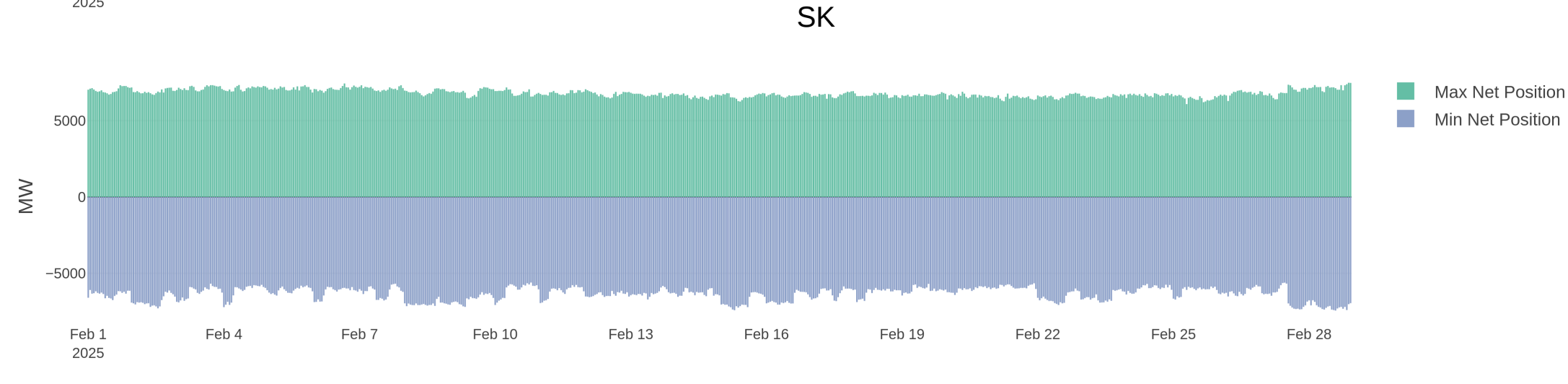
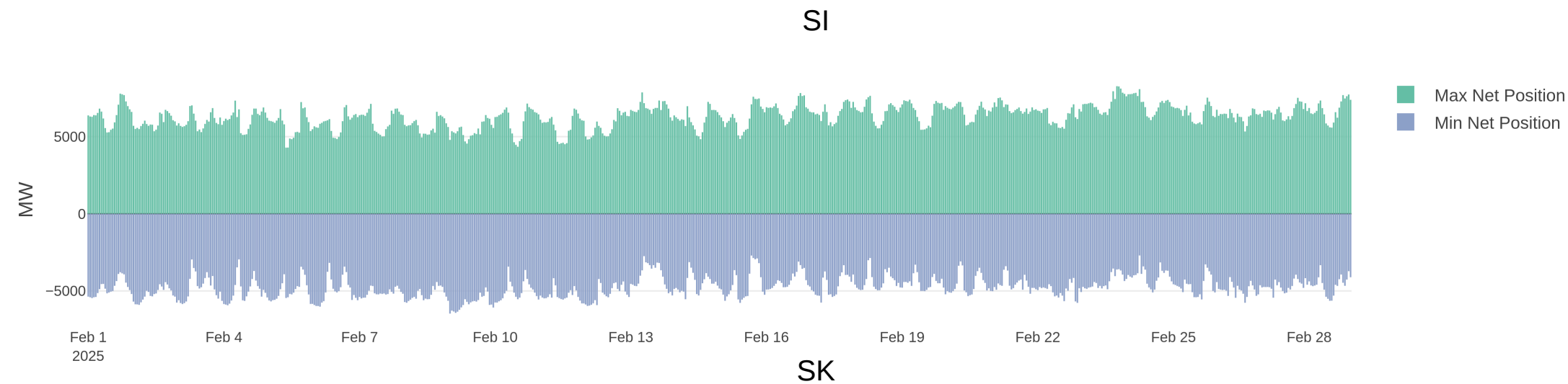
NL



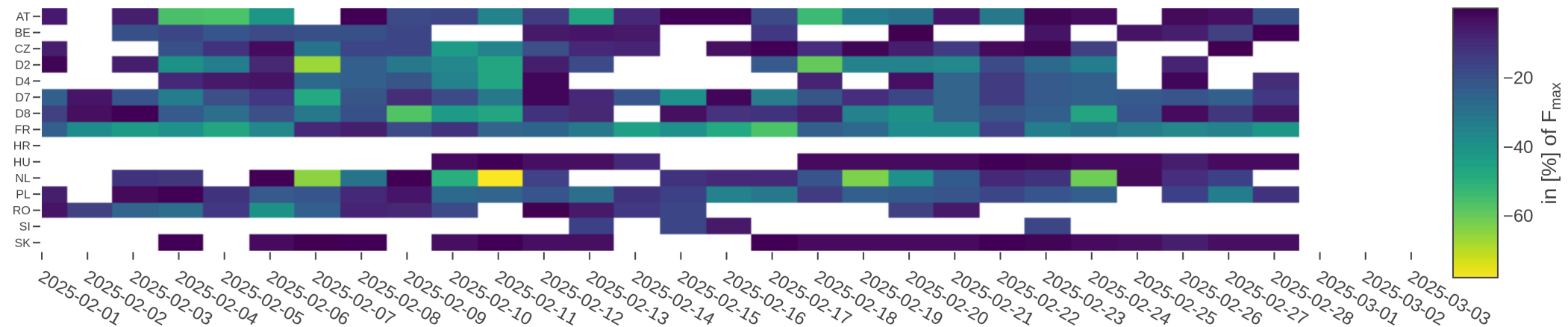
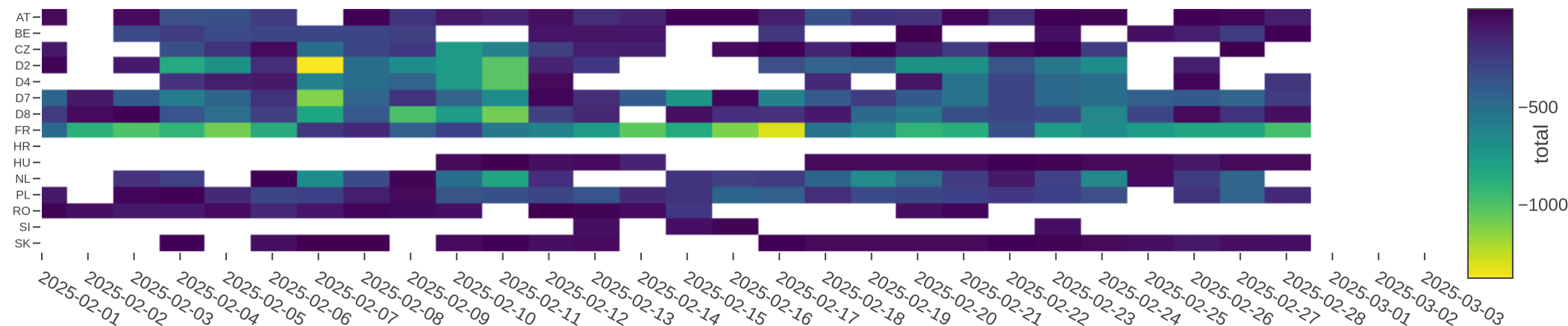
KPI 5: Min & max net positions per BZ hub



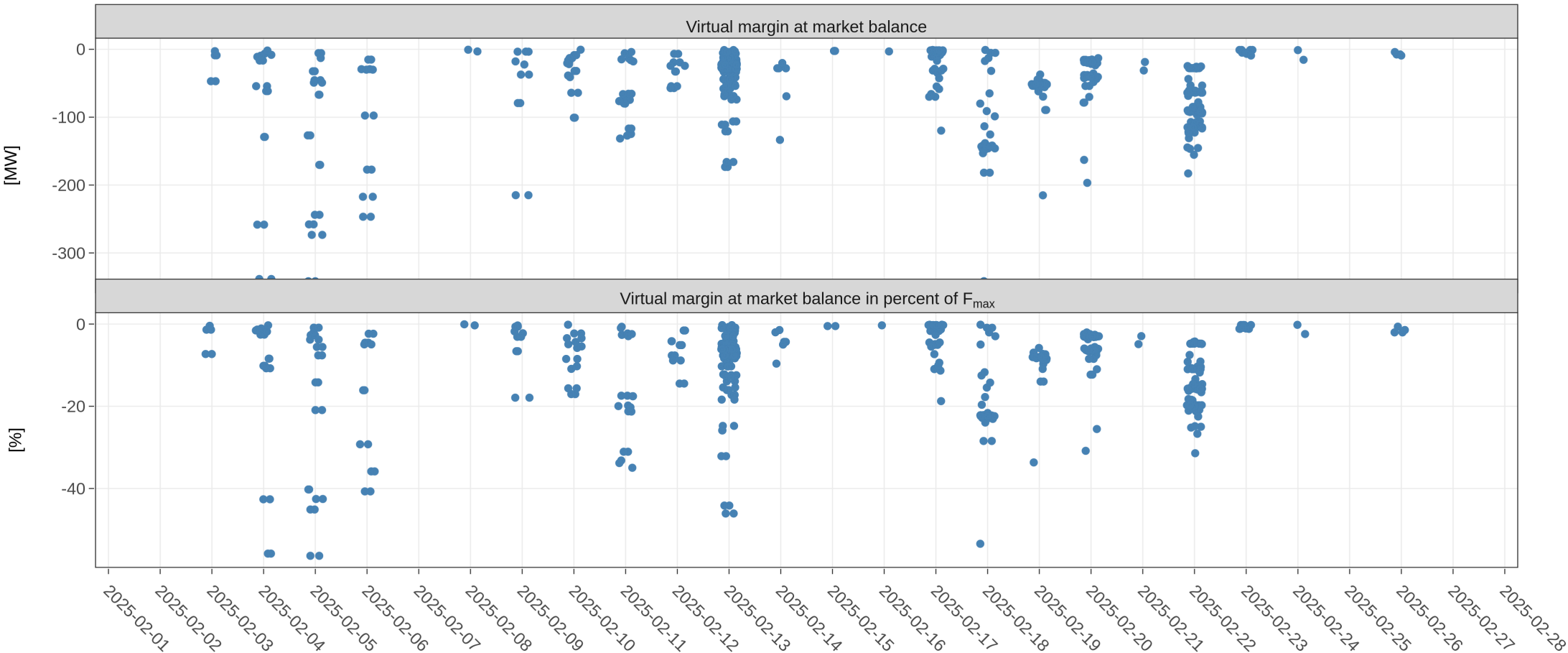
KPI 5: Min & max net positions per BZ hub



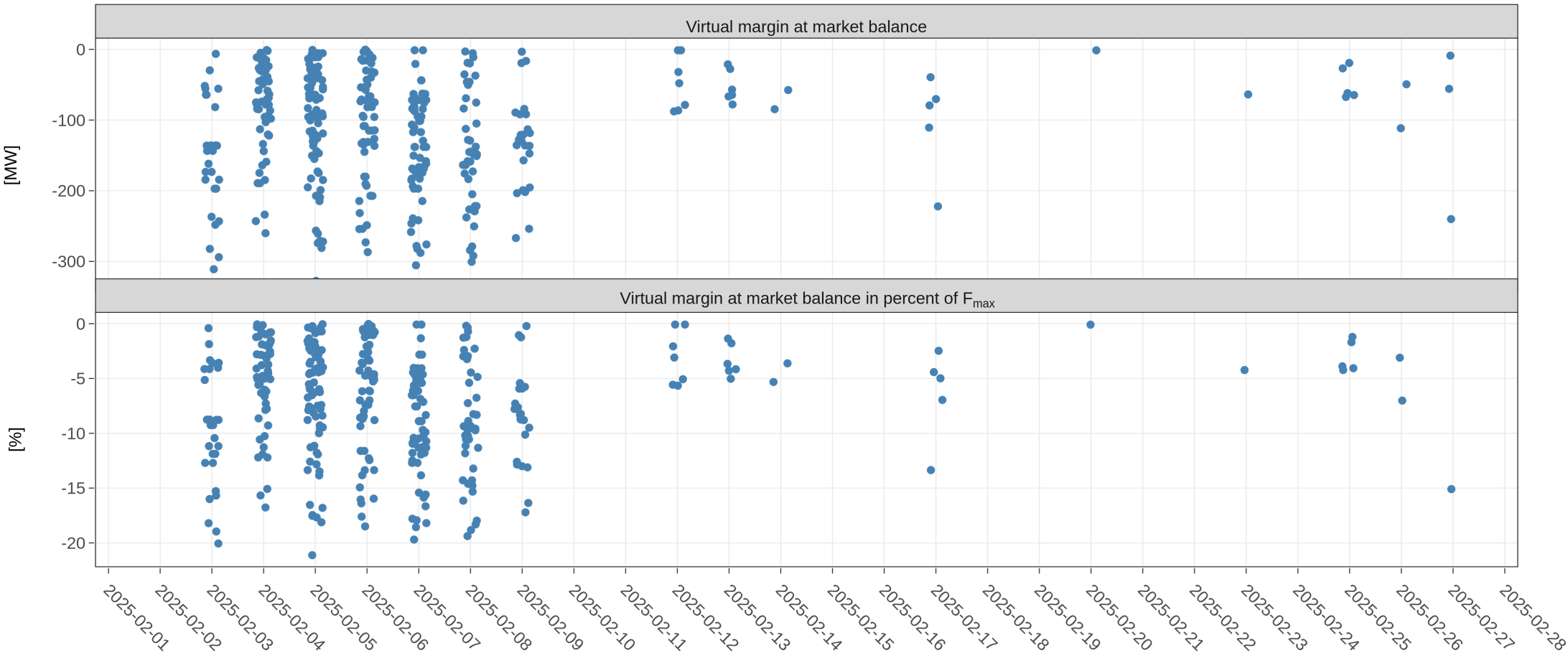
KPI 6a: Highest virtual margins at market balance for CORE TSOs



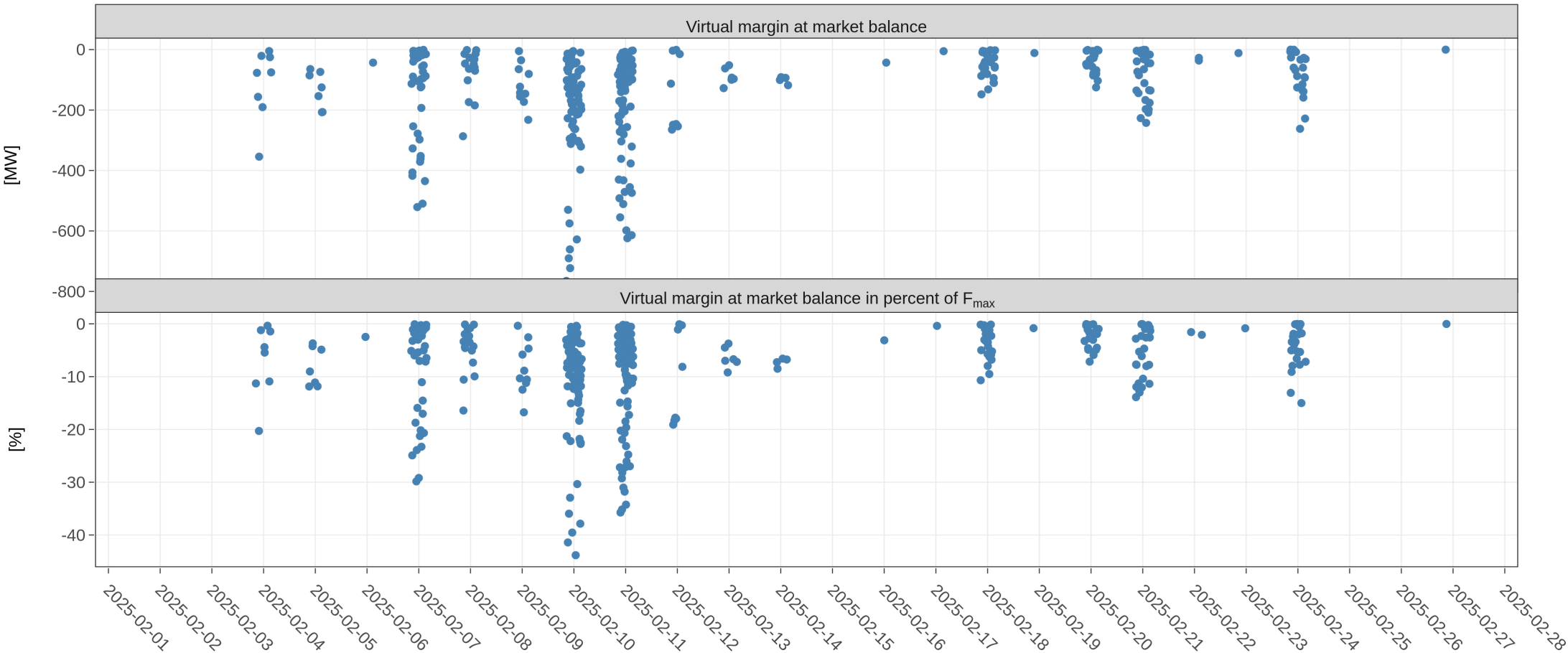
KPI 6b: Virtual margins at market balance AT



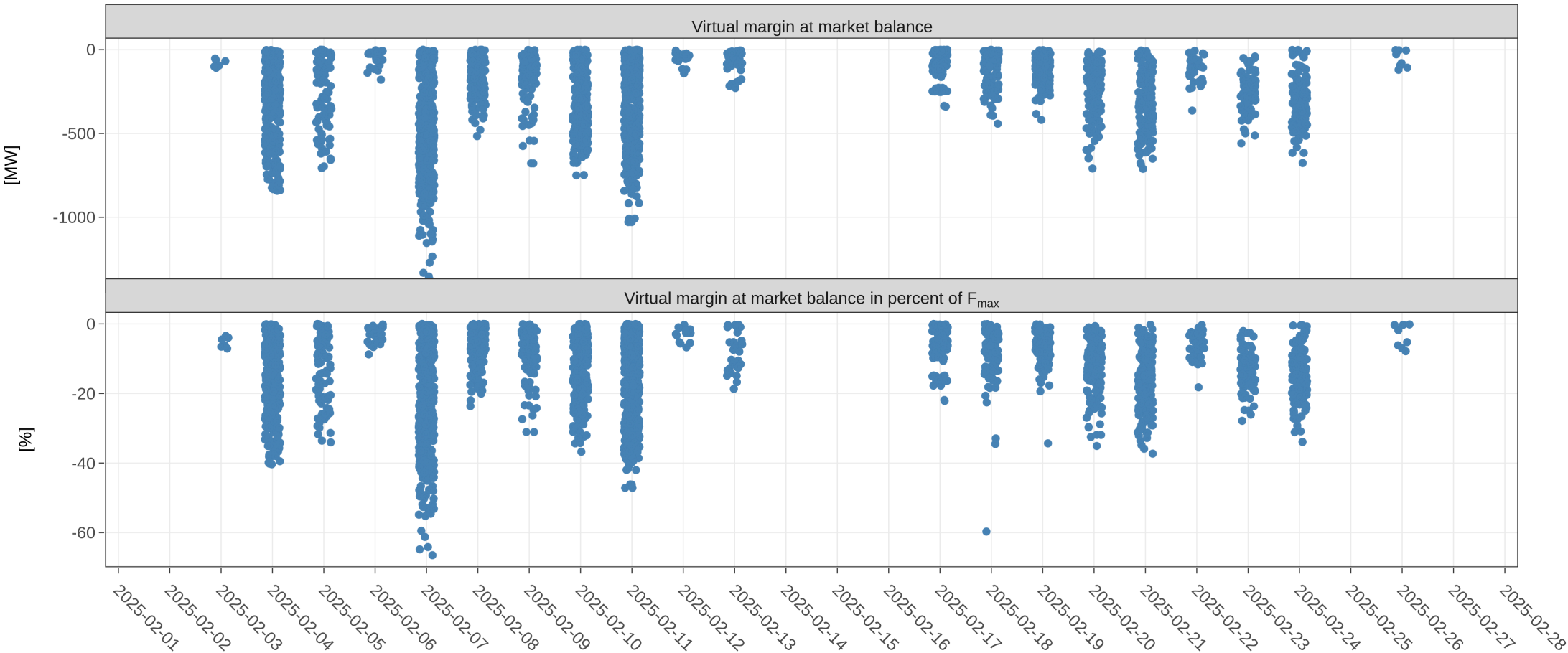
KPI 6b: Virtual margins at market balance BE



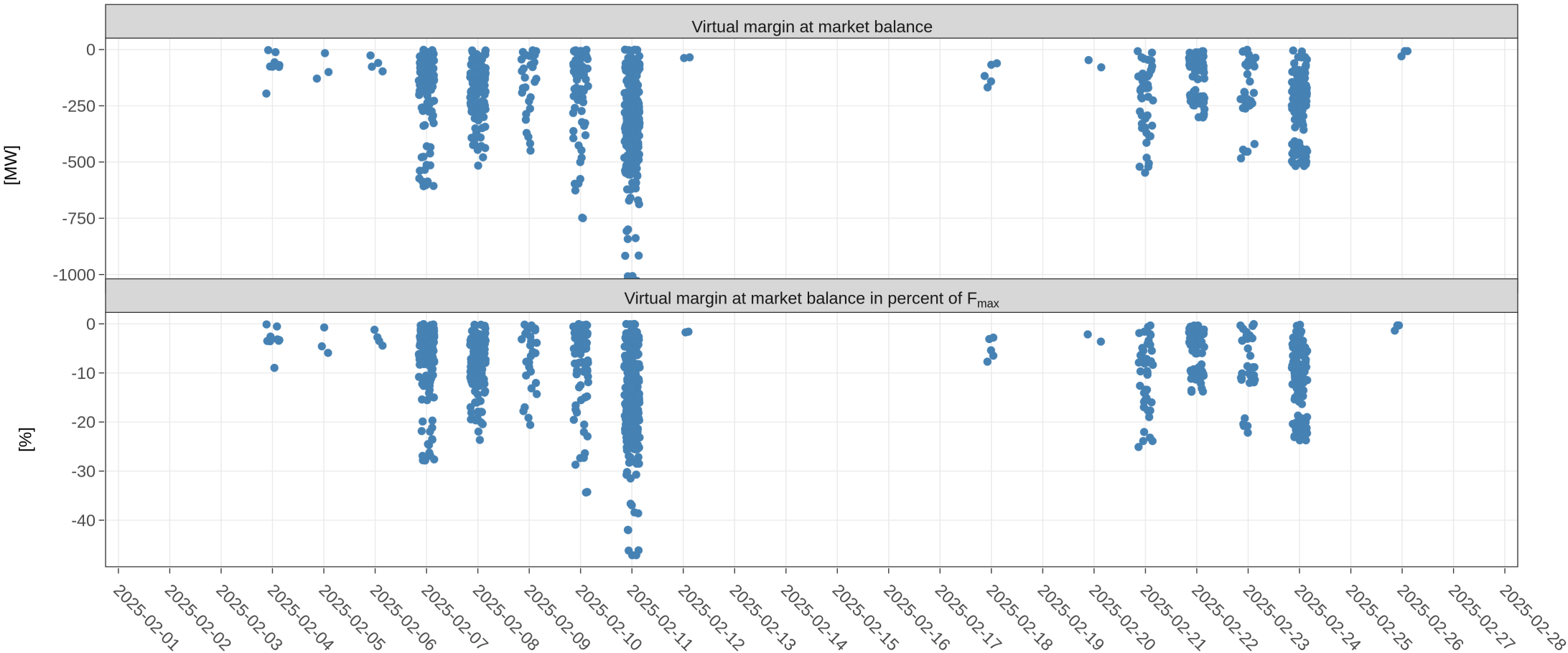
KPI 6b: Virtual margins at market balance CZ



KPI 6b: Virtual margins at market balance D2



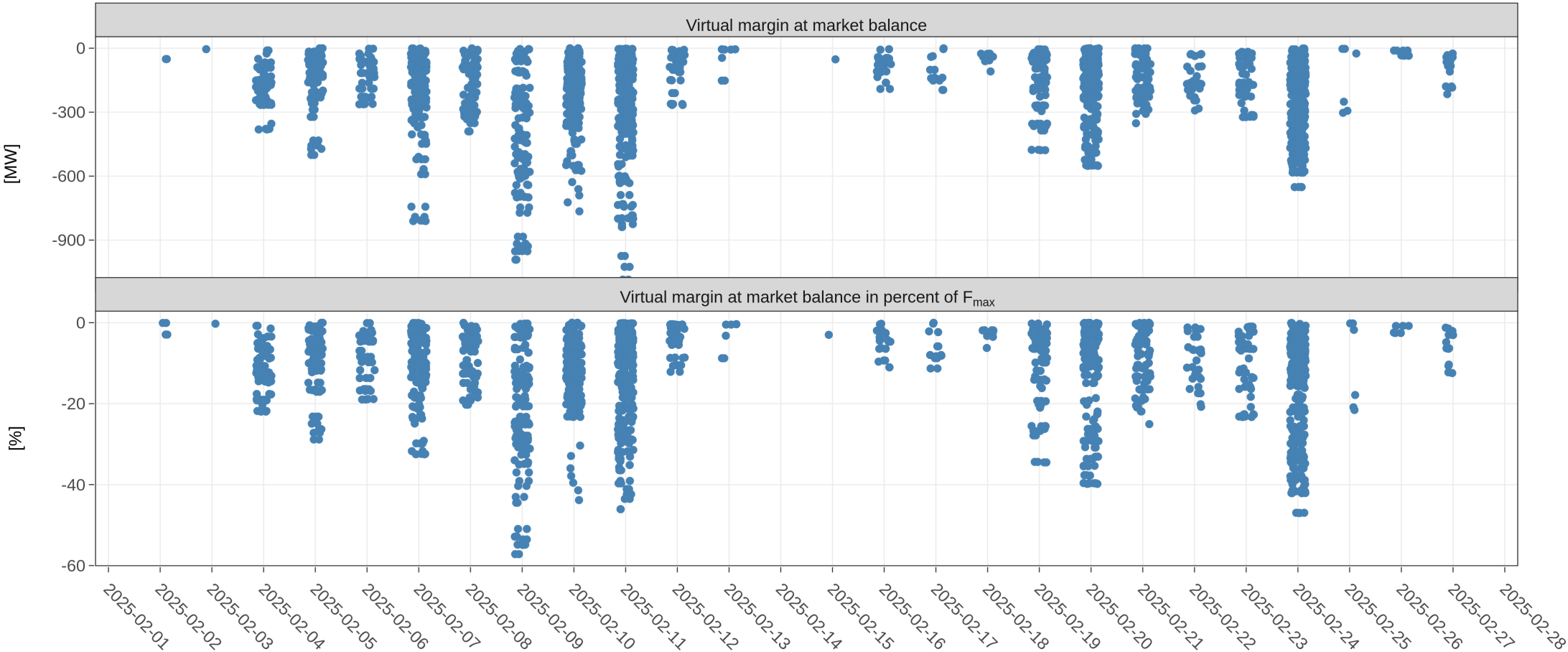
KPI 6b: Virtual margins at market balance D4



KPI 6b: Virtual margins at market balance D7



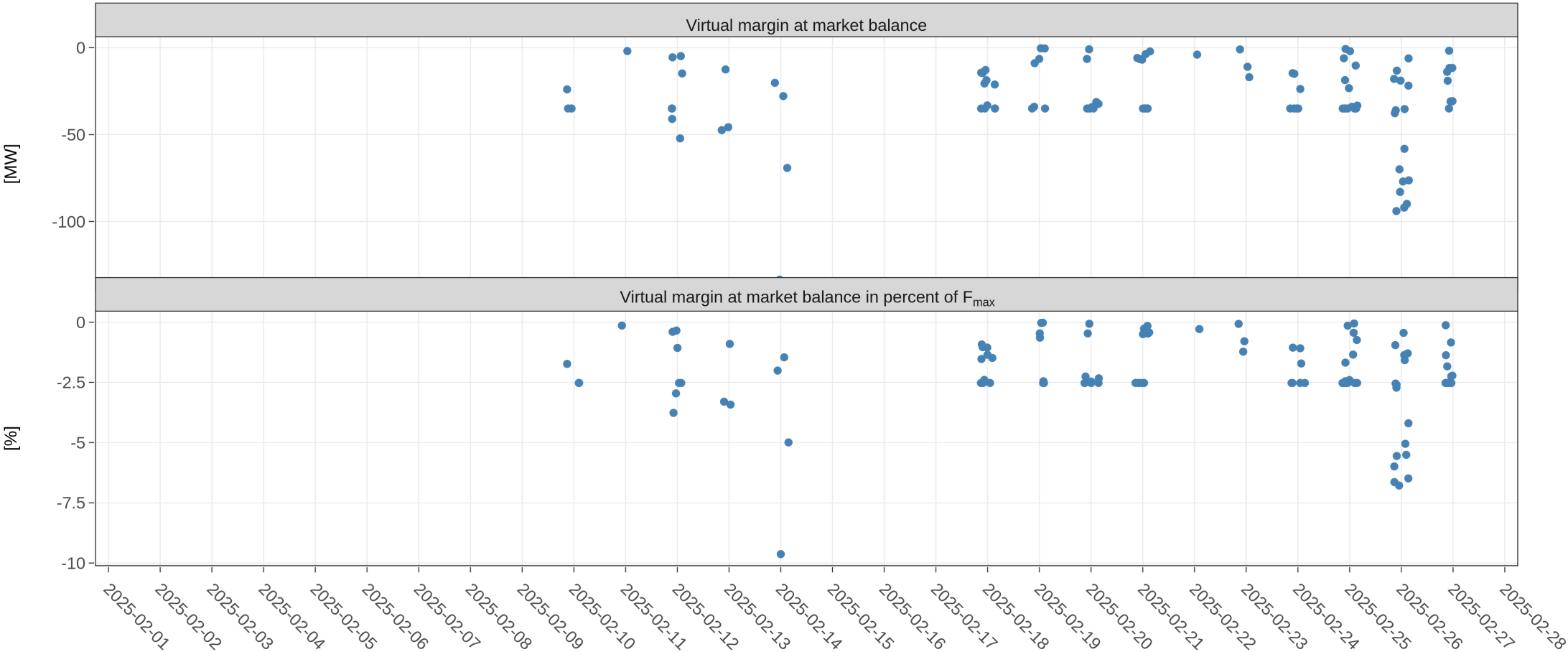
KPI 6b: Virtual margins at market balance D8



KPI 6b: Virtual margins at market balance FR



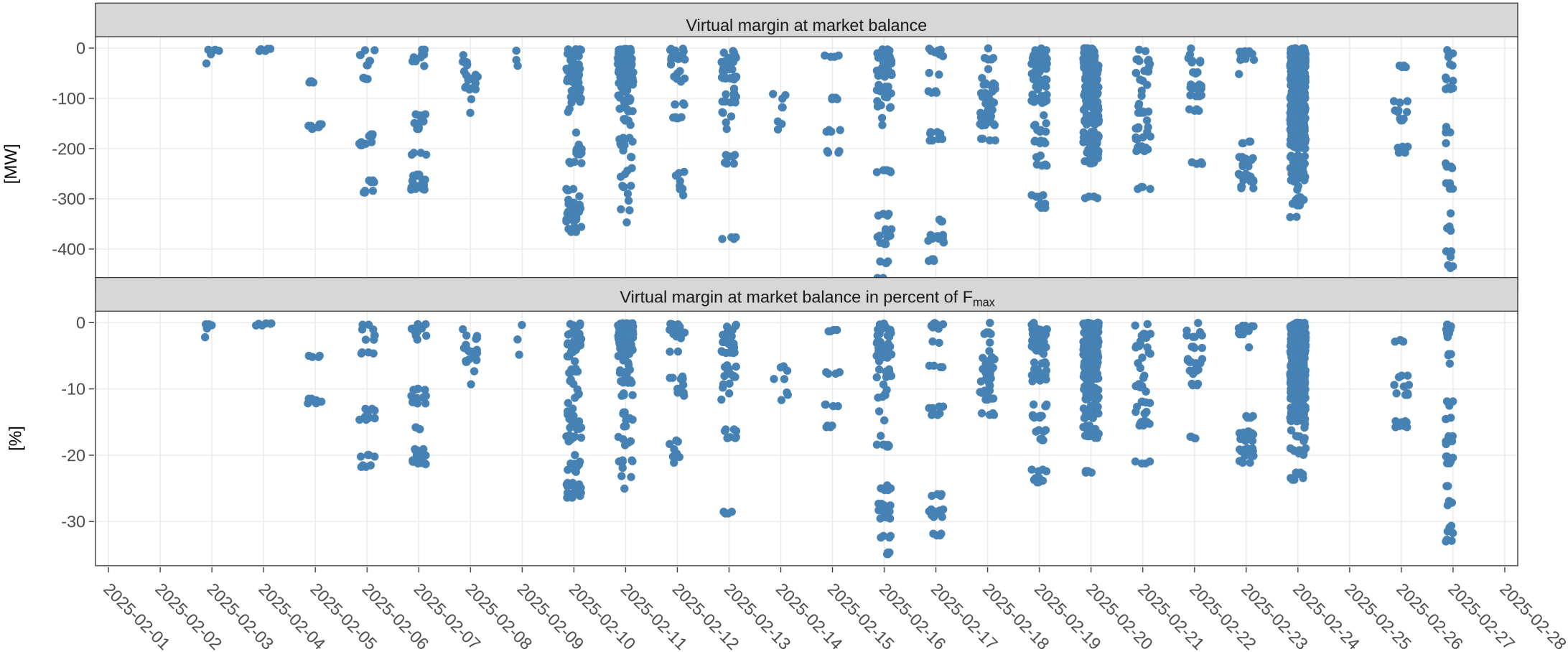
KPI 6b: Virtual margins at market balance HU



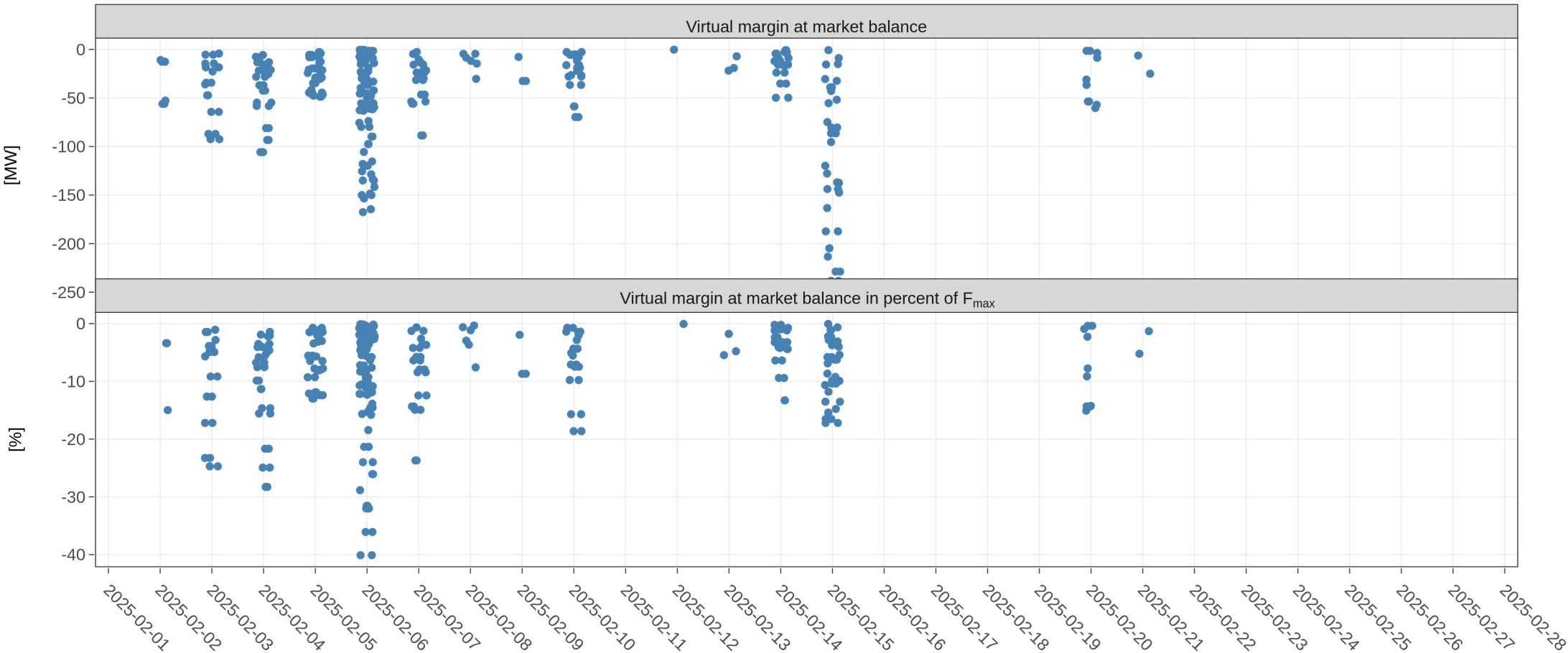
KPI 6b: Virtual margins at market balance NL



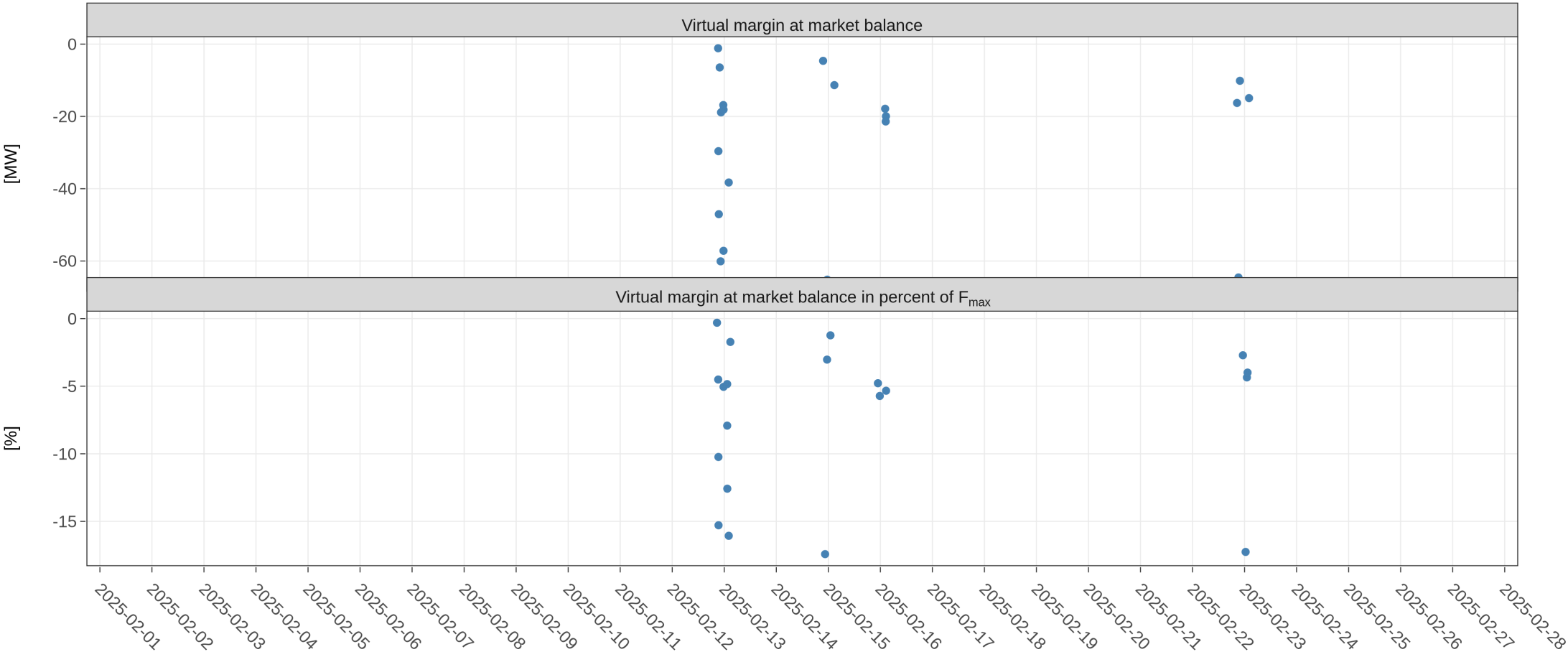
KPI 6b: Virtual margins at market balance PL



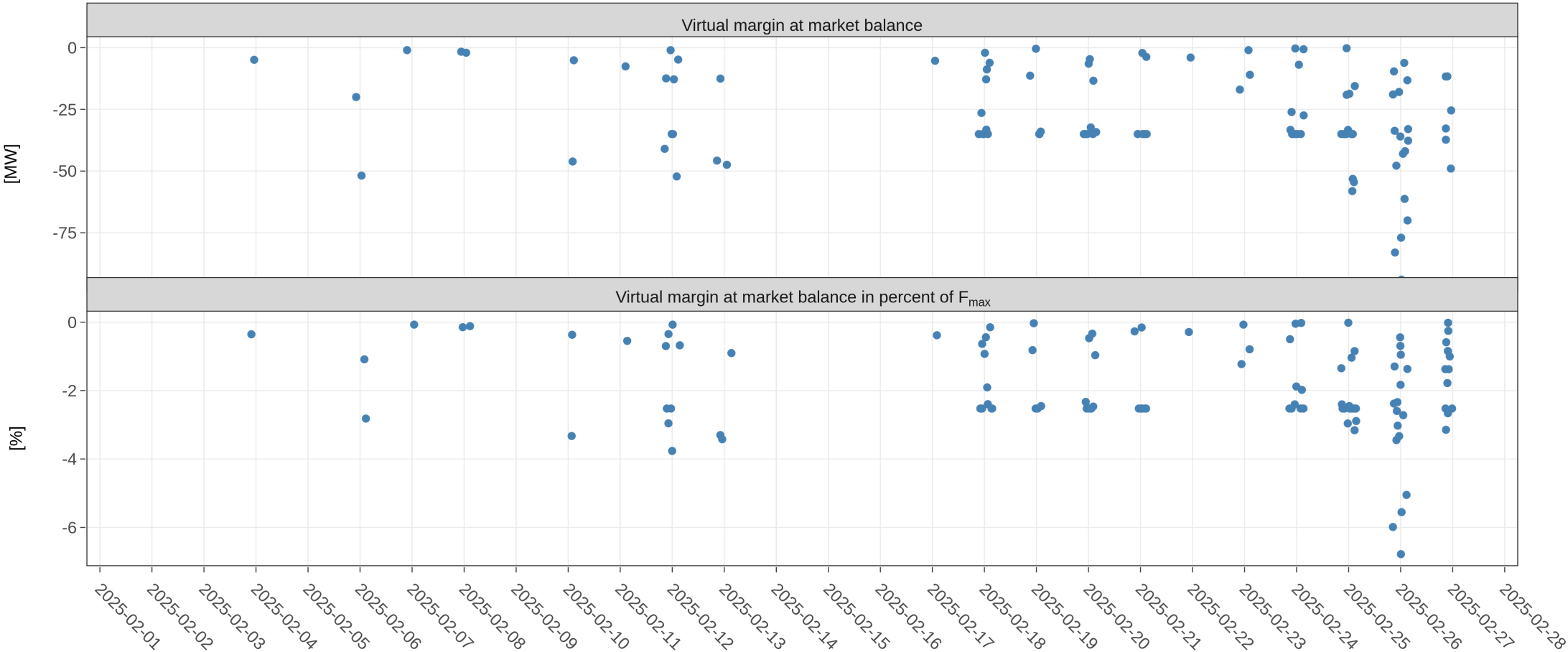
KPI 6b: Virtual margins at market balance RO



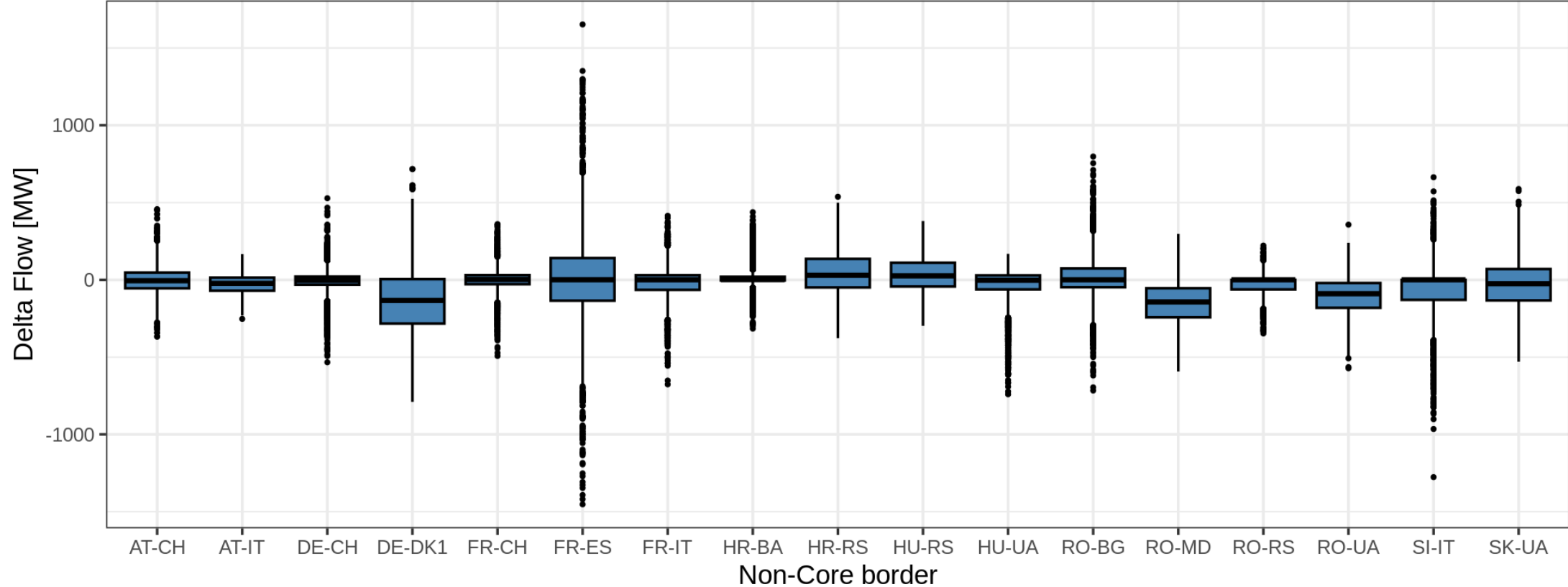
KPI 6b: Virtual margins at market balance SI



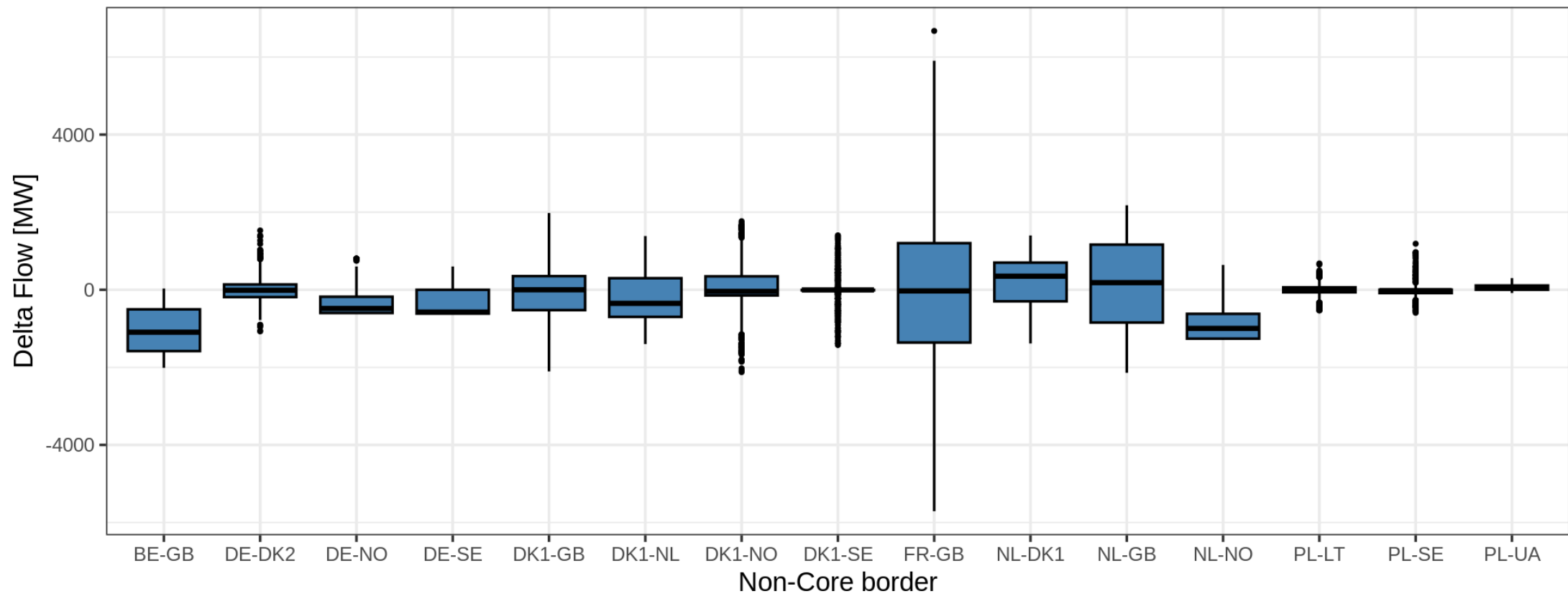
KPI 6b: Virtual margins at market balance SK



KPI 7: Non-Core exchanges AC delta flow



KPI 7: Non-Core exchanges DC delta flow



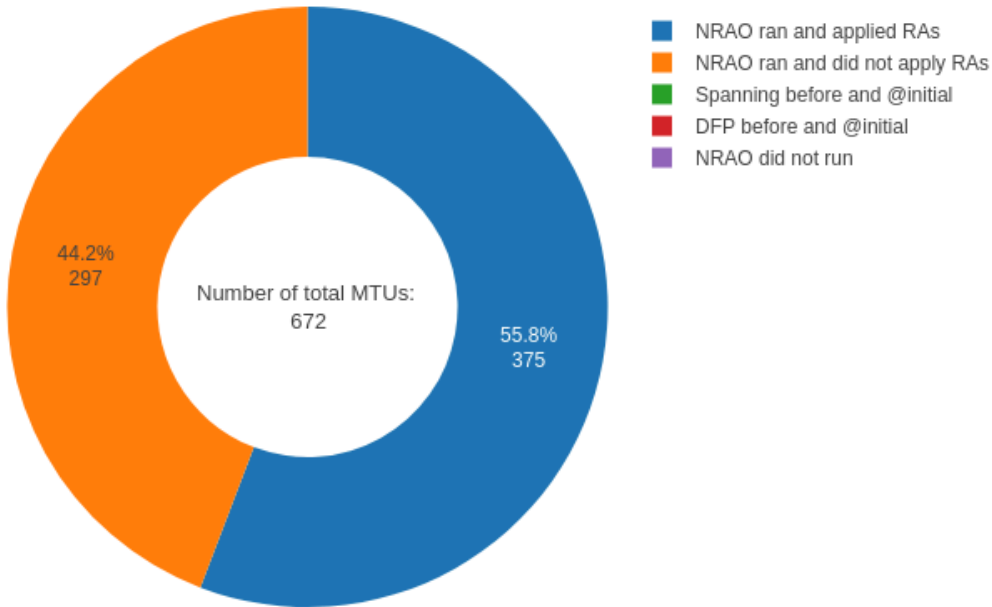
KPI 8: NRAO – Applied Remedial Action



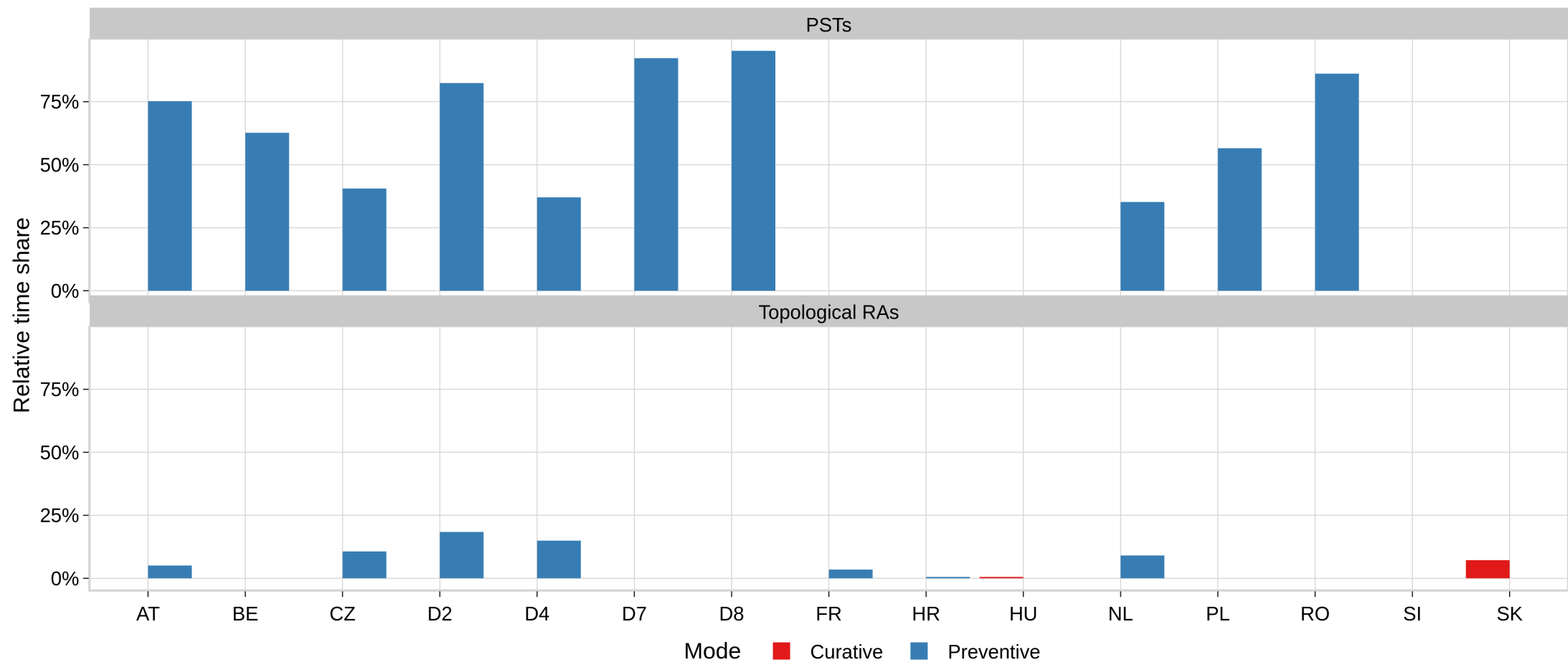
In the following plots, the relative time share relates to the hours labeled ‘NRAO Ran and Applied RAs’.

Total MTUs: 672 hours

Category	Hours (%)
NRAO ran and applied RAs	375 hours (55.8%)
NRAO ran and did not apply RAs	297 hours (44.2%)
Spanning before and @initial	0 hours (0%)
DFP before and @initial	0 hours (0%)
NRAO did not run	0 hours (0%)

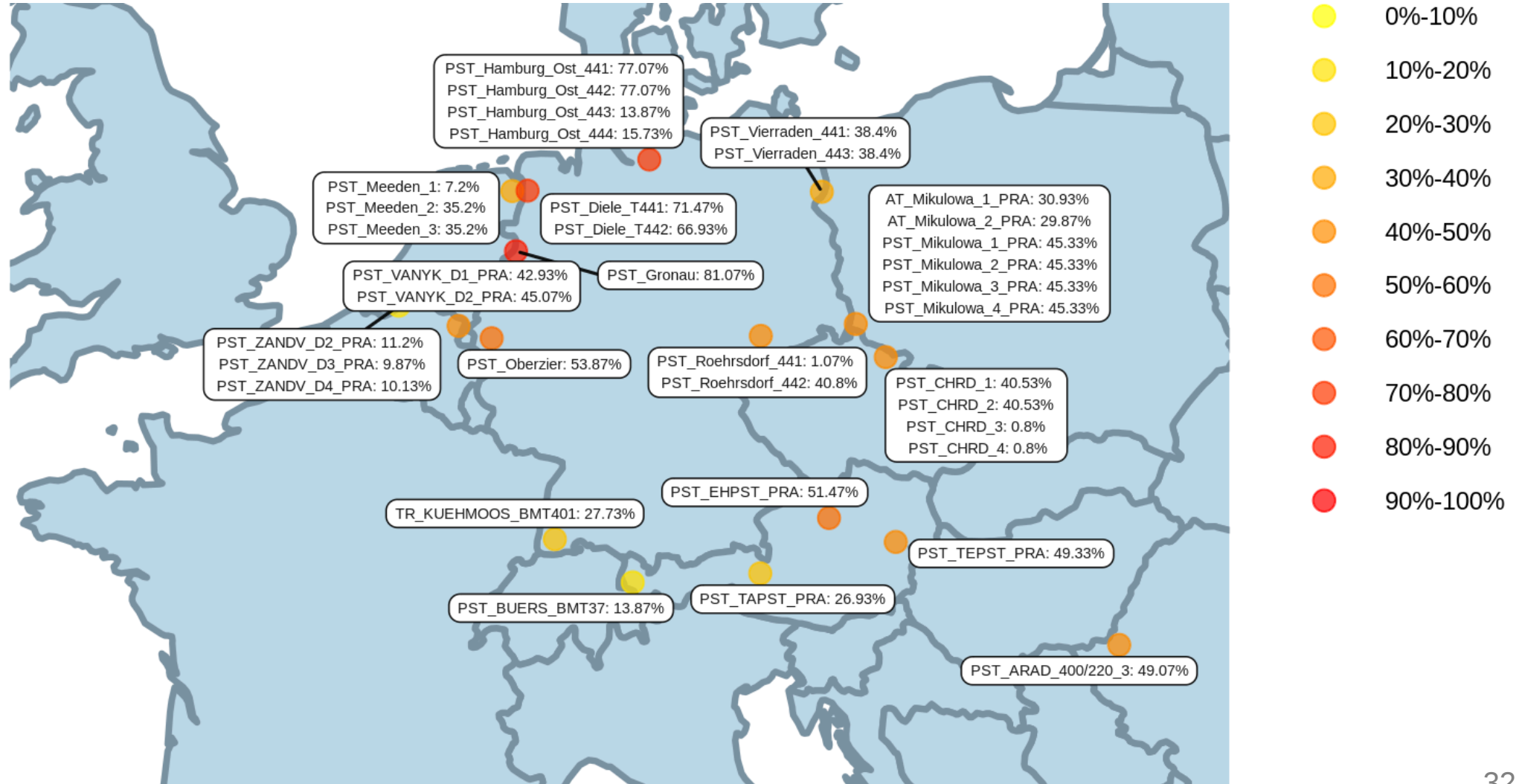


KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



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

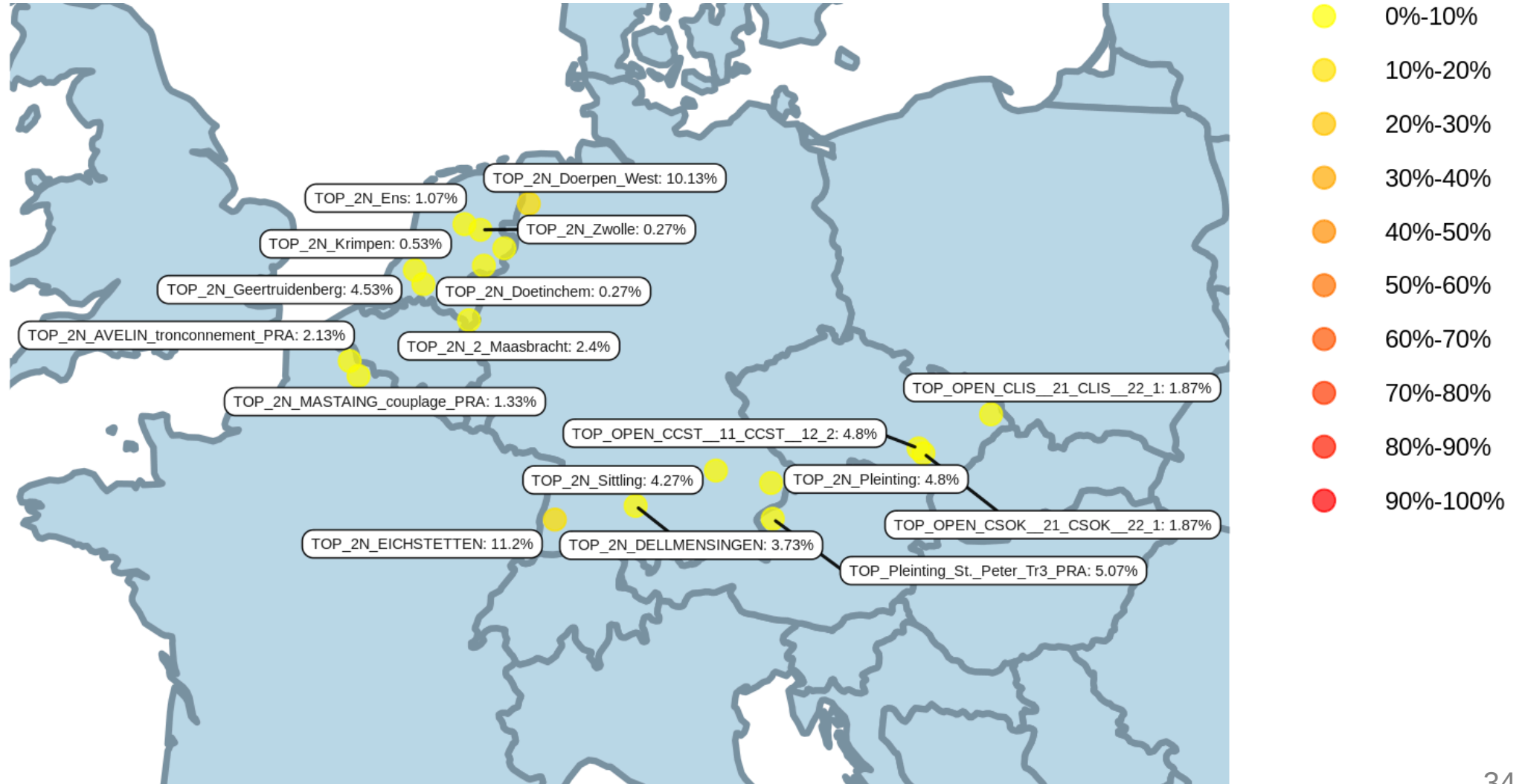
Relative Time Share of Applied PSTs in Curative Mode



- 0%-10%
- 10%-20%
- 20%-30%
- 30%-40%
- 40%-50%
- 50%-60%
- 60%-70%
- 70%-80%
- 80%-90%
- 90%-100%

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

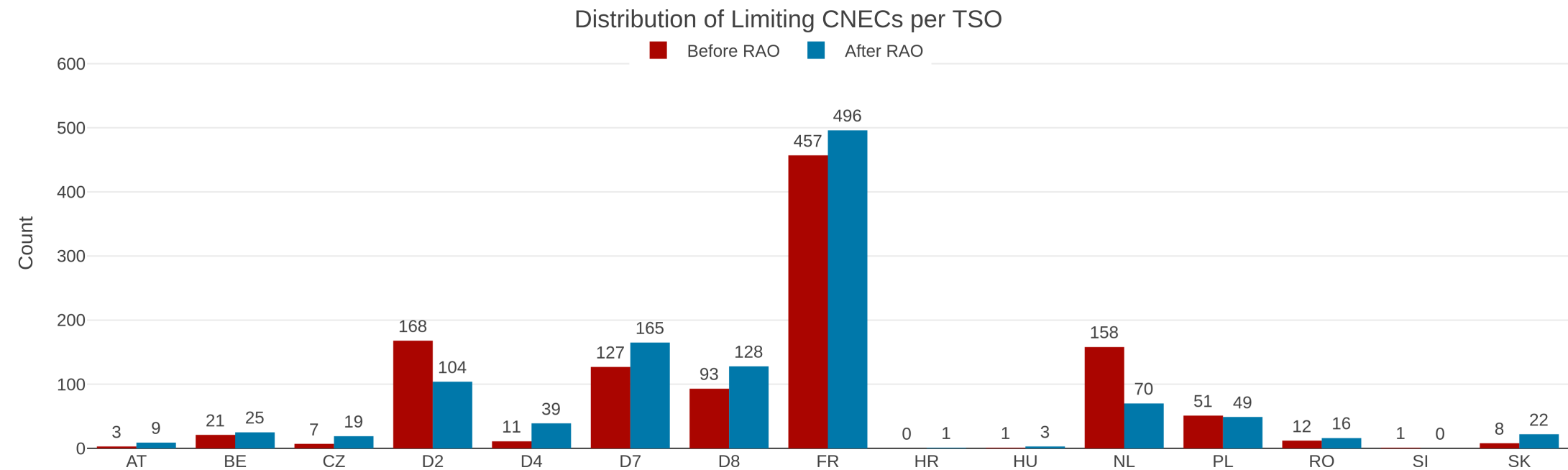
Relative Time Share of Applied Topological RAs in Curative Mode



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
[CZ-PL] Nosovice - Wielopole [DIR] [CZ]	672	681	131.85%	102.74%	157.07%	0.3341	1.2318
[SK-SK] H.Zdana - Sucany [DIR]	672	672	74.74%	68.83%	86.29%	0.1306	0.6751
[SK-SK] Gabcikovo - P.Biskupice [DIR]	672	672	81.41%	70.95%	100.32%	0.313	1.0735
[CZ-SK] Nosovice - Varin [OPP] [SK]	672	690	101.46%	77.42%	126.91%	0.3431	1.3193
[HU-HU] Gonyu - Gyor [DIR]	672	1603	76.43%	41.20%	107.86%	0.2575	1.5111
[SI-HU] Cirkovce - Heviz [OPP] [HU]	672	672	82.74%	63.42%	104.55%	0.2453	1.2013
[SI-HU] 400 kV Cirkovce - Hevitz [OPP] [SI]	672	1344	82.96%	63.66%	108.30%	0.213	1.0309
[CZ-SK] Nosovice - Varin [OPP] [CZ]	672	672	103.75%	77.78%	134.27%	0.3837	1.4994
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	672	1913	59.96%	44.30%	83.41%	0.3341	1.2318
[BE-BE] Lixhe - Gramme 380.11 [OPP]	672	672	59.47%	47.52%	66.37%	0.1539	0.3535
[CZ-SK] Nosovice - Varin [DIR] [CZ]	672	707	76.29%	46.61%	102.16%	0.3837	1.4994
[SI-HU] 400 kV Cirkovce - Hevitz [DIR] [SI]	671	1339	97.46%	71.69%	128.22%	0.213	1.0309
[SK-SK] V.Dur - Levice 1 [DIR]	670	670	46.24%	38.28%	59.05%	0.1934	0.7451
[SK-HU] Levice - God [DIR] [HU]	670	1218	60.32%	34.78%	72.87%	0.3009	0.9845
[CZ-PL] Wielopole - Nosovice [OPP] [PL]	669	925	116.57%	96.54%	154.26%	0.3245	1.1932
[CZ-D2] Hradec - Etzenricht 441 [DIR] [D2]	666	666	59.64%	52.67%	74.24%	0.1935	0.8402
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	665	1068	105.44%	41.39%	167.99%	0.1863	0.5864
[HU-HU] Gonyu - Gyor [OPP]	659	919	107.58%	63.92%	146.54%	0.2575	1.5111
[CZ-SK] Nosovice - Varin [DIR] [SK]	651	710	77.92%	53.03%	101.37%	0.3431	1.3193
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	649	1225	65.28%	21.73%	127.97%	0.1863	0.589

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 CNEs have shadow price	Max shadow price [€/MW]	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max z2zPTDF
[CZ-SK] Nosovice - Varin [DIR] [CZ]	272	272	592.04	69.46%	46.61%	86.00%	0.3837
[FR-FR] Creys - Saint-Vulbas 2 [OPP]	154	154	460.12	20.83%	19.98%	31.46%	0.1481
[SK-HU] Levice - God [DIR] [HU]	140	140	1182.23	50.82%	34.78%	67.24%	0.2637
[NL-NL] MEE DRT2 [DIR] [NL]	80	80	498.1	22.63%	19.96%	52.38%	0.2371
[NL-NL] Krimpen a/d IJssel-Geertruidenberg 380 W [DIR]	77	77	459.83	43.76%	23.23%	77.73%	0.4389
[D8-D8] Roehrsdorf - Roehrsdorf PST442 [DIR]	69	69	379.48	48.46%	31.17%	69.61%	0.2669
[D8-PL] Mikulowa PST1 [DIR] [PL]	67	67	470.91	50.12%	26.36%	64.85%	0.2817
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	63	63	224.43	58.60%	54.26%	63.42%	0.3238
[FR-D7] Vigy - Ensndorf VIGY2 S [DIR] [D7]	51	51	588	21.47%	19.90%	32.64%	0.2087
[D7-FR] Ensndorf - Vigy VIGY2 S [OPP] [FR]	46	46	533.93	21.68%	19.96%	28.50%	0.2086
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	44	44	1539.01	56.01%	20.03%	93.83%	0.1475
[FR-FR] Creys - Saint-Vulbas 1 [OPP]	34	34	537.46	20.15%	19.98%	24.77%	0.1473
[D8-D8] Vierraden - Vierraden PST441 [DIR]	33	33	287.05	47.69%	40.48%	55.70%	0.2687
[D7-D7] Gronau - Gronau TR 441 E [DIR]	32	32	240.12	64.69%	44.20%	74.67%	0.2106
[D2-D2] Altheim - Sittling 219 [OPP]	32	32	1202.87	61.61%	31.03%	95.20%	0.0936
[NL-NL] Maasbracht-Eindhoven 380 W [OPP]	30	31	204.1	58.40%	34.16%	90.81%	0.3323
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	23	23	25.23	70.96%	37.42%	107.01%	0.2971
[BE-BE] Y-Mercator (-Doel - Lillo) 380.51 [DIR]	23	23	233.21	49.02%	34.82%	72.21%	0.3811
[CZ-D8] Hradec - Rohrsdorf 446 [OPP] [D8]	22	22	227.48	50.03%	40.21%	54.87%	0.3014
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [DIR]	19	19	273.3	81.79%	43.60%	132.40%	0.225

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	155
AC < 0 MW	28
AC = 0 MW	77
AC > 0 MW	50

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-1991.42	3007.78
Min.	-7967.00	0.00
Max.	0.00	10395.00

