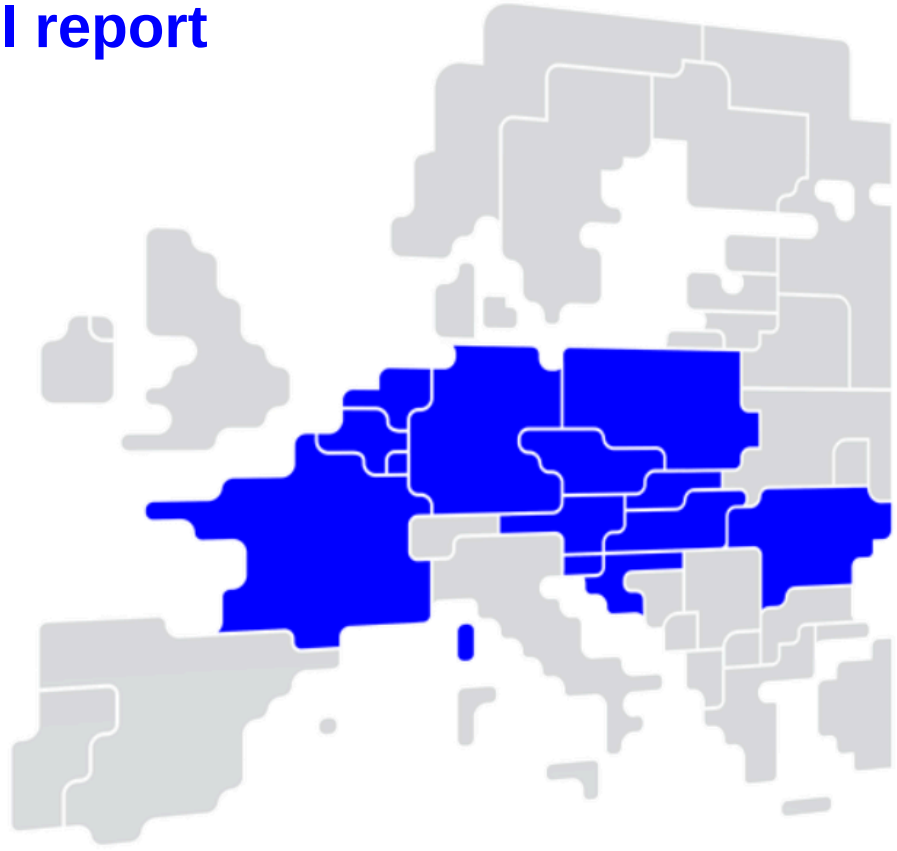
# Core FB MC Operational KPI report

## July 2024



# Overview of Operational KPIs

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- 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
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- KPI 6: Virtual margins at market balance for CORE TSOs
- KPI 7: Non-Core exchanges delta flow

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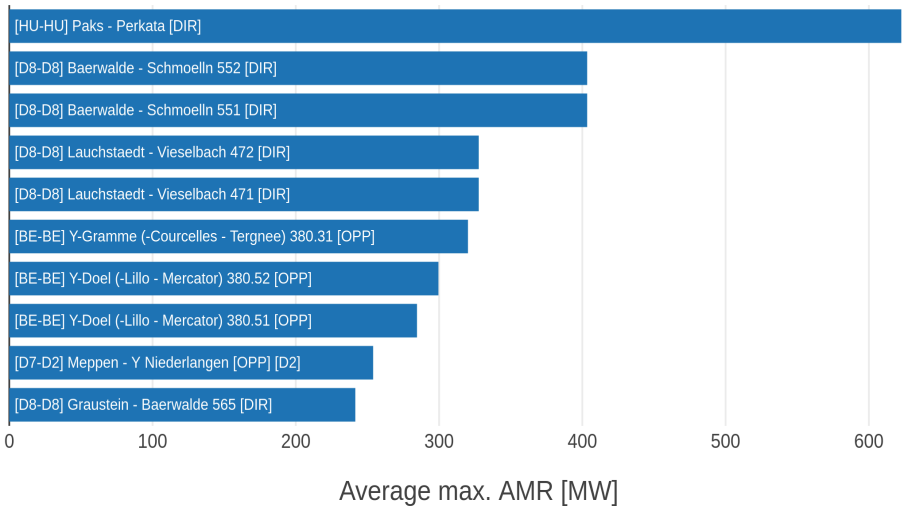
# KPI 1: Average maximum AMR per CNE (Top 10)

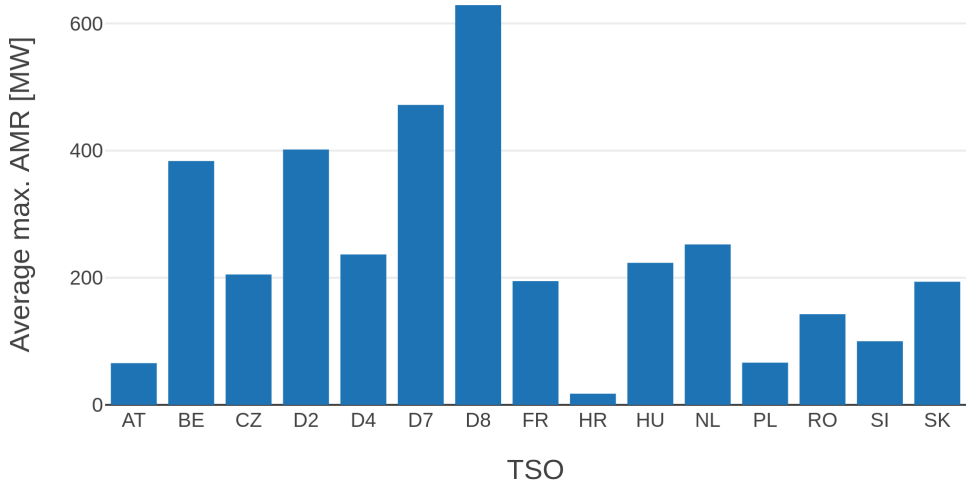
| CNE | Average Maximum AMR (MW) | AMR as % of Fmax |
|---|---|---|
| [HU-HU] Paks - Perkata [DIR] | 622.67 | 0.18% |
| [D8-D8] Baerwalde - Schmoelln 551 [DIR] | 403.38 | 16.17% |
| [D8-D8] Baerwalde - Schmoelln 552 [DIR] | 403.38 | 16.17% |
| [D8-D8] Lauchstaedt - Vieselbach 471 [DIR] | 327.69 | 11.32% |
| [D8-D8] Lauchstaedt - Vieselbach 472 [DIR] | 327.69 | 11.32% |
| [BE-BE] Y-Gramme (-Courcelles - Tergnee) 380.31 [OPP] | 320.15 | 21.33% |
| [BE-BE] Y-Doel (-Lillo - Mercator) 380.52 [OPP] | 299.55 | 20.91% |
| [BE-BE] Y-Doel (-Lillo - Mercator) 380.51 [OPP] | 284.59 | 13.63% |
| [D7-D2] Meppen - Y Niederlangen [OPP] [D2] | 253.97 | 9.32% |
| [D8-D8] Graustein - Baerwalde 565 [DIR] | 241.54 | 12.13% |




# KPI 2: Average maximum AMR per TSO

| TSO | Average maximum AMR per TSO |
|---|---|
| AT | 65.57 |
| BE | 383.62 |
| CZ | 205.07 |
| D2 | 401.77 |
| D4 | 236.63 |
| D7 | 471.81 |
| D8 | 628.85 |
| FR | 194.70 |
| HR | 17.57 |
| HU | 223.41 |

| TSO | Average maximum AMR per TSO |
|---|---|
| NL | 252.40 |
| PL | 66.37 |
| RO | 142.68 |
| SI | 100.02 |
| SK | 193.67 |

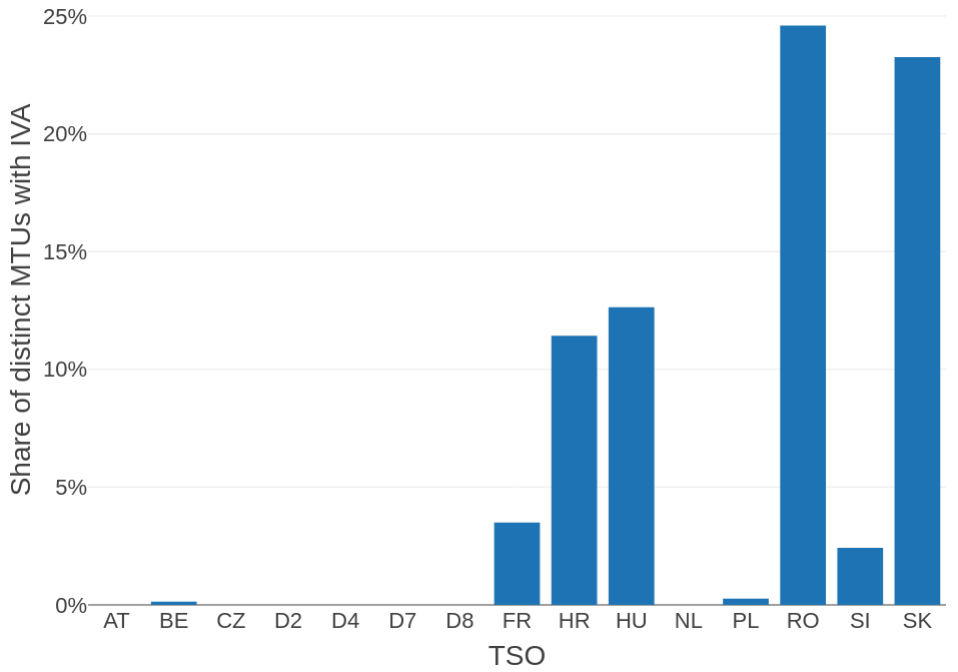


# KPI 3: Share of MTUs with intervention per TSO

| Total BDs | Total MTUs | MTUs without IVA | Share of distinct MTUs without IVA | MTUs with IVA | Share of distinct MTUs with IVA |
|---|---|---|---|---|---|
| 31 | 744 | 314 | 42.2% | 430 | 57.8% |

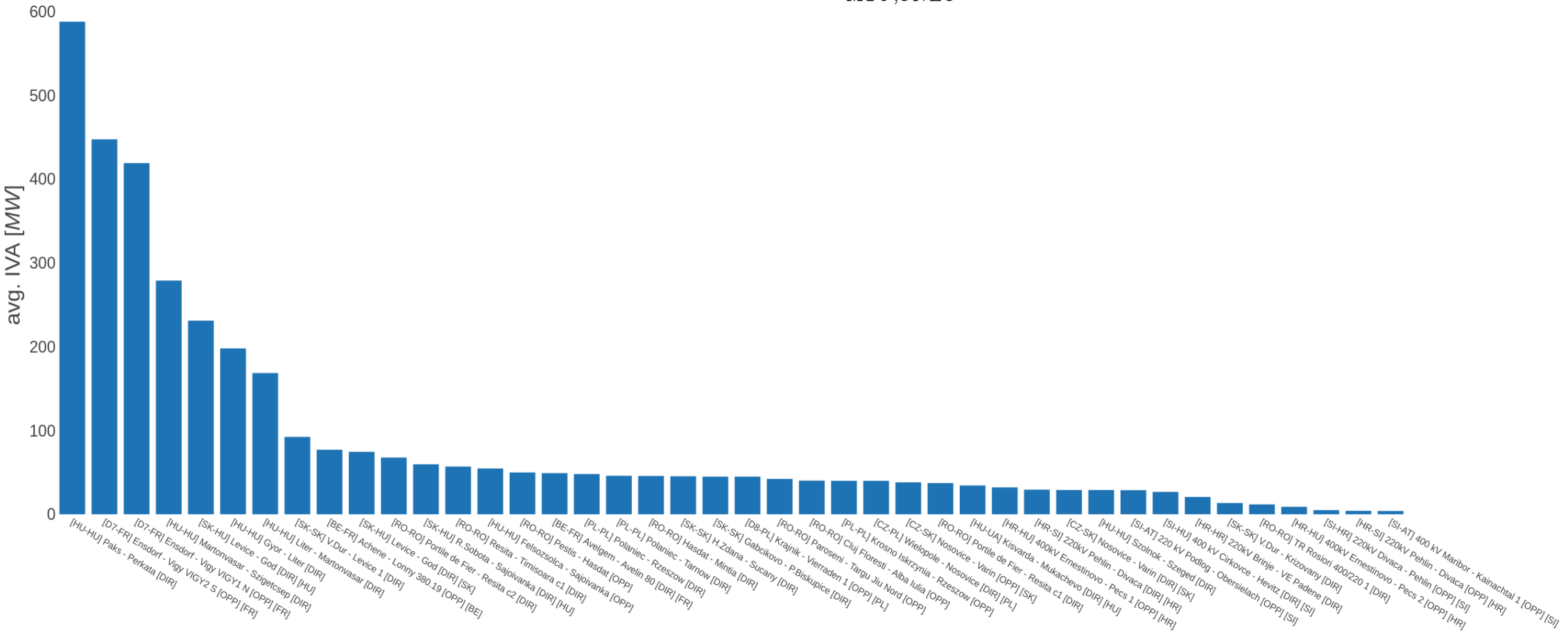
| TSO | Share of distinct MTUs with IVA | Distinct MTUs with IVA |
|---|---|---|
| AT | 0.00% | 0 |
| BE | 0.13% | 1 |
| CZ | 0.00% | 0 |
| D2 | 0.00% | 0 |
| D4 | 0.00% | 0 |
| D7 | 0.00% | 0 |
| D8 | 0.00% | 0 |
| FR | 3.49% | 26 |
| HR | 11.42% | 85 |
| HU | 12.63% | 94 |

| TSO | Share of distinct MTUs with IVA | Distinct MTUs with IVA |
|---|---|---|
| NL | 0.00% | 0 |
| PL | 0.27% | 2 |
| RO | 24.60% | 183 |
| SI | 2.42% | 18 |
| SK | 23.25% | 173 |



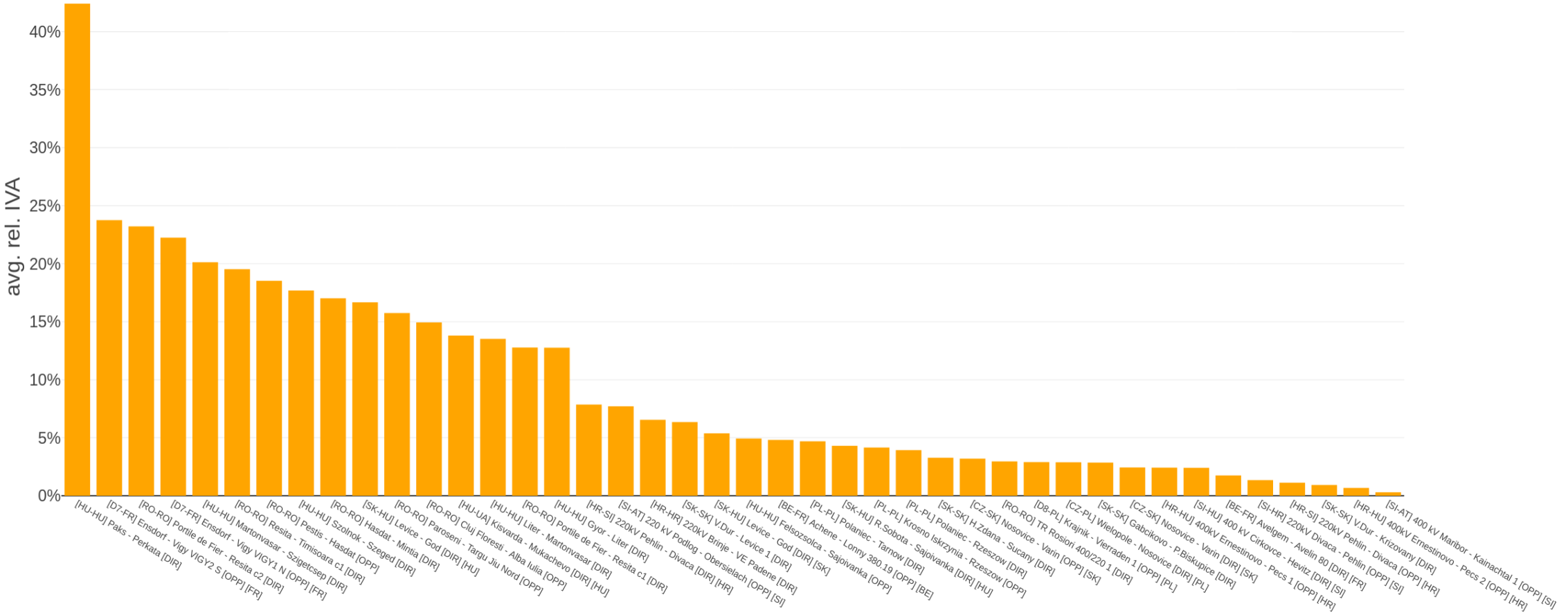
# KPI 4a: Average IVA applied for each CNE affected by TSO intervention

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

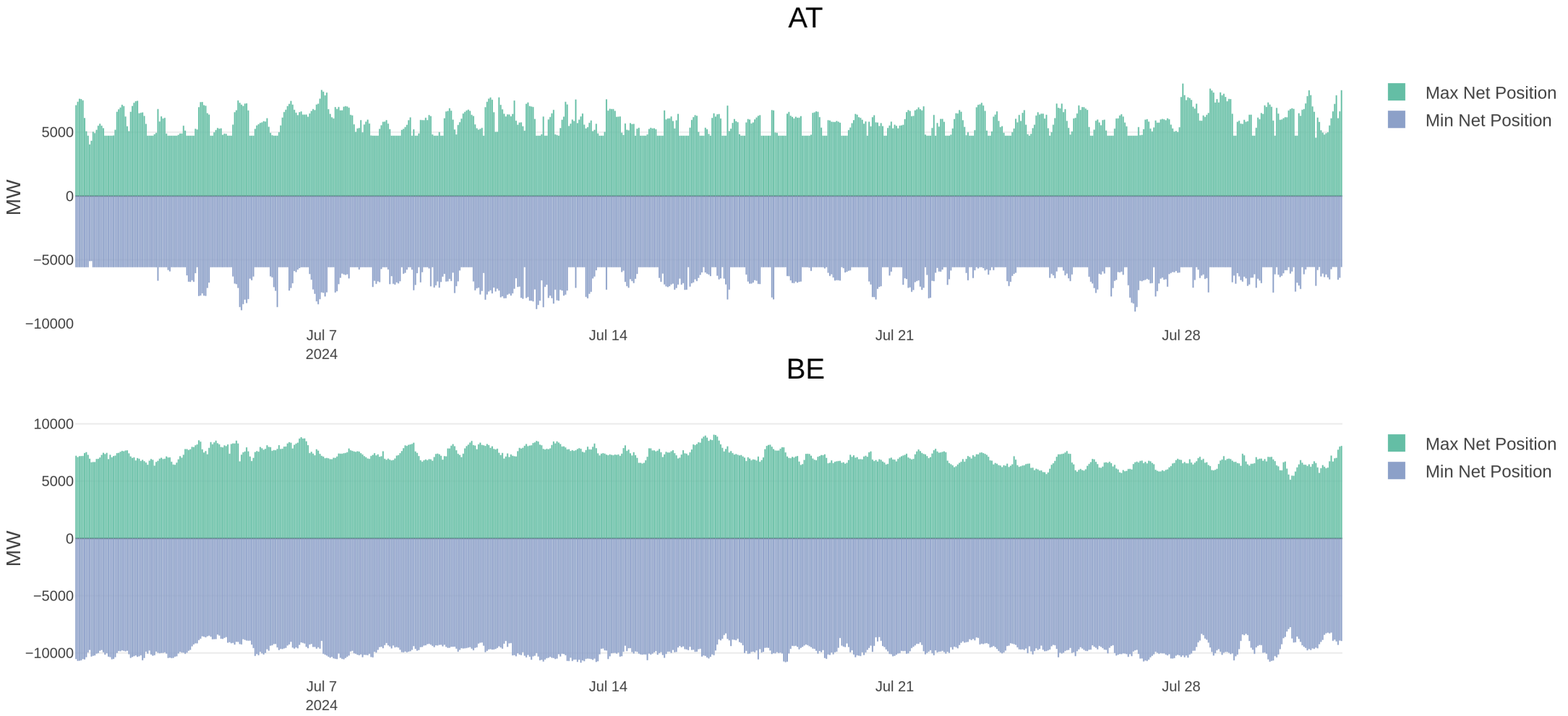


# KPI 4b: Average relative IVA applied for each CNE affected by TSO intervention

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



# KPI 5: Min & max net positions per BZ hub



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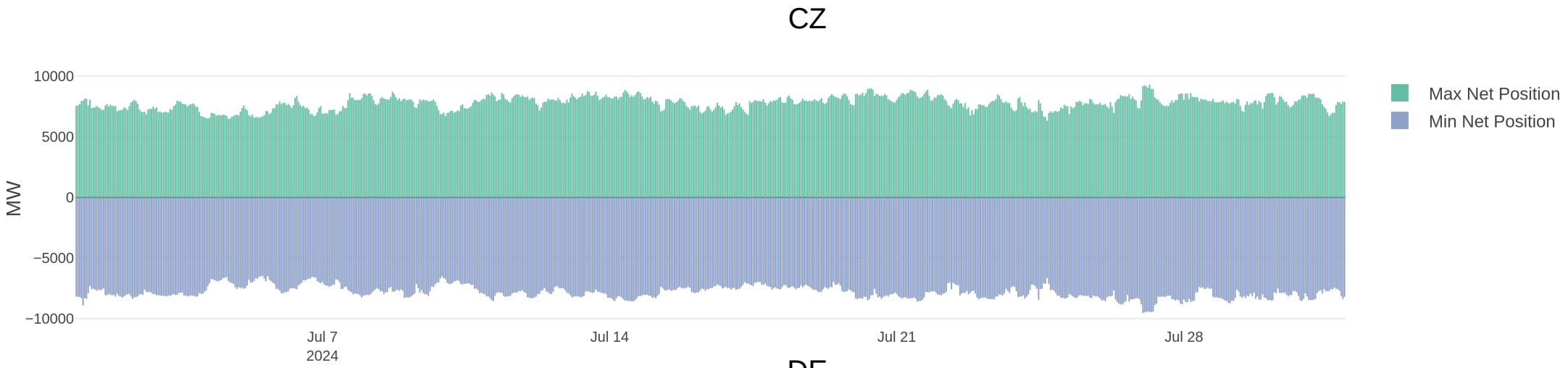


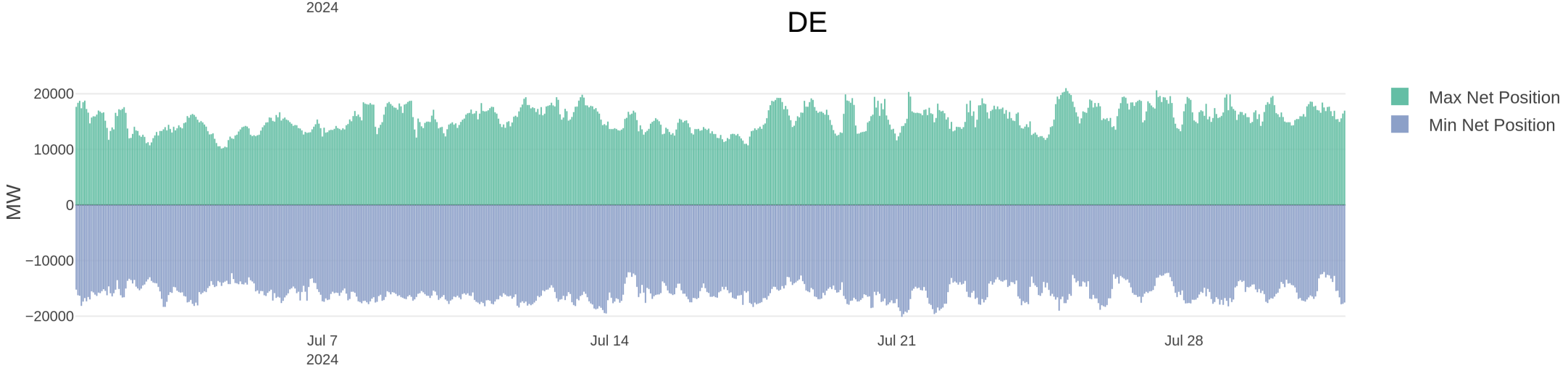

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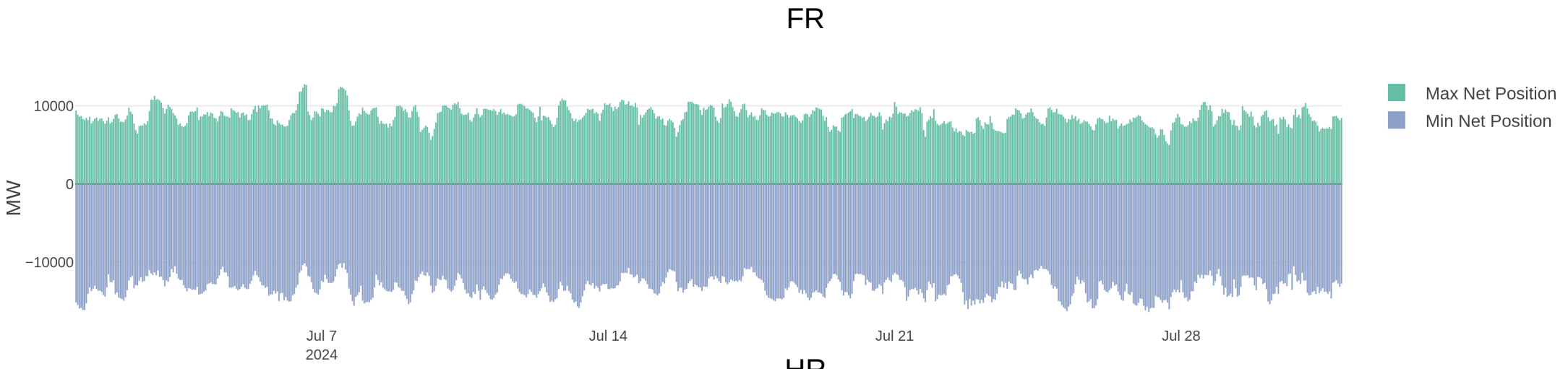


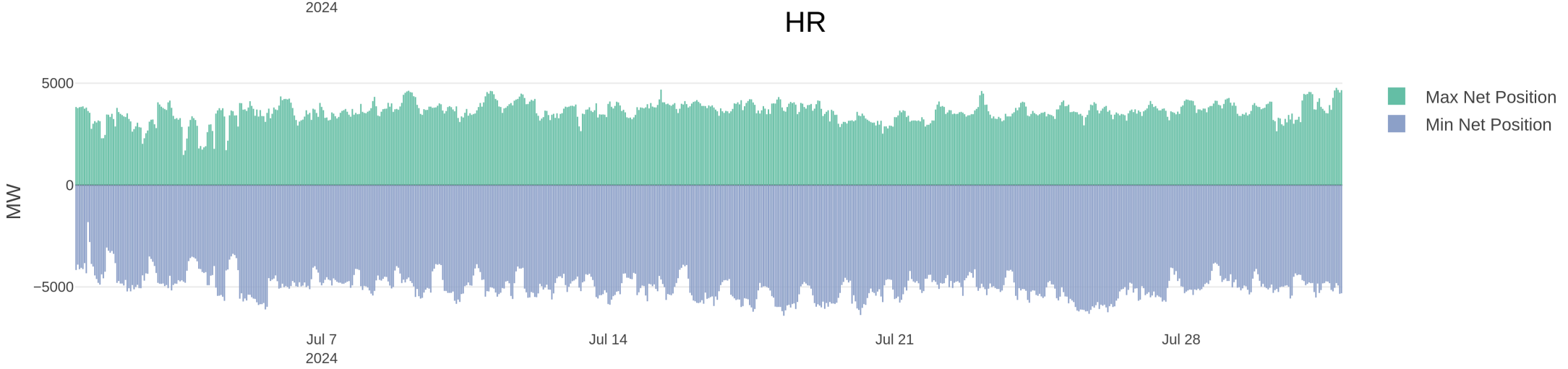

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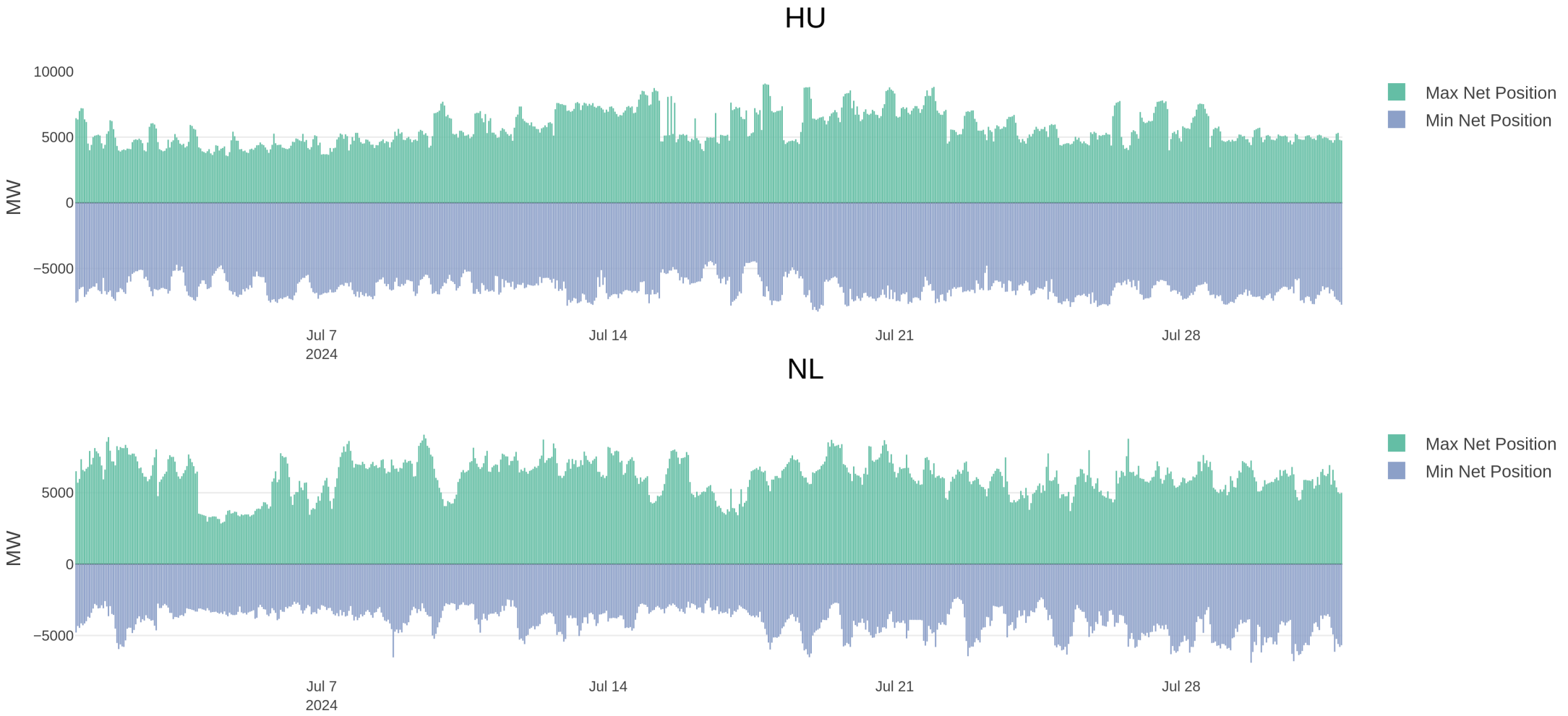

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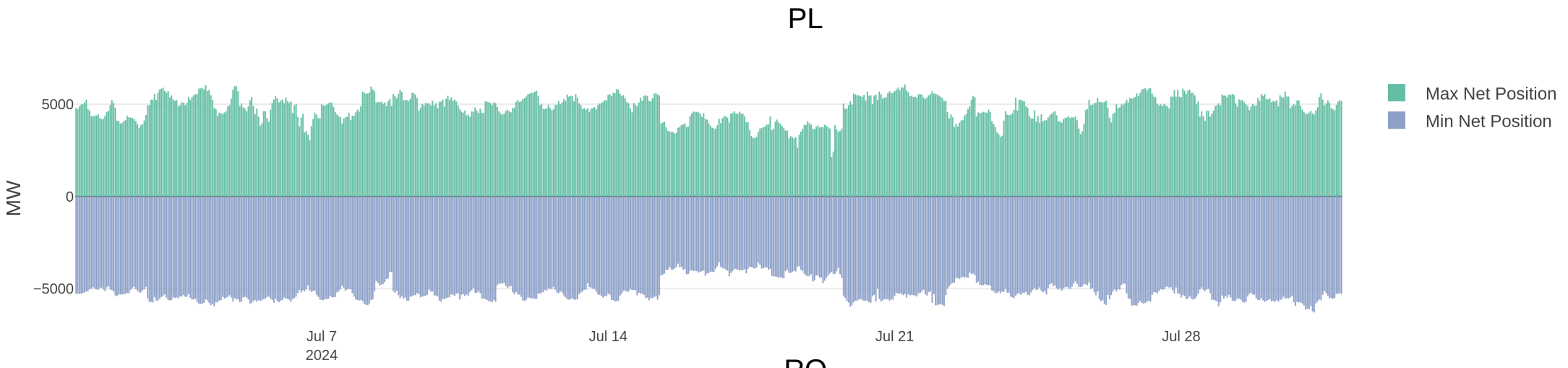


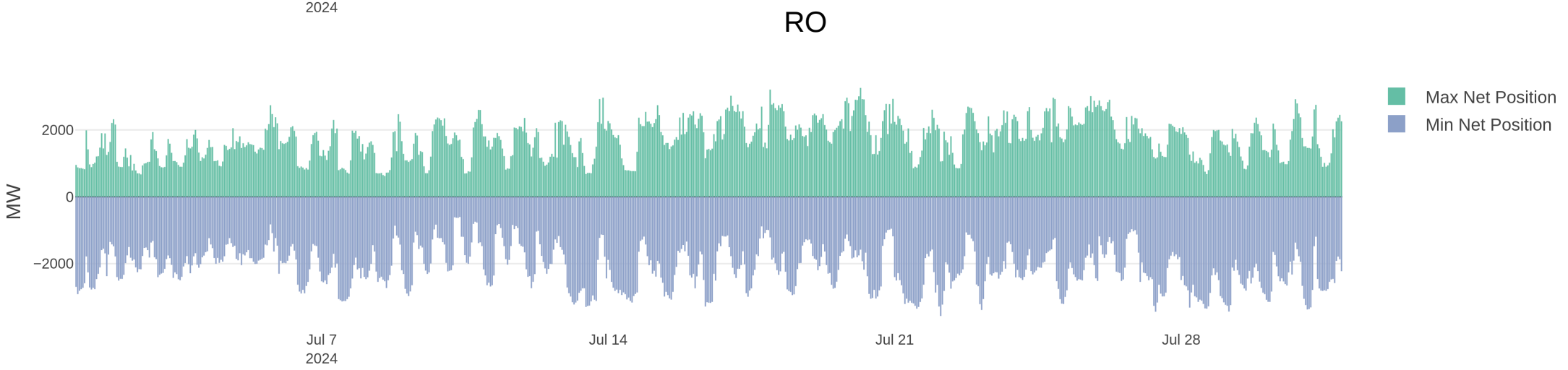

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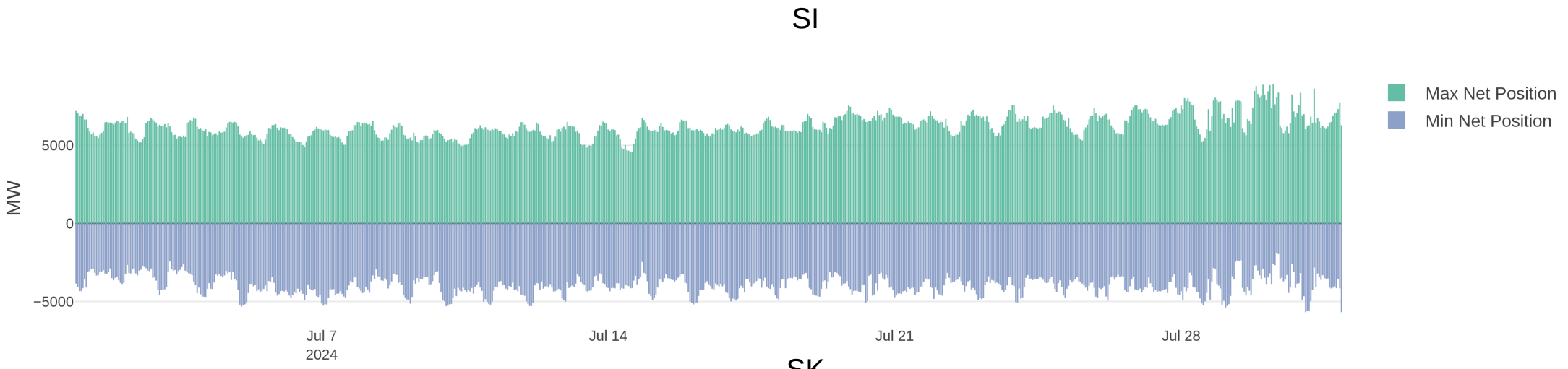
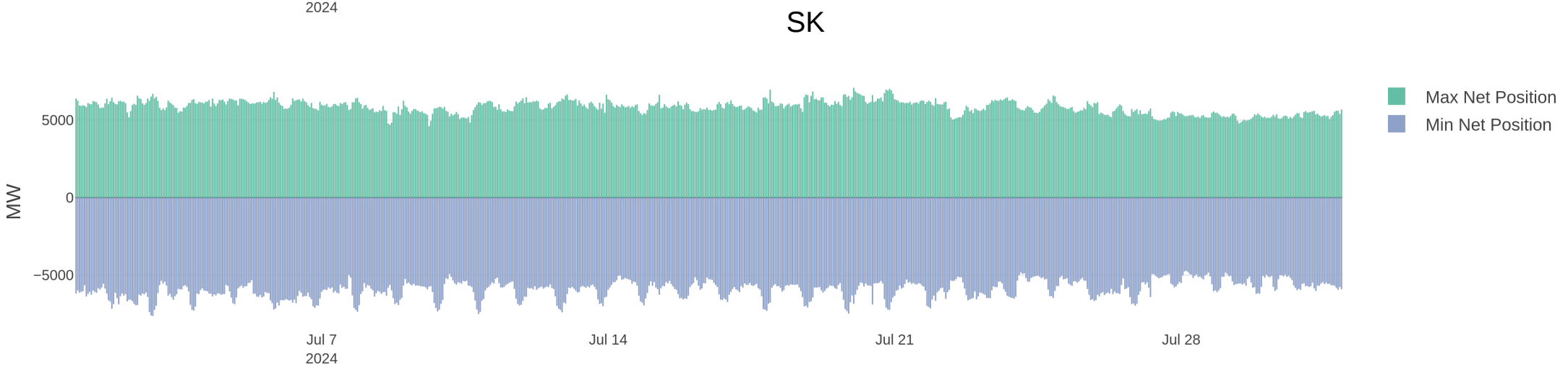
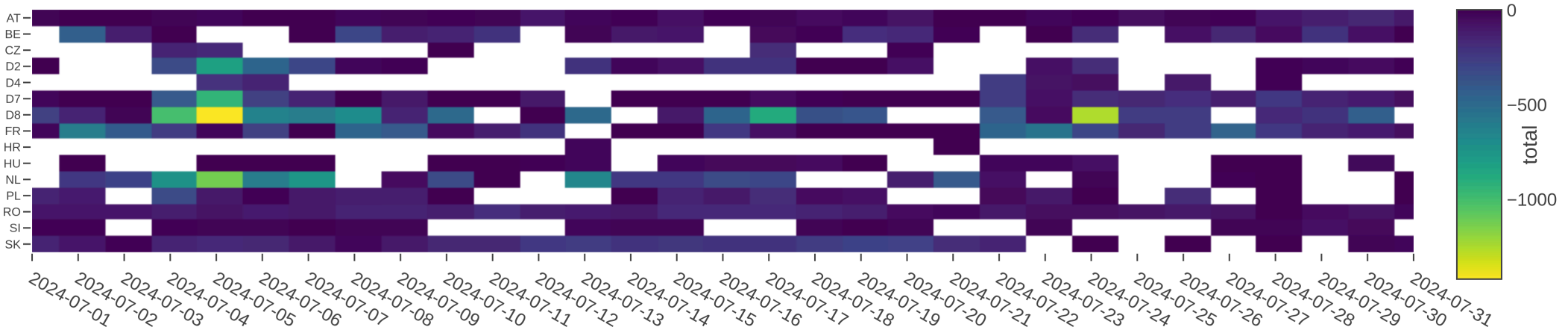
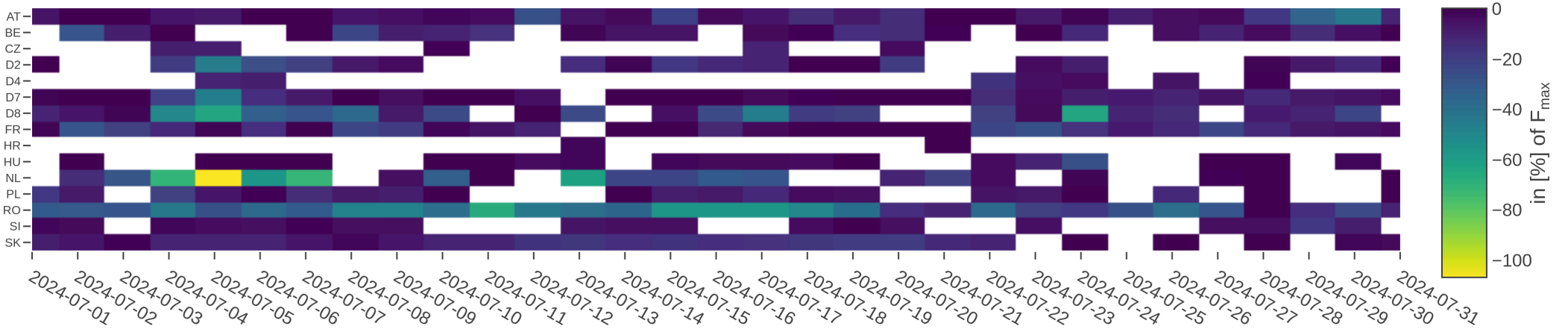


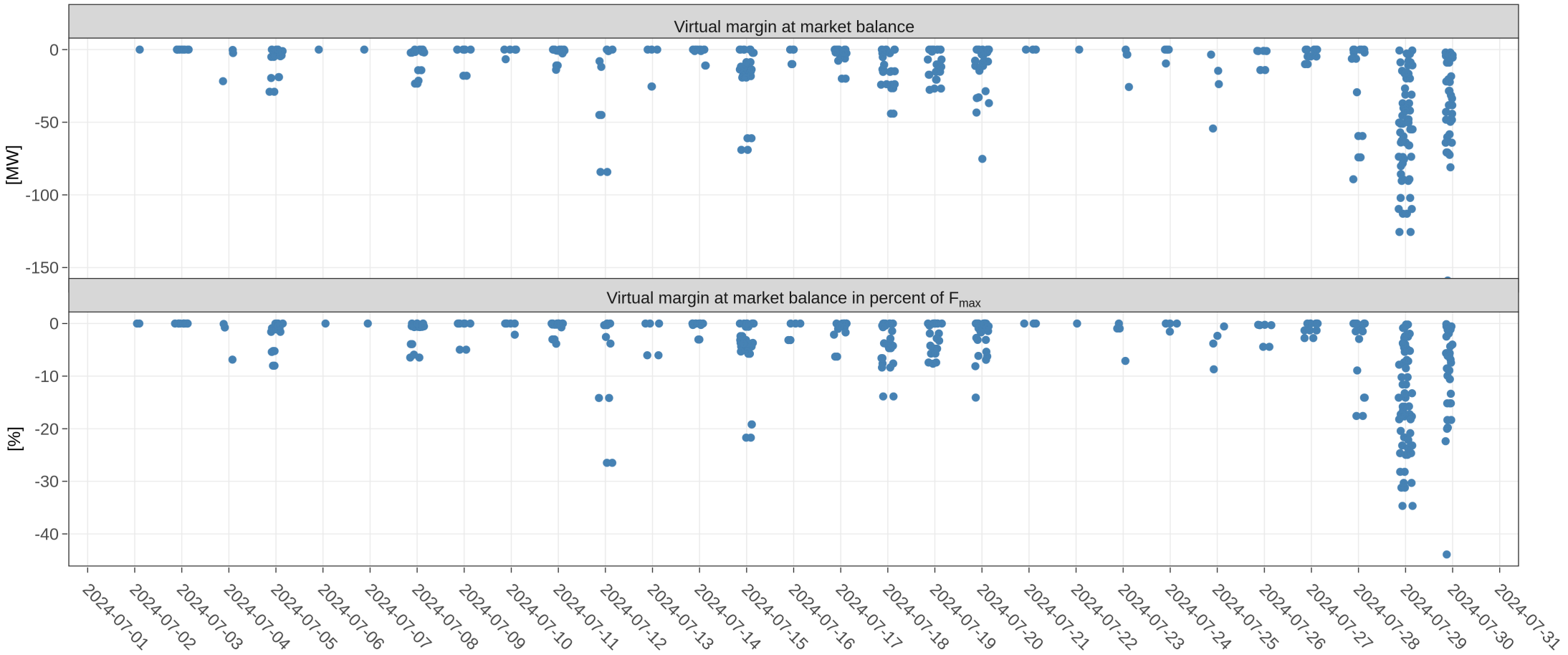



# KPI 6a: Highest virtual margins at market balance for CORE TSOs

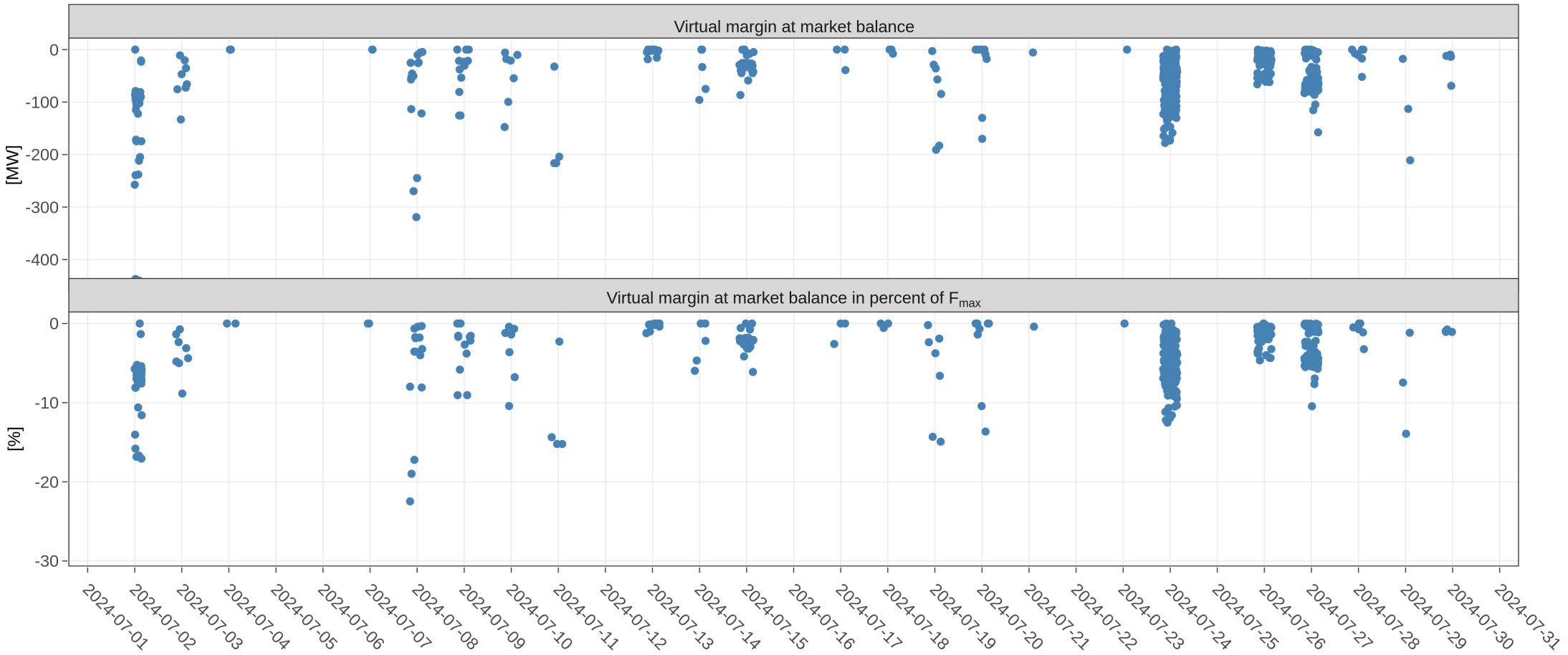


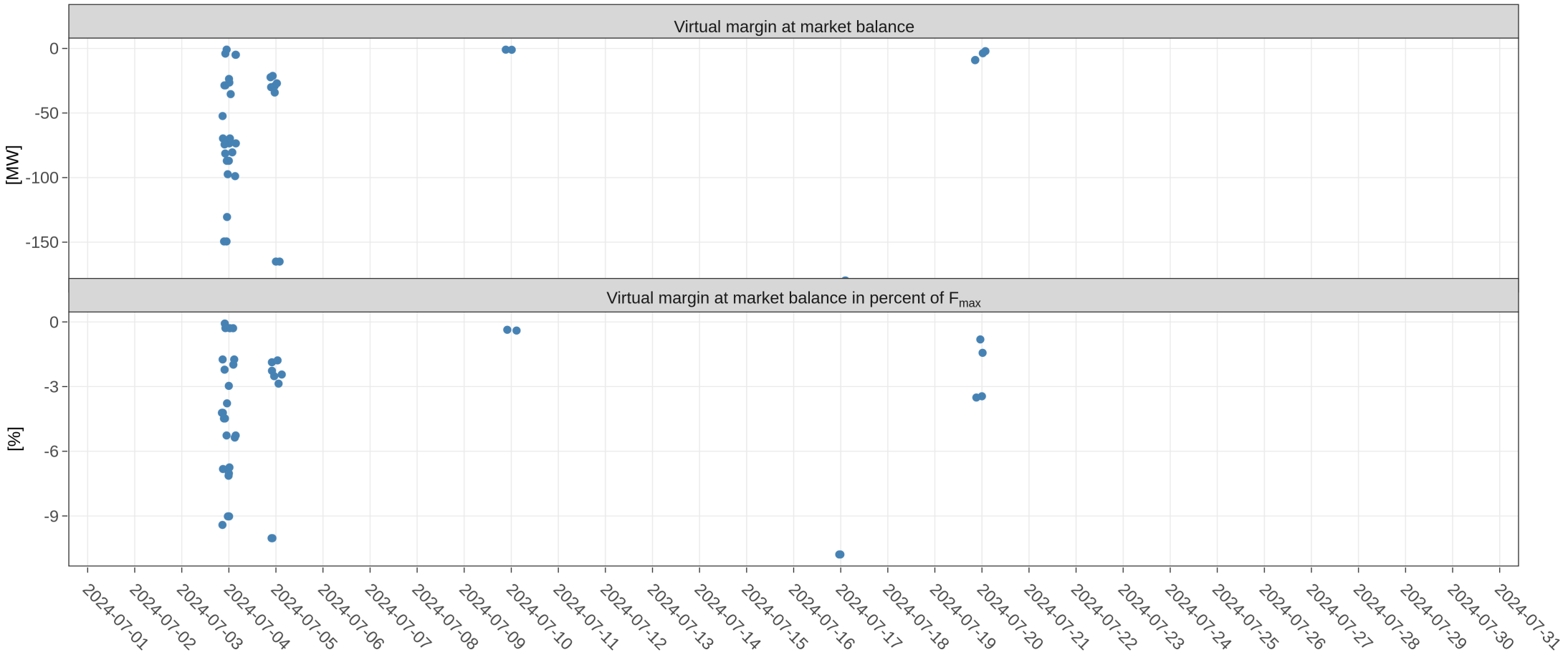
# KPI 6b: Virtual margins at market balance AT



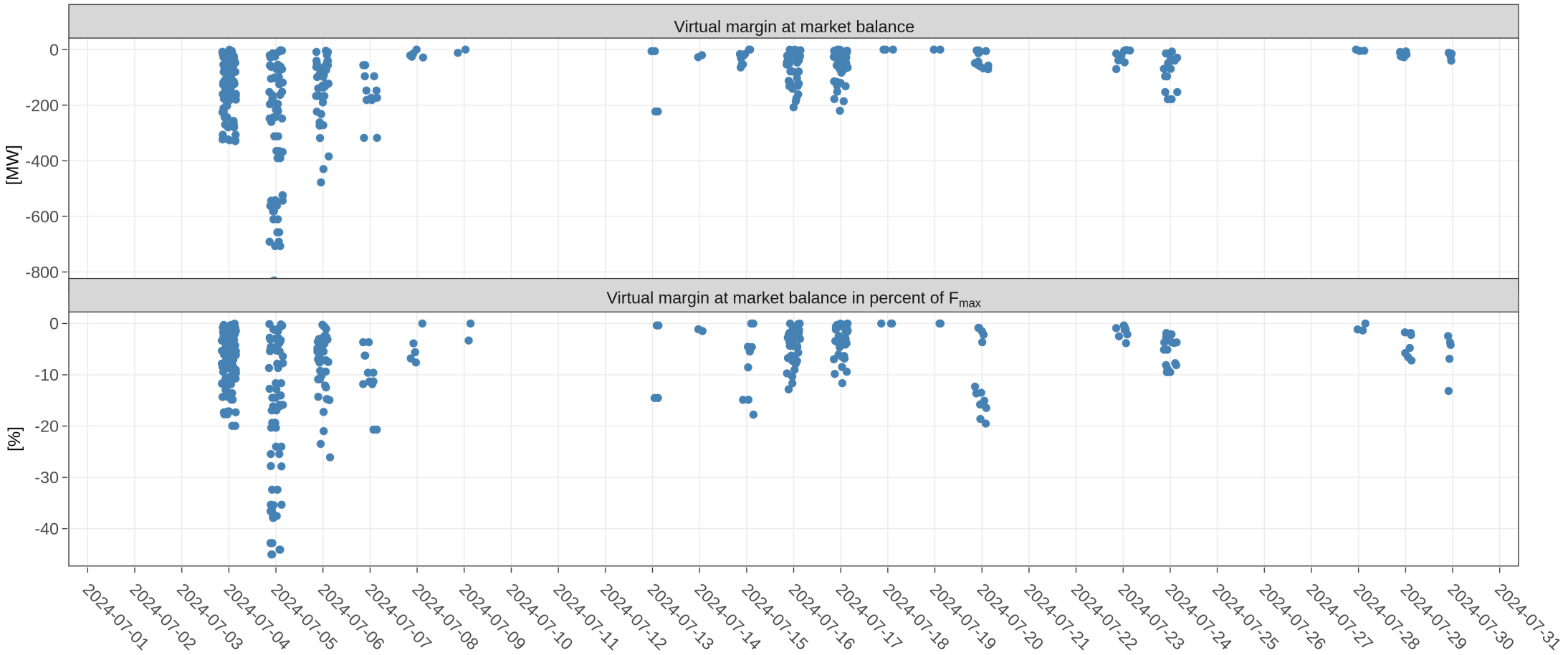
# KPI 6b: Virtual margins at market balance BE



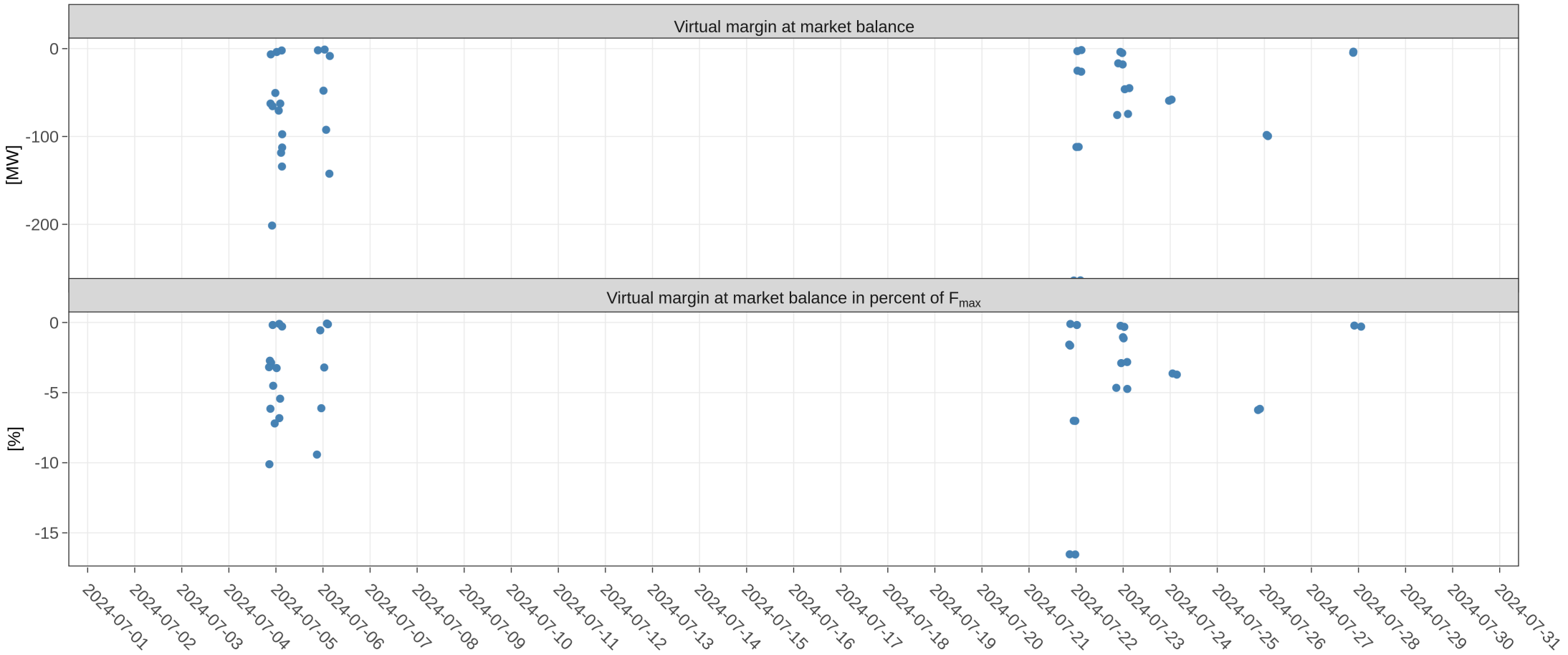
# KPI 6b: Virtual margins at market balance CZ



# KPI 6b: Virtual margins at market balance D2

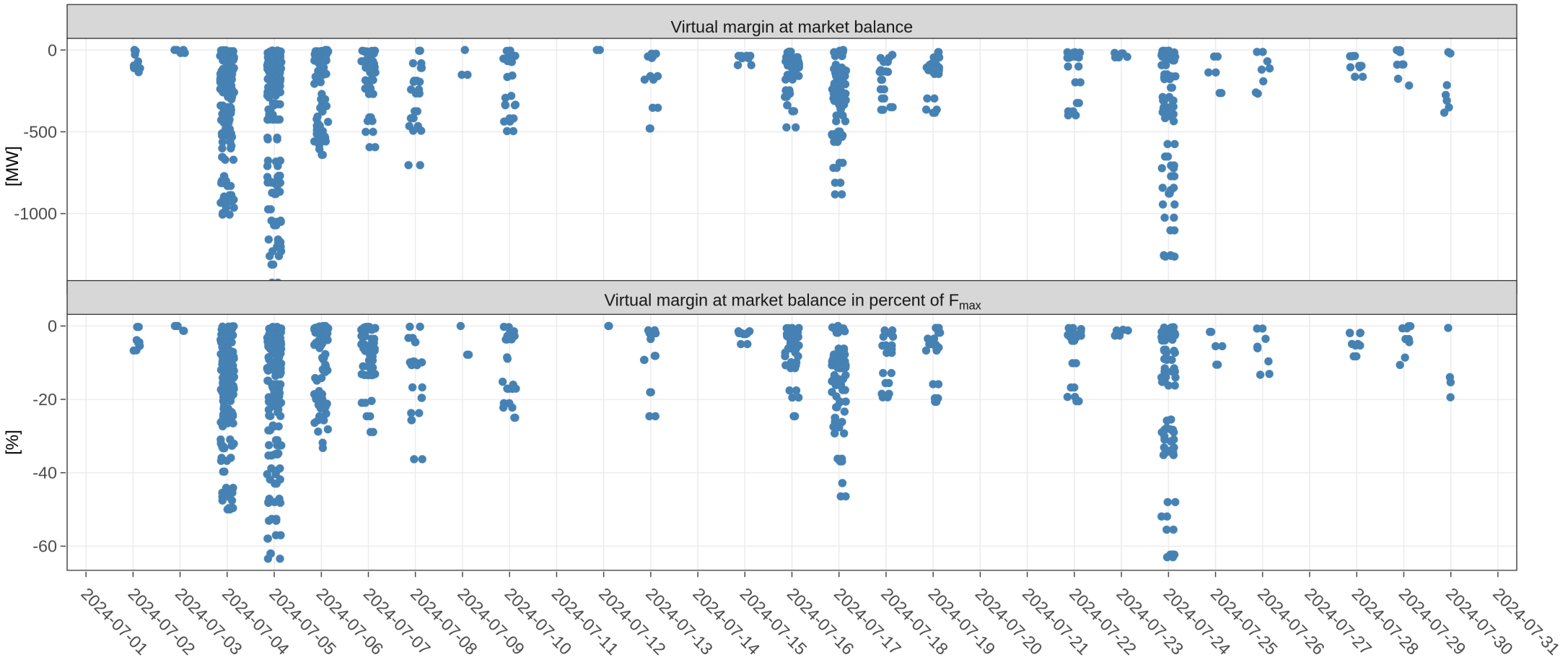


# KPI 6b: Virtual margins at market balance D4



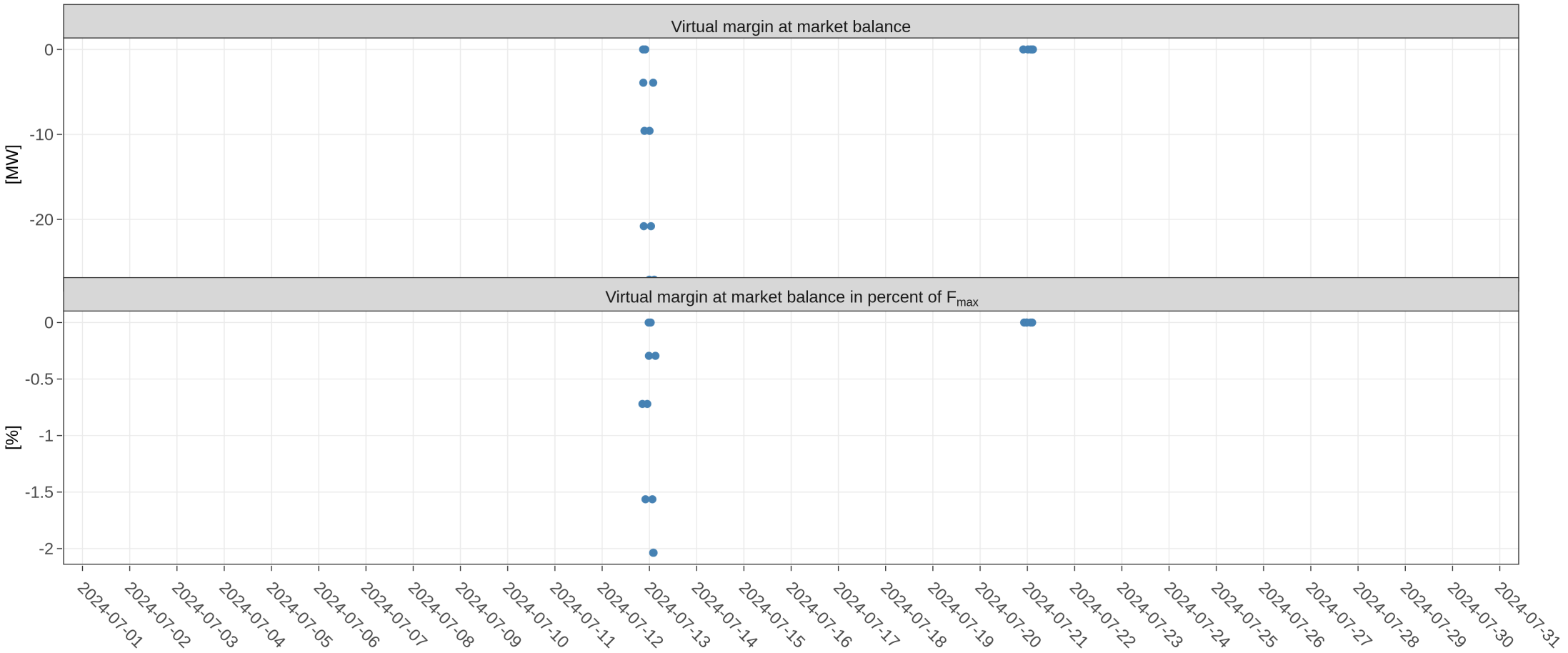
# KPI 6b: Virtual margins at market balance D7

# KPI 6b: Virtual margins at market balance D8

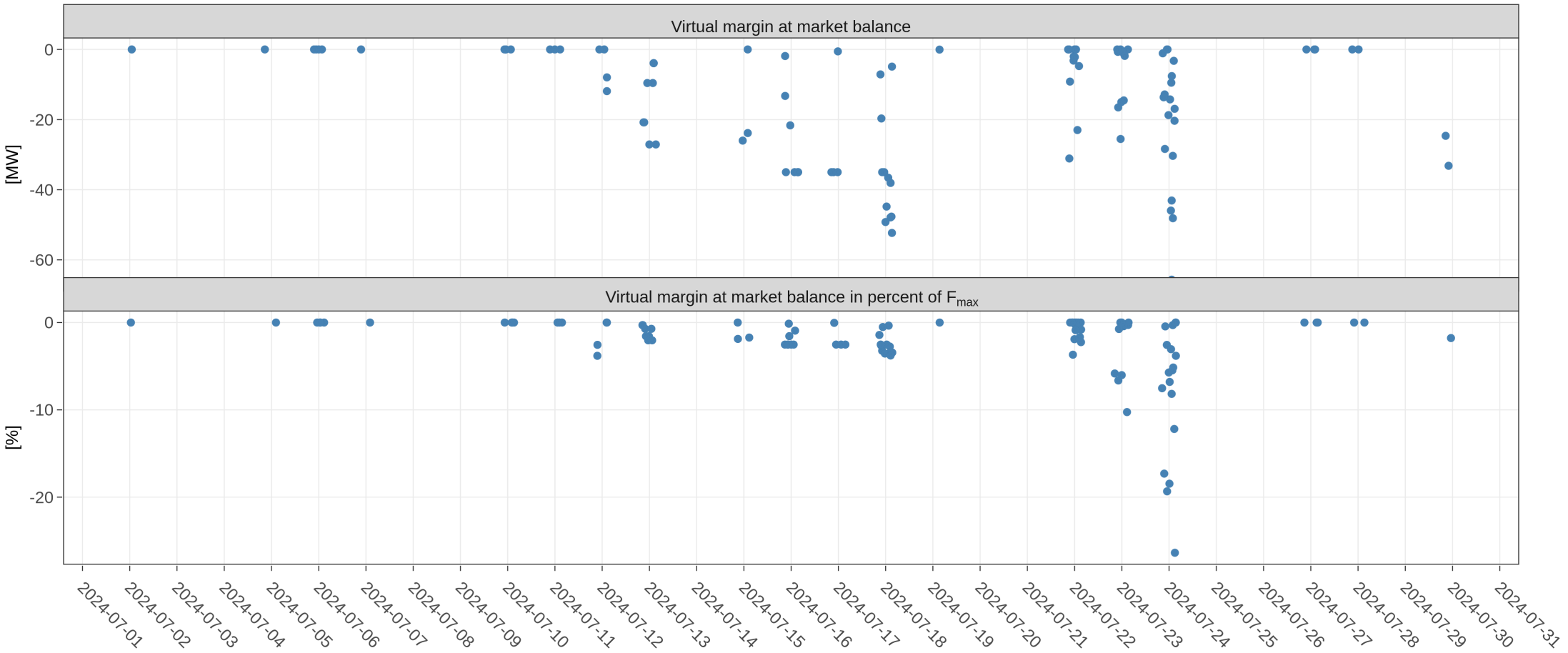


# KPI 6b: Virtual margins at market balance FR

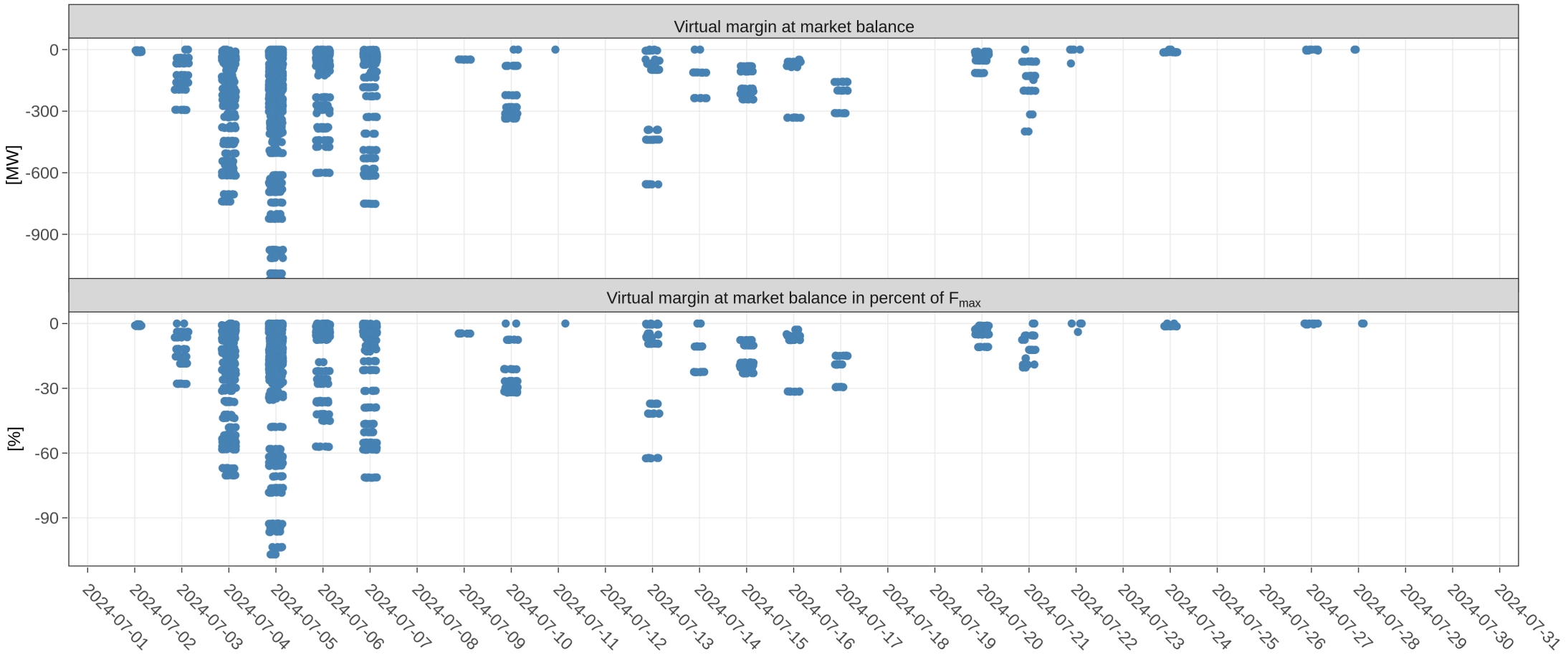
# KPI 6b: Virtual margins at market balance HR



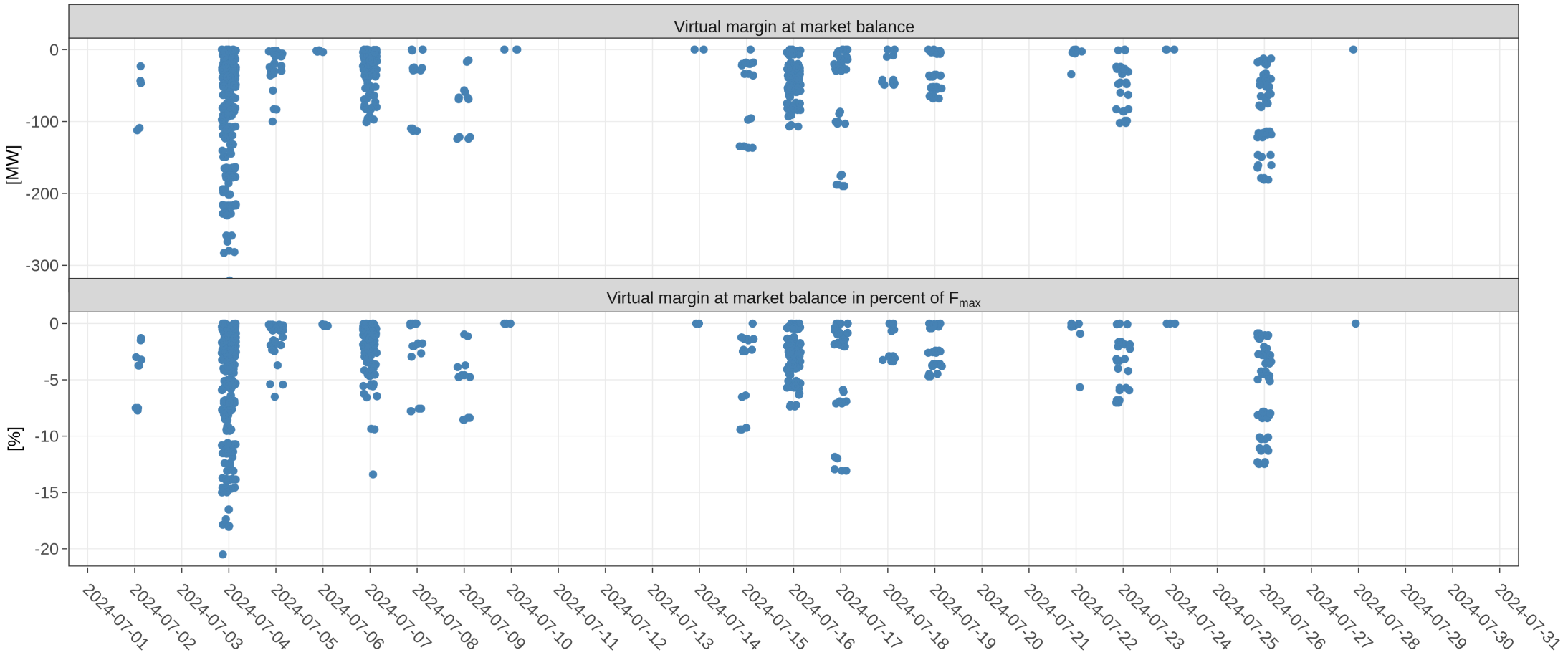
# KPI 6b: Virtual margins at market balance HU



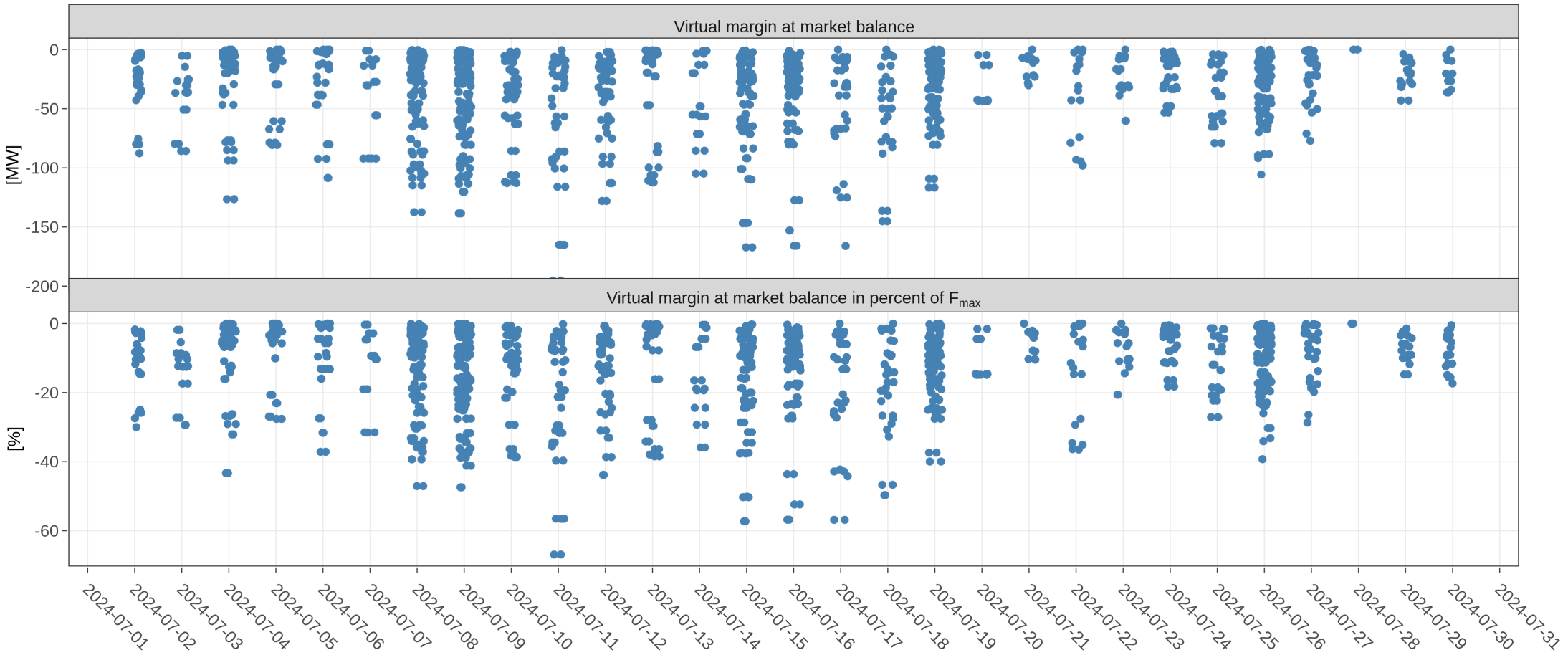
# KPI 6b: Virtual margins at market balance NL



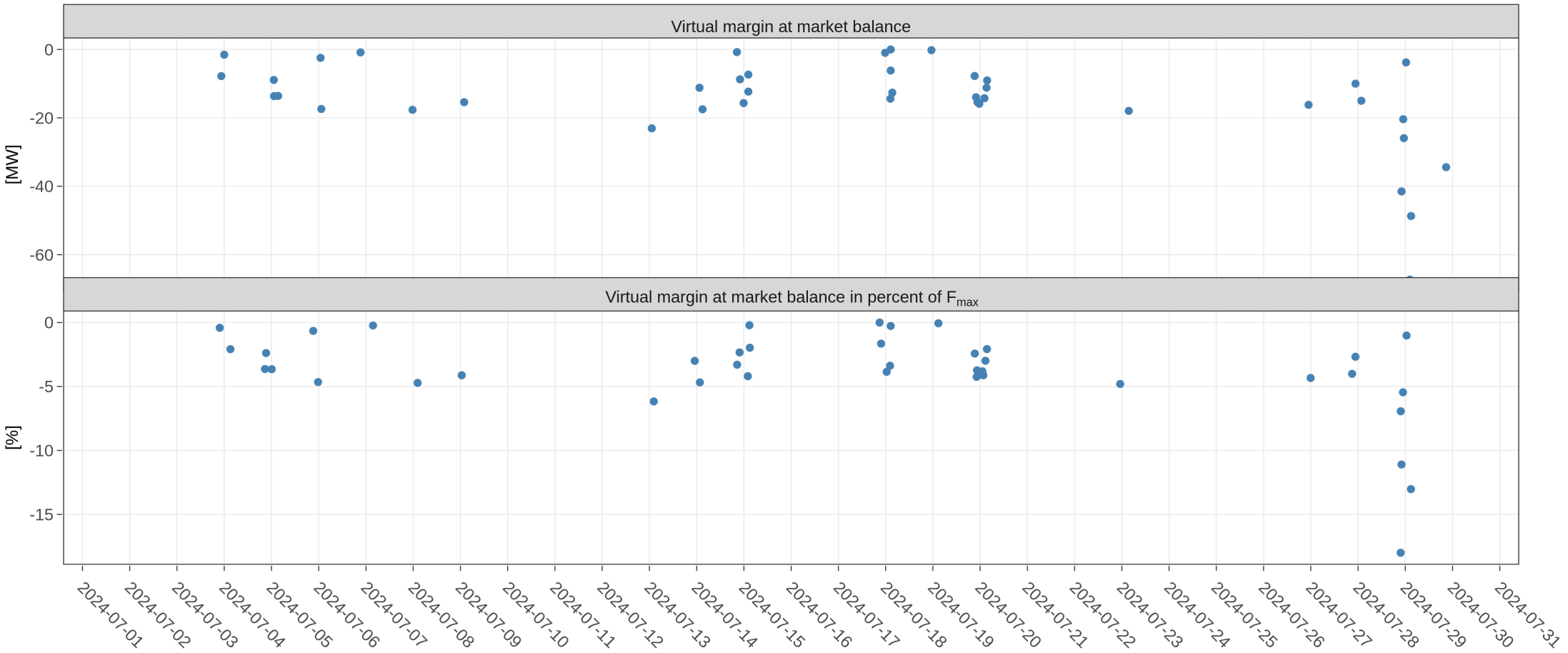
# KPI 6b: Virtual margins at market balance PL



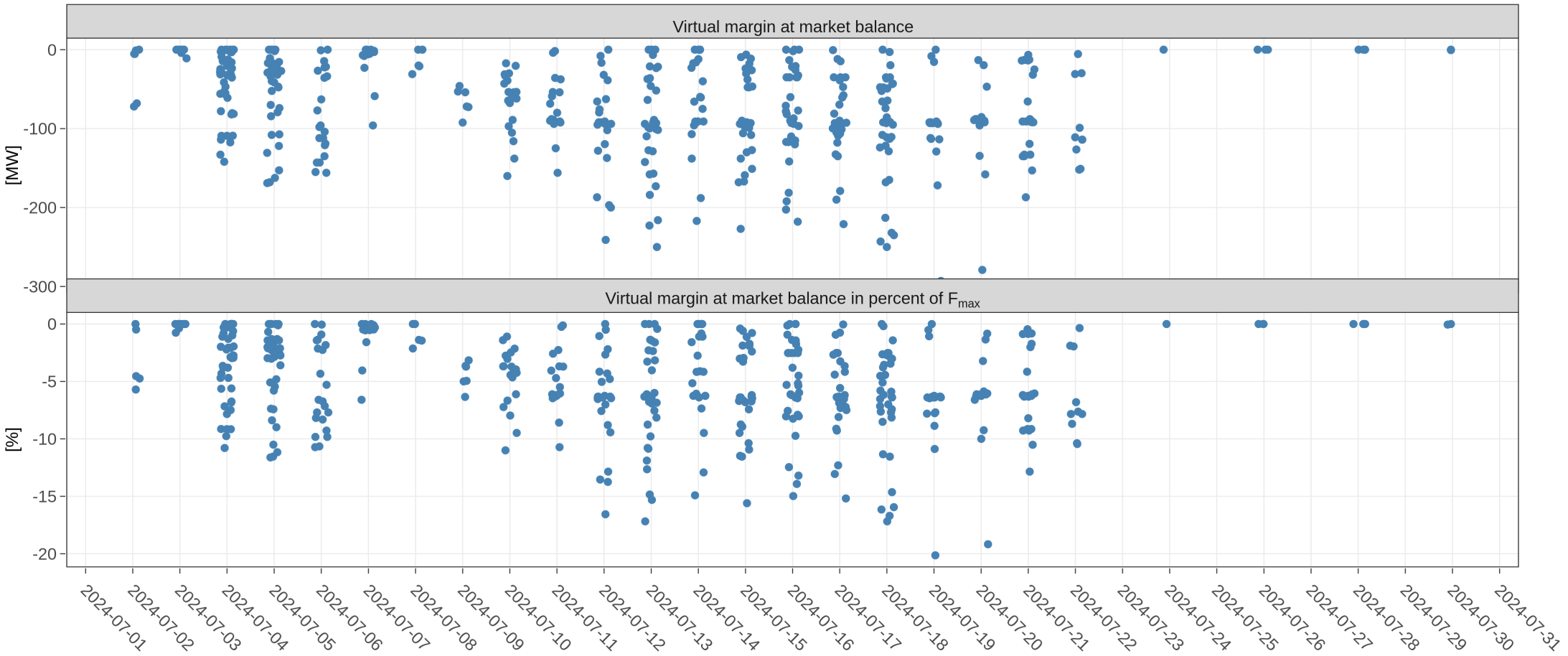
# KPI 6b: Virtual margins at market balance RO



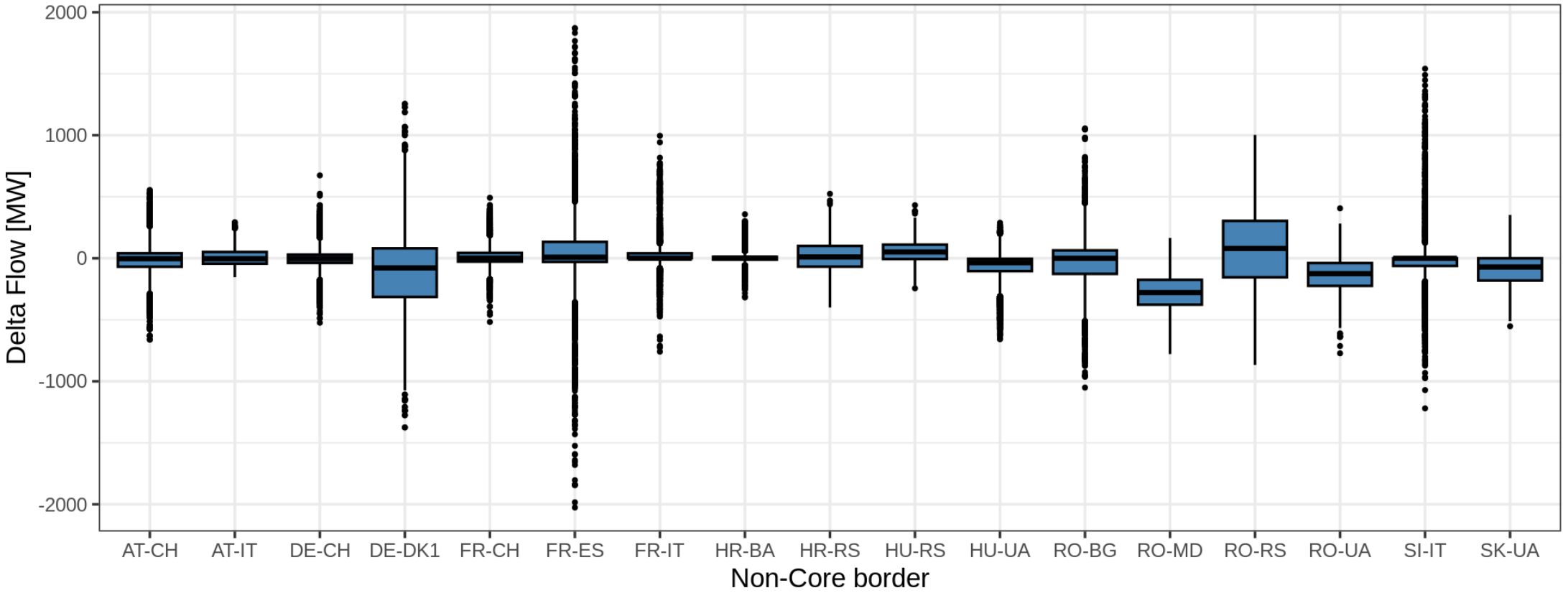
# KPI 6b: Virtual margins at market balance SI



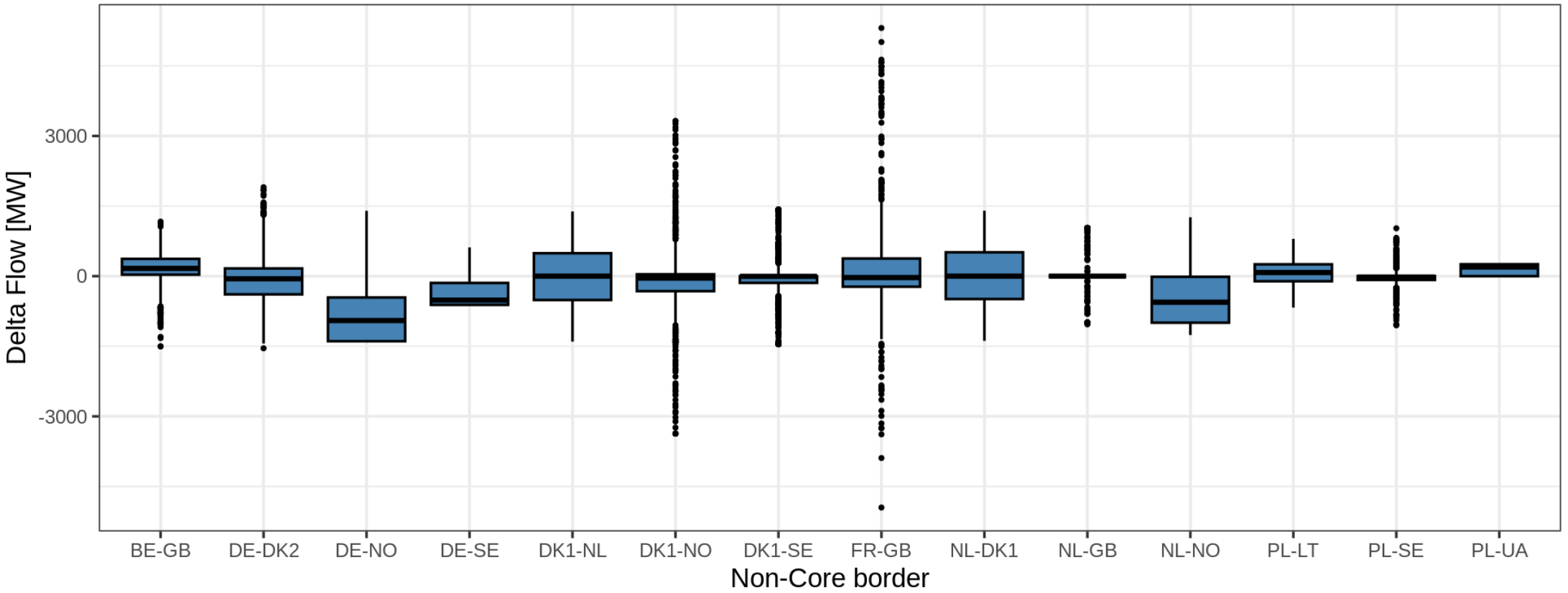
# KPI 6b: Virtual margins at market balance SK



# KPI 7: Non-Core exchanges AC delta flow

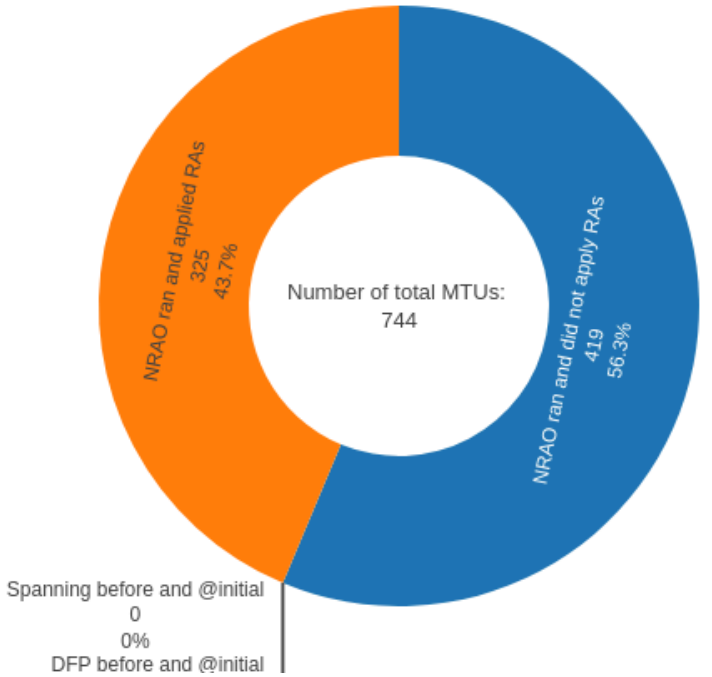


# KPI 7: Non-Core exchanges DC delta flow

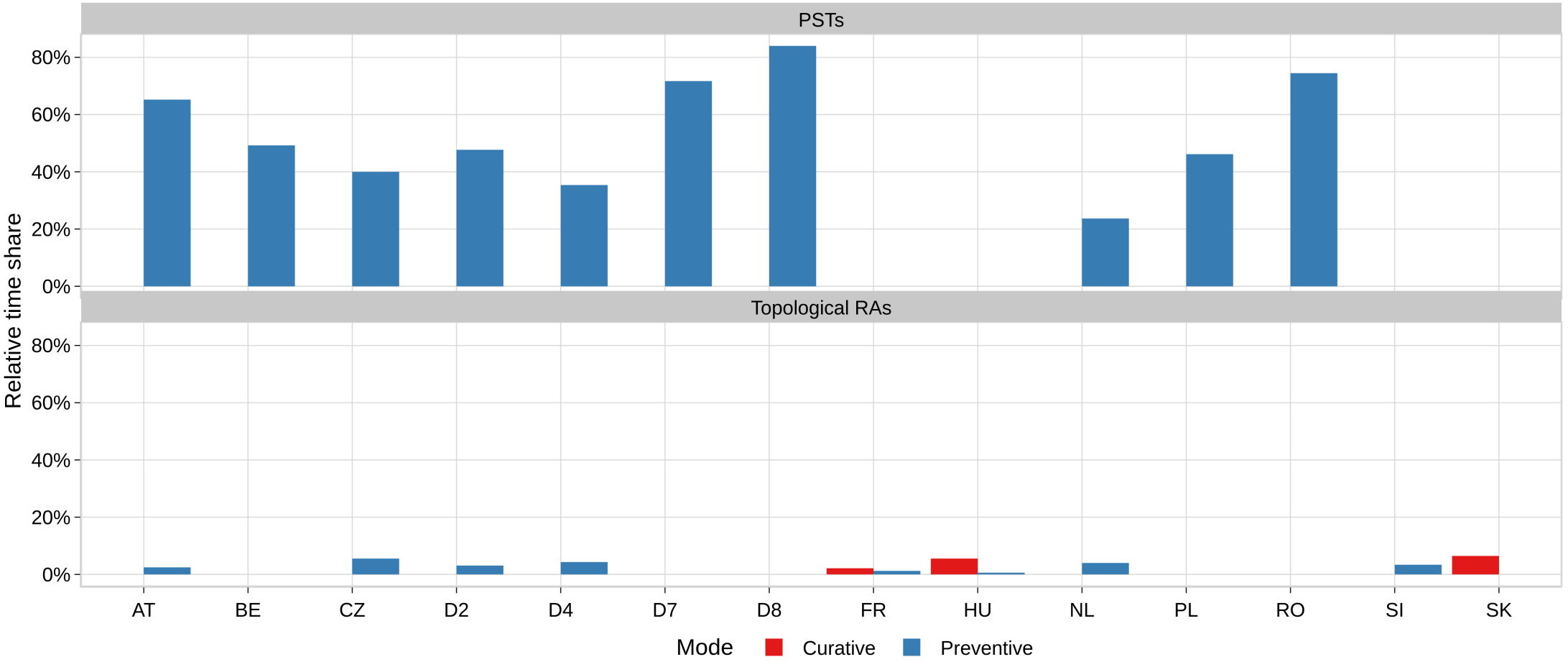


# KPI 8: NRAO – Applied Remedial Action

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

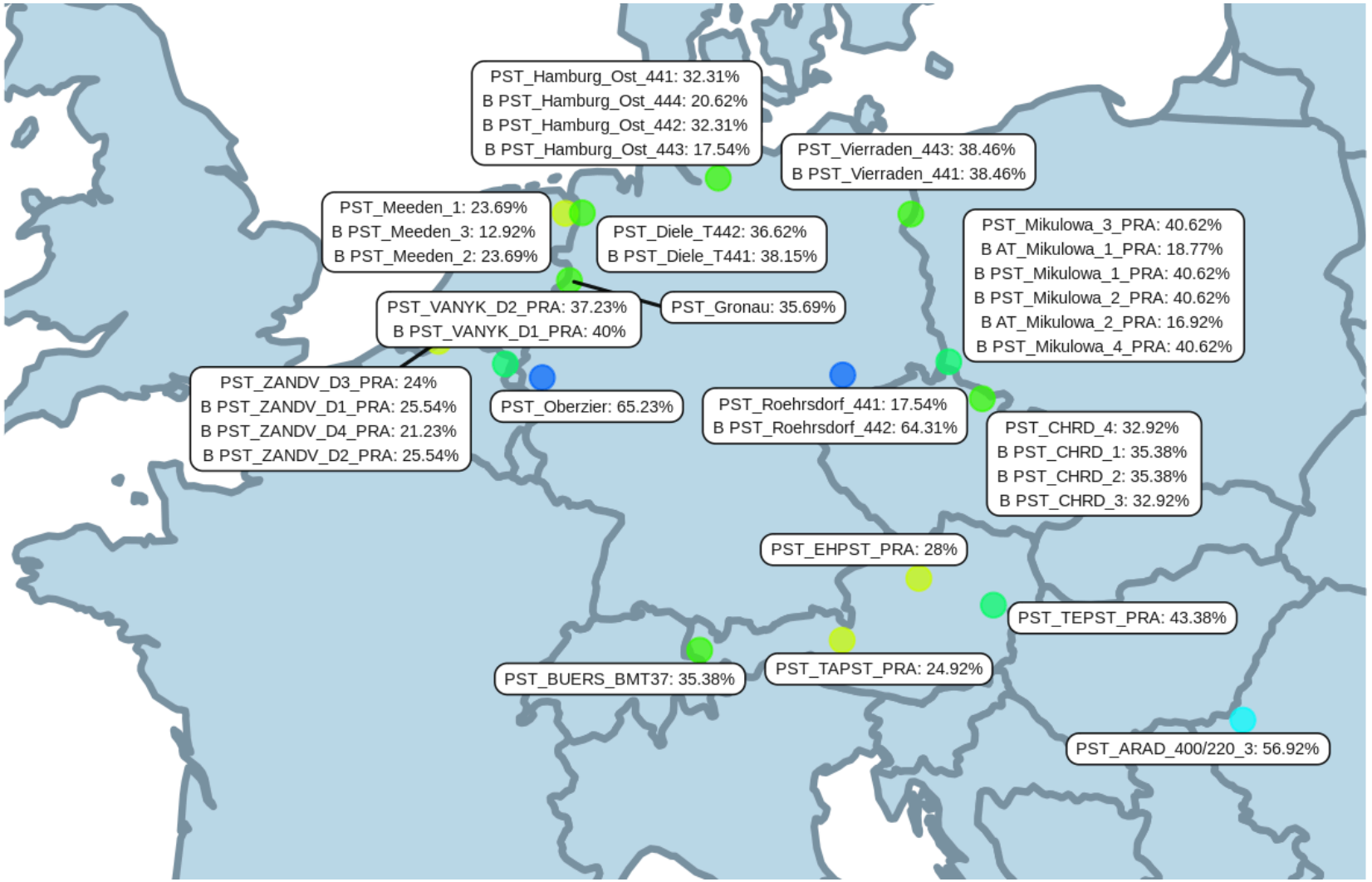


# KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode



# 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

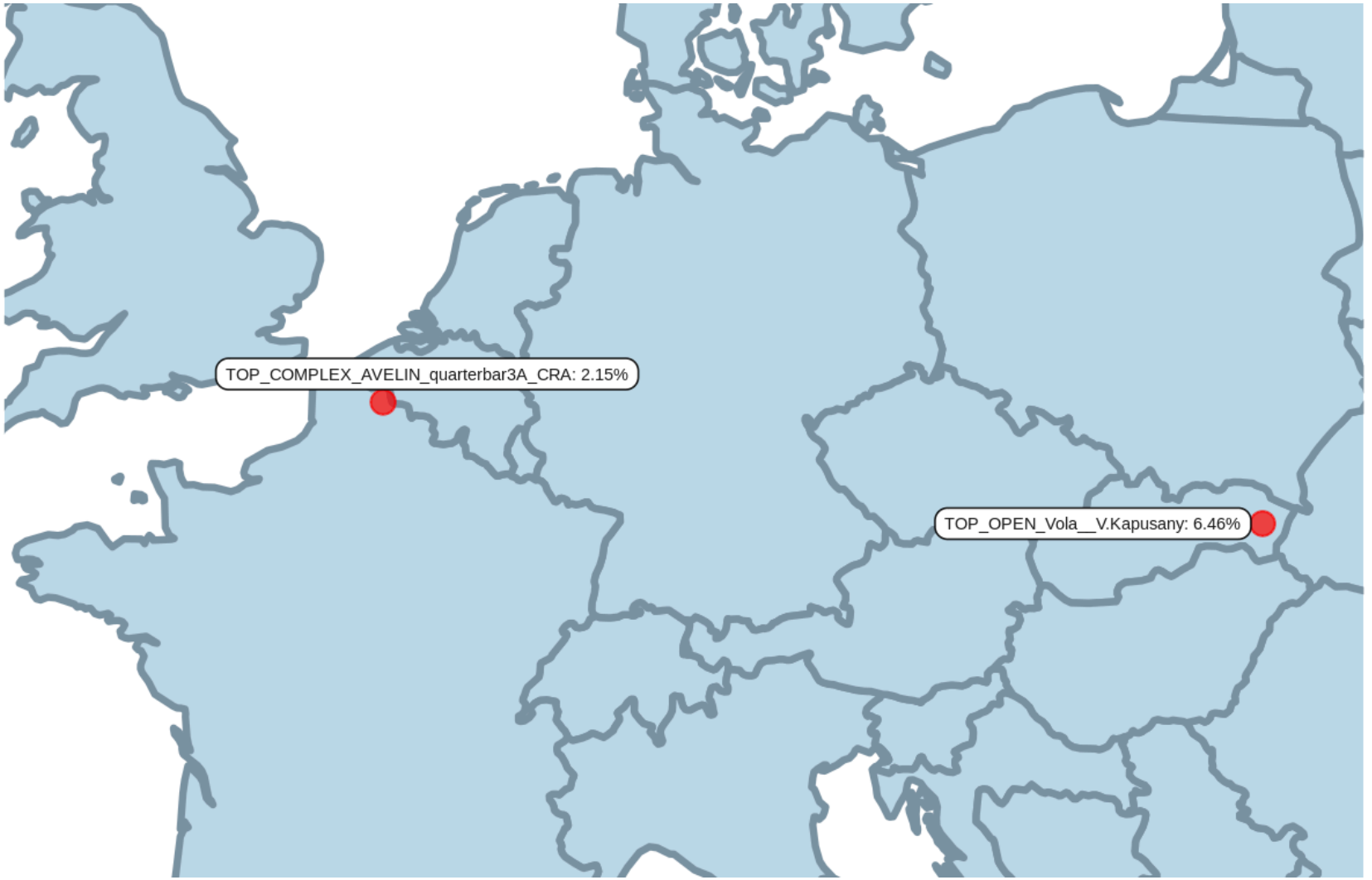
# KPI 8: Relative Time Share of Applied RAs, by TSO, Type and Mode

## Relative Time Share of Applied Topological RAs in Preventive Mode


- 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

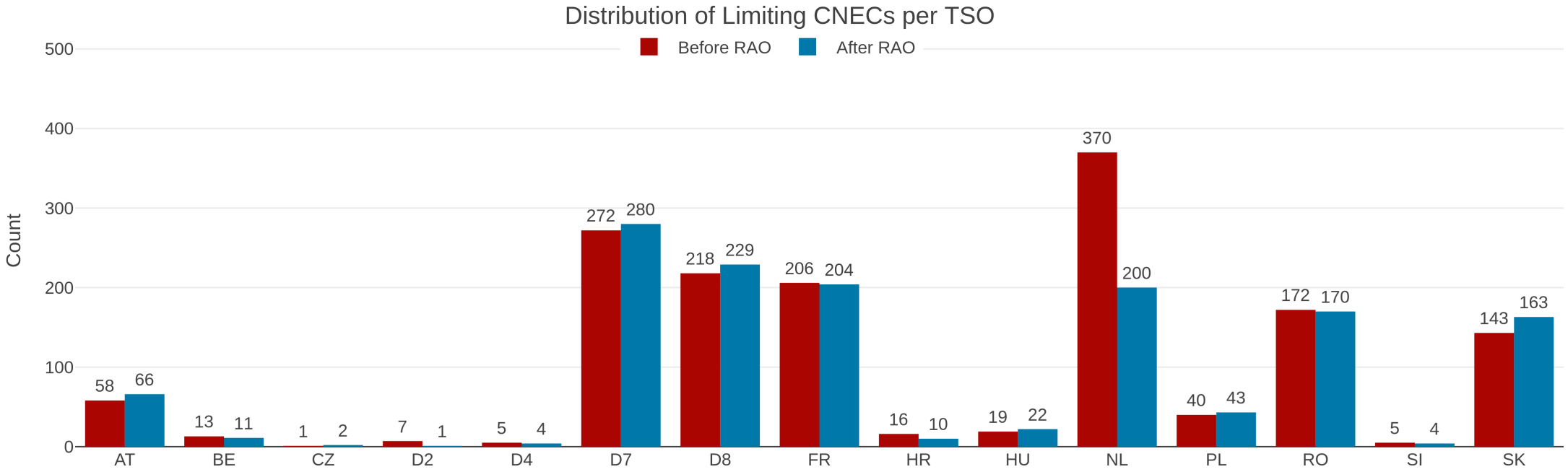
## Relative Time Share of Applied Topological RAs in Curative Mode




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

# 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



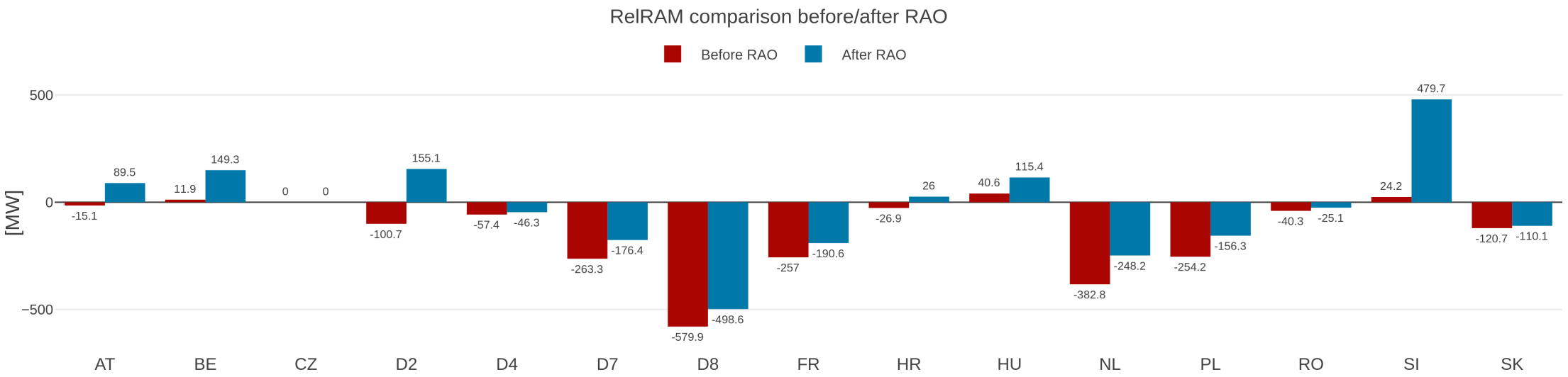

As expected, there is redistributing of the most limiting CNECs. This is because the application of Remedial Actions does not eliminate flows but re-routes, reducing the flows on some limiting CNECs and increasing the load on others, which at the end impacts also the RAM values.

# 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

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



# 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] | 744 | 1456 | 124.25% | 87.17% | 179.14% | 0.2182 | 0.5347 |
| [HR-SI] 220kV Pehlin - Divaca [DIR] [HR] | 744 | 830 | 46.18% | 9.63% | 93.05% | 0.2182 | 0.5347 |
| [HU-HU] Gonyu - Gyor [DIR] | 744 | 1603 | 71.65% | 52.89% | 102.89% | 0.3084 | 1.6106 |
| [SK-HU] Gabcikovo - Gonyu [OPP] [HU] | 741 | 1396 | 85.67% | 62.84% | 114.79% | 0.3293 | 1.1312 |
| [HU-HU] Gonyu - Gyor [OPP] | 734 | 958 | 111.44% | 72.80% | 148.41% | 0.3084 | 1.6106 |
| [AT-SI] Obersielach - Podlog 247 [DIR] [AT] | 733 | 1896 | 63.54% | 21.55% | 124.86% | 0.1855 | 0.6099 |
| [CZ-PL] Wielopole - Nosovice [DIR] [PL] | 728 | 864 | 58.68% | 40.55% | 85.20% | 0.3117 | 1.1264 |
| [CZ-SK] Liskovec - P. Bystrica [OPP] [CZ] | 716 | 716 | 100.20% | 74.52% | 133.98% | 0.0893 | 0.3245 |
| [CZ-D2] Prestice - Etzenricht 442 [DIR] [D2] | 715 | 1423 | 75.42% | 51.12% | 108.35% | 0.249 | 1.0517 |
| [PL-PL] Krosno Iskrzynia - Rzeszow [OPP] | 712 | 732 | 60.57% | 39.17% | 91.33% | 0.3714 | 1.2857 |
| [AT-SI] Obersielach - Podlog 247 [OPP] [AT] | 711 | 1472 | 110.48% | 39.50% | 187.29% | 0.1855 | 0.6099 |
| [SK-SK] Gabcikovo - P.Biskupice [DIR] | 708 | 708 | 83.02% | 69.81% | 103.67% | 0.2966 | 1.1369 |
| [BE-BE] Lixhe - Gramme 380.11 [OPP] | 705 | 973 | 60.66% | 47.50% | 92.82% | 0.1969 | 0.4562 |
| [AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP] | 695 | 1573 | 80.89% | 24.10% | 171.70% | 0.2942 | 1.3038 |
| [AT-D2] St. Peter 2 - Pleinting 258 [DIR] [AT] | 695 | 1237 | 80.63% | 19.85% | 166.36% | 0.1643 | 0.6258 |
| [CZ-SK] Nosovice - Varin [OPP] [SK] | 692 | 1665 | 100.61% | 71.98% | 138.67% | 0.351 | 1.2778 |
| [BE-BE] Doel - Mercator 380.53 [DIR] | 691 | 691 | 64.96% | 41.32% | 93.52% | 0.1287 | 0.478 |
| [CZ-SK] Liskovec - P. Bystrica [DIR] [CZ] | 689 | 689 | 79.16% | 57.53% | 114.67% | 0.0893 | 0.3246 |
| [SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK] | 687 | 709 | 51.43% | 23.90% | 85.11% | 0.2662 | 1.0272 |
| [RO-RO] TR Rosiori 400/220 1 [DIR] | 681 | 681 | 40.21% | 19.00% | 100.75% | 0.1337 | 0.2334 |

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 CNECs with shadow price | Max shadow price [€/MW] | Avg RAM/Fmax | Min RAM/Fmax | Max RAM/Fmax | Max z2zPTDF |
|---|---|---|---|---|---|---|---|
| [FR-D7] Vigy - Ensdorf VIGY2 S [DIR] [D7] | 378 | 378 | 739.13 | 41.29% | 19.96% | 69.48% | 0.215 |
| [SK-SK] V.Dur - Levice 1 [DIR] | 247 | 247 | 4757.99 | 34.41% | 15.81% | 44.95% | 0.1805 |
| [AT-SI] Obersielach - Podlog 247 [DIR] [AT] | 213 | 220 | 2110.93 | 57.54% | 21.66% | 103.04% | 0.1855 |
| [SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK] | 144 | 144 | 601.18 | 43.90% | 23.90% | 69.76% | 0.2662 |
| [D8-PL] Mikulowa PST1 [DIR] [PL] | 59 | 59 | 394.06 | 50.44% | 40.43% | 62.53% | 0.4154 |
| [D8-D8] Vierraden - Vierraden PST441 [DIR] | 57 | 57 | 430.77 | 45.56% | 36.15% | 60.39% | 0.3061 |
| [D2-D2] Altheim - Simbach 234/230 [DIR] | 54 | 54 | 836.56 | 55.44% | 36.46% | 75.00% | 0.1122 |
| [AT-AT] Tauern - Weissenbach 221 [DIR] | 49 | 49 | 1889.6 | 46.90% | 21.07% | 77.99% | 0.1054 |
| [NL-D7] Maasbracht - Siersdorf SELFK SW [DIR] [D7] | 49 | 56 | 435.08 | 53.75% | 29.97% | 81.41% | 0.2877 |
| [FR-D7] Vigy - Ensdorf VIGY1 N [DIR] [D7] | 46 | 46 | 750.72 | 47.64% | 22.66% | 72.51% | 0.2062 |
| [RO-RO] TR Rosiori 400/220 1 [DIR] | 44 | 44 | 4938.81 | 33.04% | 19.25% | 54.50% | 0.1337 |
| [AT-AT] Neusiedl - Wien Suedost 246A [OPP] | 41 | 41 | 15434.44 | 50.75% | 40.71% | 62.50% | 0.0633 |
| [D8-PL] Krajnik - Vierraden 1 [OPP] [PL] | 39 | 39 | 679.36 | 34.07% | 19.73% | 49.42% | 0.2931 |
| [D8-PL] Mikulowa - Hagenwerder 2 [OPP] [PL] | 38 | 38 | 819.83 | 42.04% | 33.79% | 62.65% | 0.4141 |
| [FR-FR] Creys - Saint-Vulbas 2 [OPP] | 38 | 38 | 619.3 | 33.96% | 19.99% | 51.15% | 0.1413 |
| [PL-PL] Krosno Iskrzynia - Rzeszow [OPP] | 34 | 34 | 363.31 | 55.29% | 46.67% | 73.87% | 0.3027 |
| [AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT] | 32 | 32 | 864.09 | 52.14% | 20.37% | 85.05% | 0.1584 |
| [HU-UA] Kisvarda - Mukachevo [DIR] [HU] | 31 | 31 | 3996.94 | 7.10% | 0.00% | 24.10% | 0.0904 |
| [AT-HU] Neusiedl - Gyoer 246B [DIR] [AT] | 26 | 26 | 3637.16 | 51.94% | 40.71% | 72.12% | 0.079 |
| [AT-HU] Wien Suedost - Gyoer 245 [DIR] [AT] | 23 | 23 | 2574.69 | 60.20% | 50.00% | 70.51% | 0.0693 |

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 = 400mW/0.4 = 1250MW

# KPI 13 : Allocation Constraints - Poland

| | # MTUs |
|---|---|
| AC was limiting MC | 245 |
| AC < 0 MW | 92 |
| AC = 0 MW | 151 |
| AC > 0 MW | 2 |

| | PL AC Import [MW] | PL AC Export [MW] |
|---|---|---|
| Avg. | -1957.78 | 3641.24 |
| Min. | -9597.00 | 500.00 |
| Max. | 0.00 | 12608.00 |