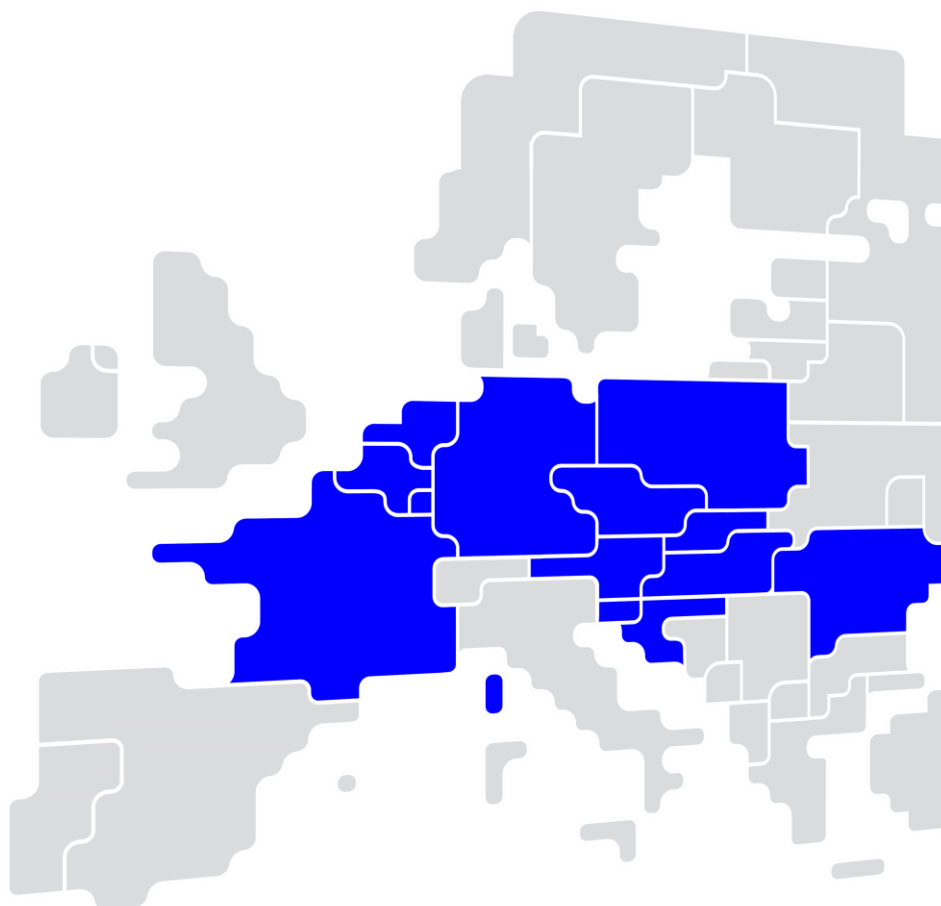




Core DA CC – Annual Report

2023



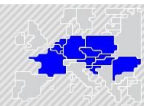
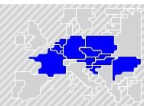
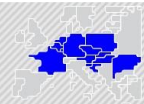


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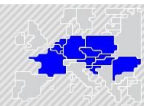


Glossary

AHC	Advanced Hybrid Coupling
AMR	Adjustment For Minimum RAM
ATC	Available Transfer Capacity
BCI	Base Case Improvement
BD	Business Day
CACM	The Guideline on Capacity Allocation and Congestion Management
CBCO	Critical Branch Critical Outage
CCC	Capacity Calculation Coordinator
CCct	Core Capacity Calculation Tool
CCR	Capacity Calculation Region
CGM	Common Grid Model
CNE	Critical Network Element
CNEC	Critical Network Element And Contingency
Core DA CCM	Core Day-Ahead Capacity Calculation Methodology
Core IG	Core Implementation Group
DA CSA	Day-Ahead Coordinated Security Analysis
DACF	Day-Ahead Congestion Forecast
DFP	Default Flow Base Parameters
DQI	Data Quality Indicator
ICS	Improved Coordinated Solution
IGM	Individual Grid Model
IVA	Individual Validation Adjustment
KPI	Key Performance Indicator
LTA	Long Term-Allocated Capacity
LTN	Long Term Nomination
MNEC	Monitored Network Element with a Contingency
MP	Market Party
MTU	Market Time Unit
NP	Net Position
NRA	National Regulatory Agency
NRAO	Non-Costly Remedial Action Optimiser
NTC	Net Transfer Capacity
PRA	Preventive Remedial Action
PST	Phase Shifting Transformer
PTDF	Power Transfer Distribution Factor
PTRs	Physical Transmission Rights
RA	Remedial Action



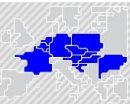
RAM	Remaining Available Margin
RDP	Redispatch Potential
REMIT	The Regulation on Wholesale Energy Market Integrity And Transparency
SDAC	Single Day-Ahead Coupling
SEW	Social Economic Welfare
SGM	Static Grid Model
SO GL	System Operation Guideline on Electricity Transmission
SP	Shadow Price
TF	Task Force
TSO	Transmission System Operator



TSOs in Core Region

Below you will find an overview of the Transmission System Operators (TSO) located in the Core region.

UCT TSO Country Code	TSO
AT	Austrian Power Grid (APG)
BE	Elia
CZ	CEPS
D2	TenneT TSO (TTG)
D4	TransnetBW (TBW)
D6	Creos
D7	Amprion
D8	50Hertz
FR	RTE
HR	HOPS
HU	MAVIR
NL	TenneT TSO BV
PL	PSE
RO	Transelectrica
SI	ELES
SK	SEPS



Introduction

According to the Core DA CCM and the Core DA CCM 1st amendment ([link](#)), the annual reporting obligations following the implementation of this methodology are as follows:

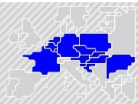
Art. 27(4): “The CCC, with the support of the Core TSOs where relevant, shall draft and publish an annual report satisfying the reporting obligations set in Articles 10, 13, 16, 26 and 28 of this methodology:

- (a) According to Article 10(6), the Core TSOs shall report to the CCC on systematic withholdings which were not essential to ensure operational security in real-time operation*
- (b) According to Article 13(5), the Core TSOs shall monitor the accuracy of non-Core exchanges in the CGM*
- (c) According to Article 16(7), the CCC shall monitor the efficiency of the NRAO*
- (d) According to Article 26(3), the CCC shall monitor and report on the quality of the data published on the dedicated online communication platform as referred to in Article 25, with supporting detailed analysis of a failure to achieve sufficient data quality standards by the concerned TSOs, where relevant*
- (e) According to Article 28(4), after the implementation of this methodology, the Core TSOs shall report on their continuous monitoring of the effects and performance of the application of this methodology*

Additionally, according to Article 26(4):

*“The Core TSOs shall commit to a minimum value for at least some of the indicators mentioned in paragraph 2, to be achieved by each TSO individually on average on a monthly basis. Should a TSO fail to fulfil at least one of the data quality requirements, this TSO shall provide to the CCC within one month following the failure to fulfil the data quality requirement, detailed reasons for the failure to fulfil data quality requirements, as well as an action plan to correct past failures and prevent future failures. No later than three months after the failure, this action plan shall be fully implemented and the issue resolved. **This information shall be published on the online communication platform and in the annual report**”.*

This report covers the period from Business Day 01.01.2023 to 31.12.2023. The report is structured as follows: 3 general chapters (*Glossary, TSOs in Core Region and Introduction*), 5 chapters dedicated to reporting obligations, and 4 annexes (one Annex related to Allocation and External Constraints, other Annex for the yearly overview of the monthly data quality indicator (DQI) breaches, the third one including the raw results from the survey conducted, and the final one showing additional figures on the NRAO study).



Availability of RA for the Day-Ahead Capacity Calculation

Reporting obligations from DA CCM

As per Article 10(6) of the Core DA CCM:

“In accordance with Article 25(4) of the CACM Regulation, a TSO may withhold only those RAs, which are needed to ensure operational security in real-time operation and for which no other (costly) RAs are available, or those offered to the day-ahead capacity calculation in other CCRs in which the concerned TSO also participates. The CCC shall monitor and report in the annual report on systematic withholdings, which were not essential to ensure operational security in real-time operation.”

Following previous alignments via Core IG call 20200122, the reporting requirement is fulfilled by assessing the RA potential offered in the Core DA CC process, namely PSTs, topological RAs and redispatch, as well as a comparison of RA potential offered in the D-2 (Core DA CC process) vs D-1 timeframes (DA CSA process).

RA potential

From the D-2 timeframe (the Core DA CC process, which is the subject of this report), Core TSOs are providing RA potential to the central tool separately for 2 process steps:

- NRAO: where non-costly (PSTs and topological RAs) RAs are provided
- Simple Coordinated Validation: where non-costly (PSTs and topological RAs) and costly (redispatch potential *RD*) RAs are provided

From the D-1 timeframe (the Legacy SA process in UCTE-DEF format, currently the Improved Coordinated Solution (*ICS*)), the RA potential (costly and non-costly RAs) provided by Core TSOs is retrieved for the purpose of this reporting point.

In the following subchapters, statistics and visualisations are presented with the D-2 data on RA potential, as well as comparisons of RA potential offered in the D-2 vs D-1 timeframes. A dedicated subchapter is provided for each type of RA (PSTs, topological RAs, redispatch potential).

The definitions of the above-mentioned RAs used in both timeframes are according to Art 22(1) of the *Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation* ([link](#)) (SO GL Regulation).

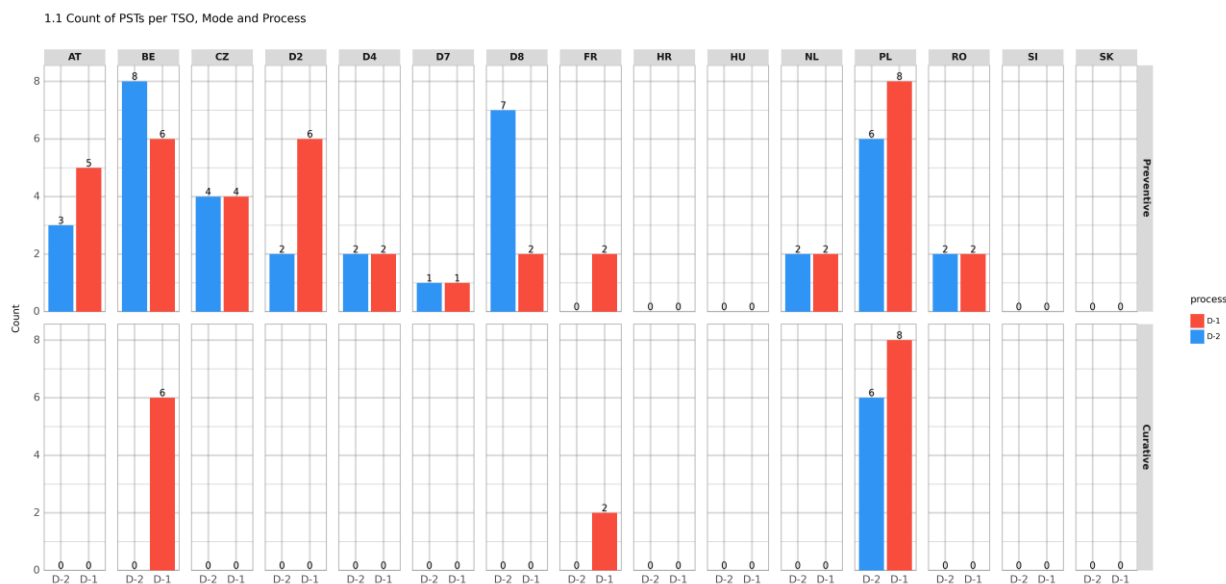
For any RA, a distinction is being made between being in Preventive (RA application can be considered regardless of base-case or considered contingency) or Curative (the RA application is associated only with a certain contingency or contingencies) mode.



RA potential – PSTs

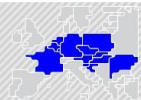
By changing the tap position of a PST, the active power flow on a certain network element or several network elements can be adjusted.

Count of PSTs by TSO, Mode (Preventive/Curative) and Process (D-2 vs D-1)

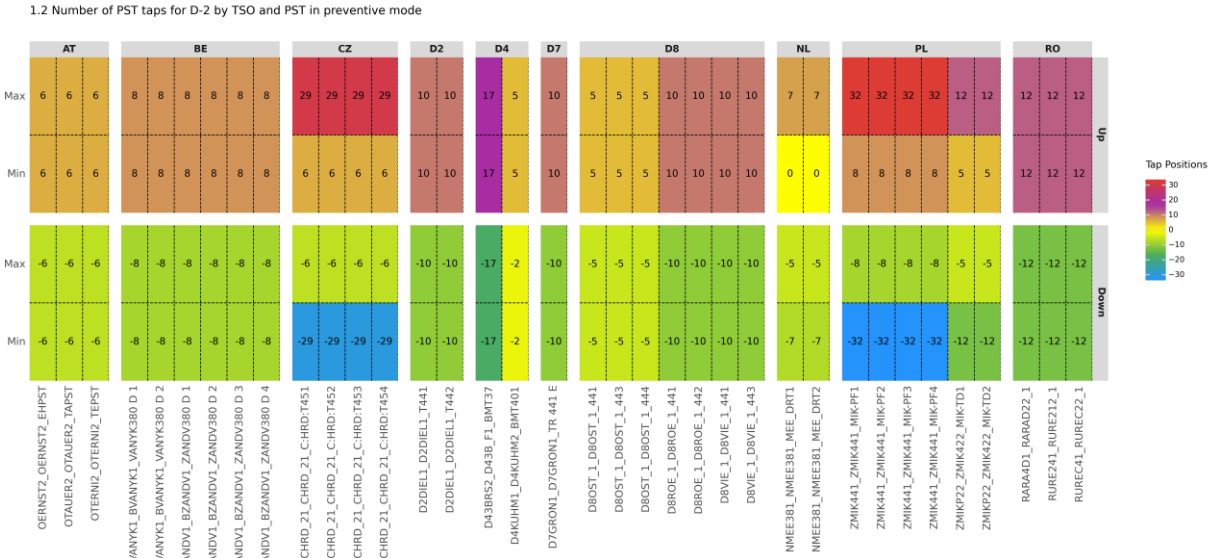


The figure above shows the cumulative number of PSTs that have been offered as RAs per TSO during the D-2 process and during the D-1 process in the reporting period. The top half of the figure shows the count of PSTs offered as preventive RAs and the bottom half shows the count of PSTs offered as curative RAs.

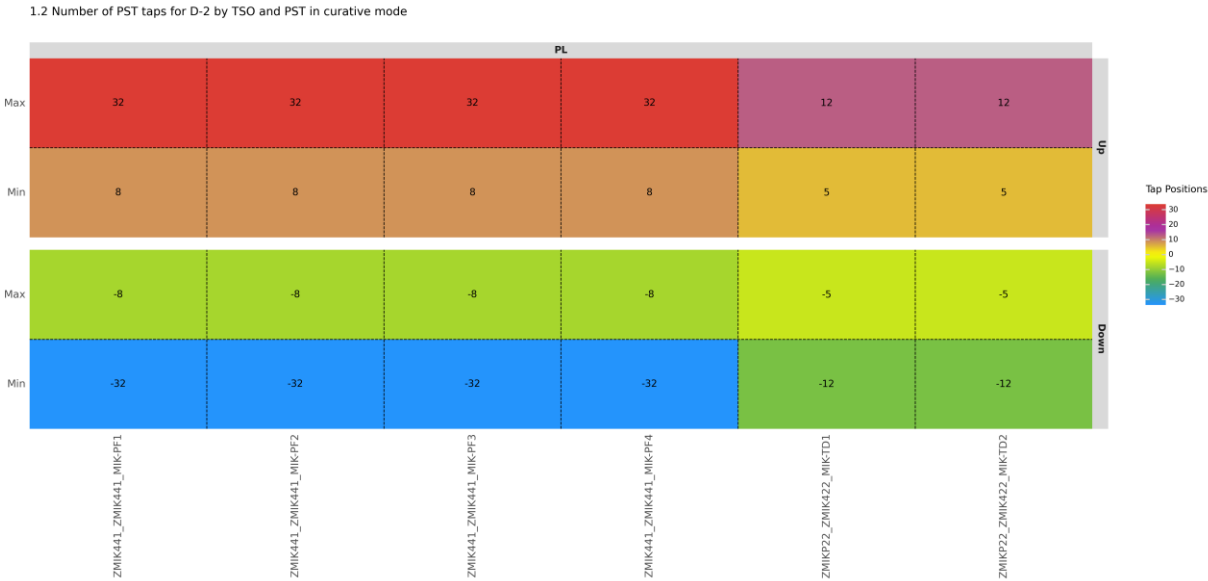
In the case of D-1 and D-2 data, the same PST can be provided for both preventive and curative measures for the same TS. In the figure, a distinct count of PSTs is considered for preventive and curative modes, even if the same PST is provided for both modes.



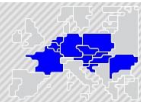
Number of PST taps provided for D-2, by TSO and PST



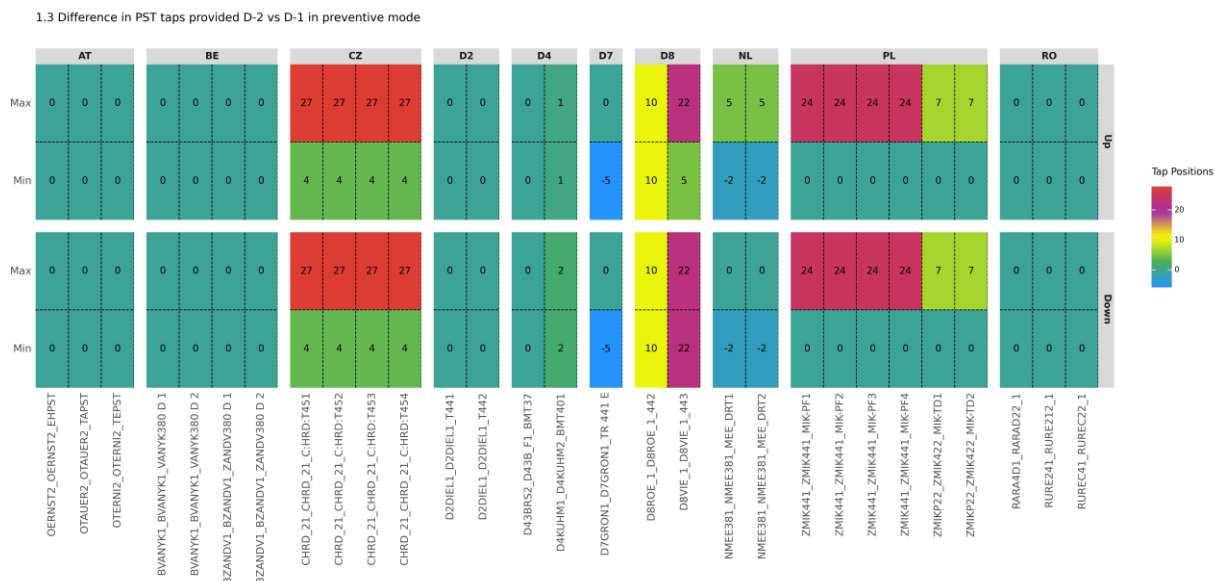
The figure above shows the number of PST taps provided by the TSOs for each PST for the D-2 process in preventive mode.



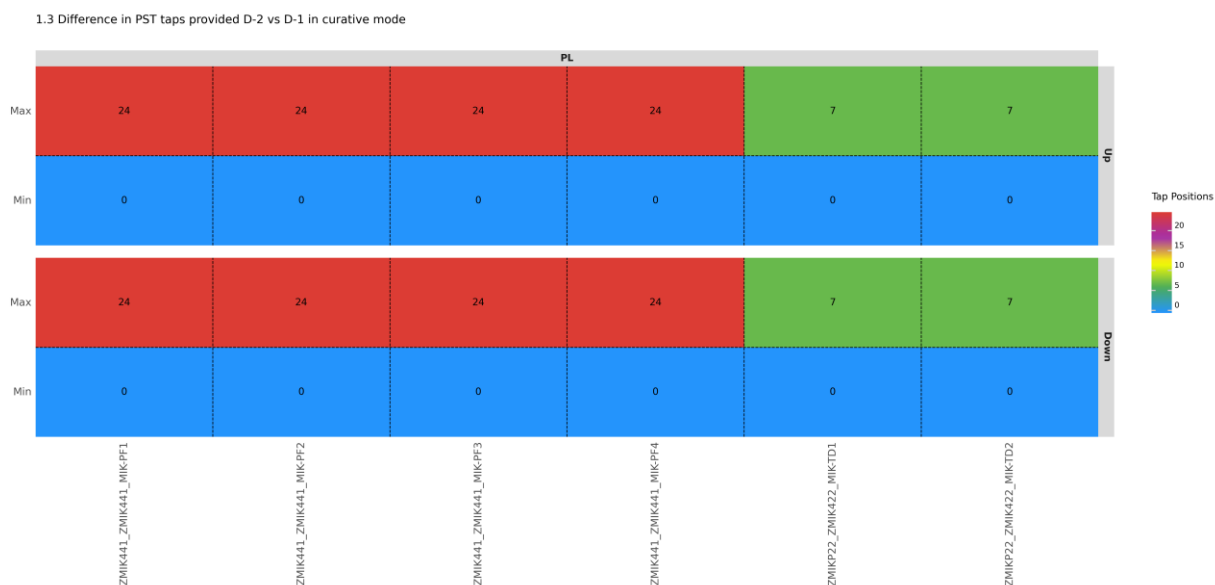
The figure above shows the number of PST taps provided by the TSOs for each PST for the D-2 process in curative mode.



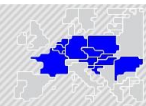
Difference in PST taps provided for D-2 vs D-1, by TSO and PST



The figure above shows the difference in provided PST taps when comparing the D-2 process to the D-1 process. The figure is showing the number per TSO and the provided PST taps are compared for preventive mode. The higher the number of the difference, the more taps were offered in D-1 (compared to D-2). Negative values (absent in the figure) would indicate that more taps were offered in D-2.

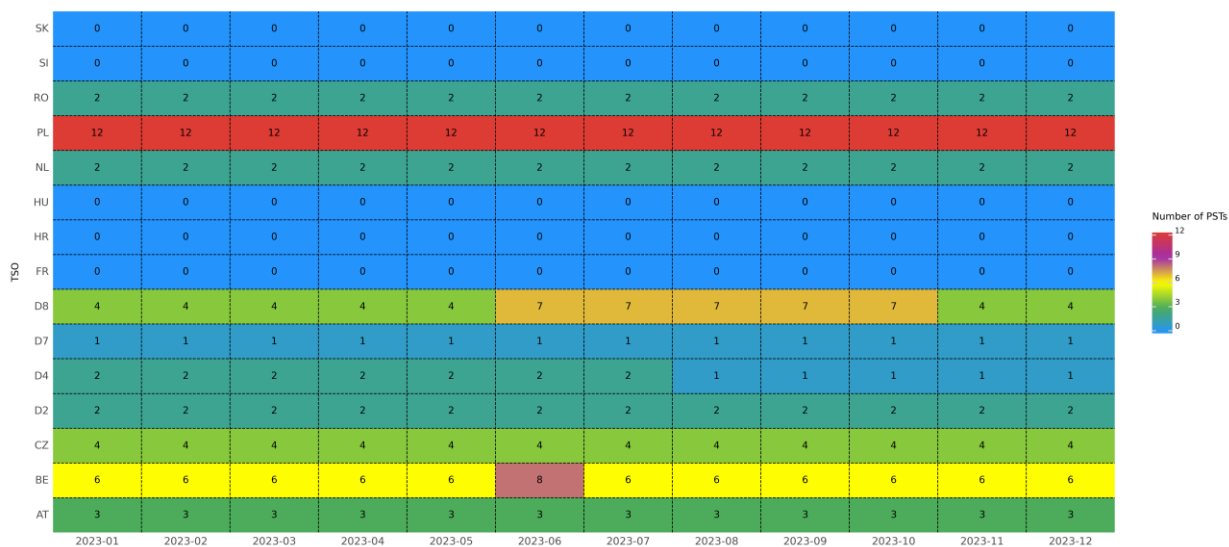


The figure above shows the difference in provided PST taps when comparing the D-2 process to the D-1 process. The figure is showing the number per TSO and the provided PST taps are compared for curative mode.



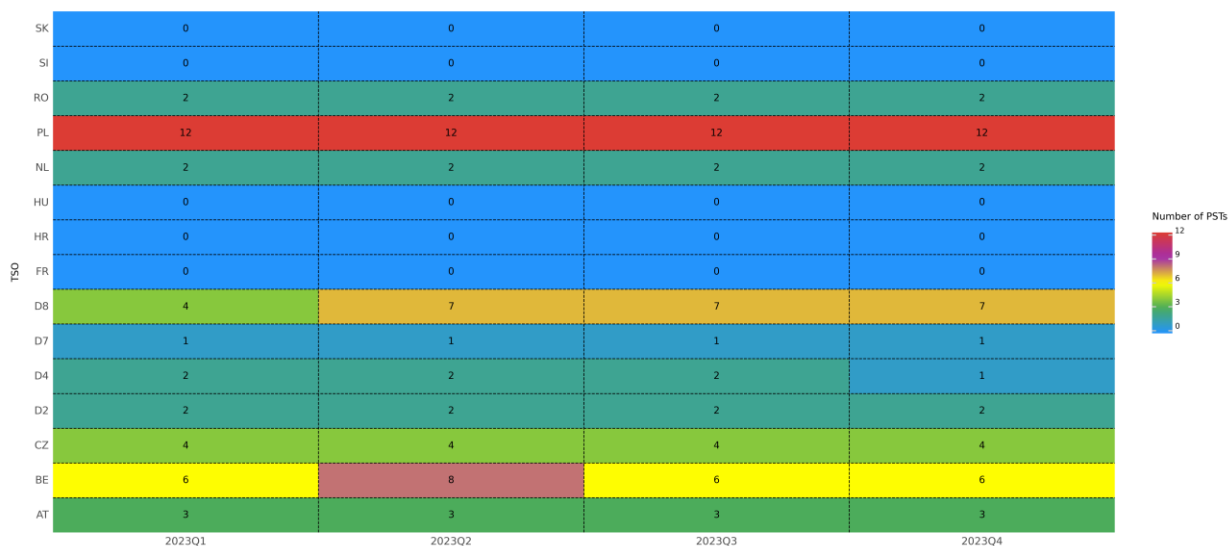
Timeseries indicators for PSTs

1.4.1 Count of PSTs from D-2 per TSO and month

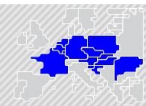


The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each month in the period.

1.4.1 Count of PSTs from D-2 per TSO and quarter



The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each quarter in the period.

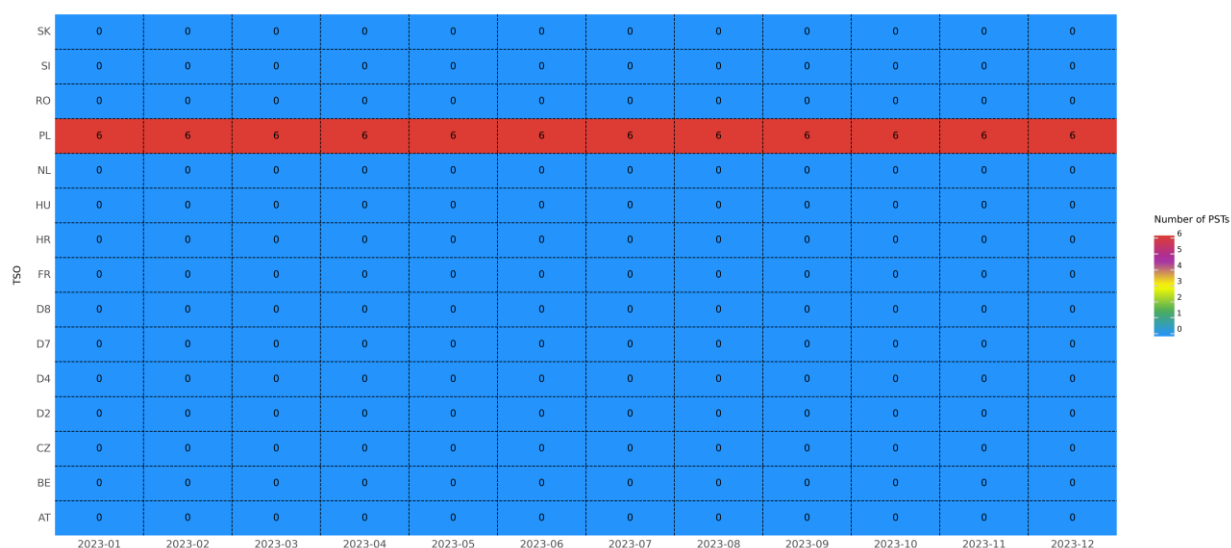


1.4.2 Count of PSTs from D-2 per TSO and month in preventive mode

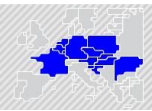


The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each month in the period in preventive mode.

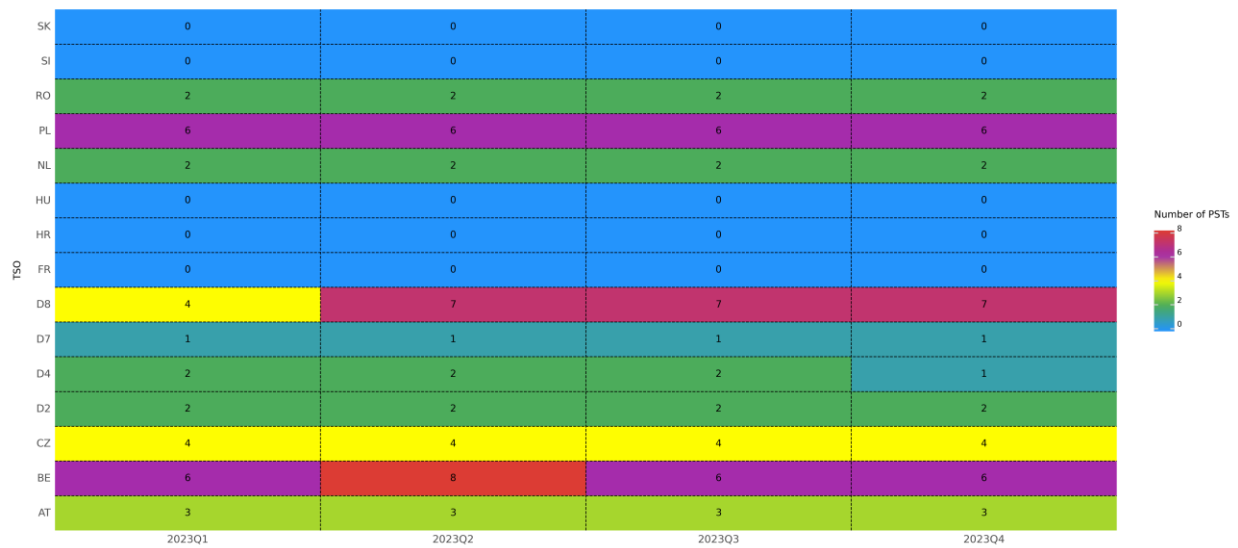
1.4.2 Count of PSTs from D-2 per TSO and month in curative mode



The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each quarter in the period in preventive mode.

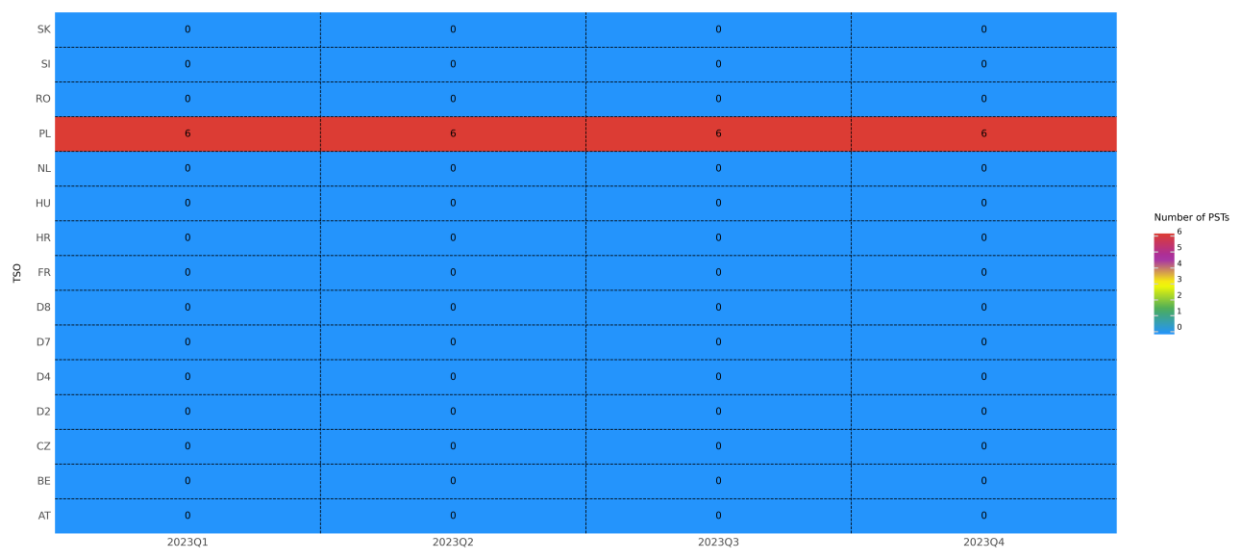


1.4.2 Count of PSTs from D-2 per TSO and quarter in preventive mode

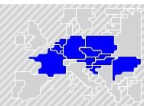


The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each quarter in the period in curative mode.

1.4.2 Count of PSTs from D-2 per TSO and quarter in curative mode



The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each quarter in the period in curative mode.

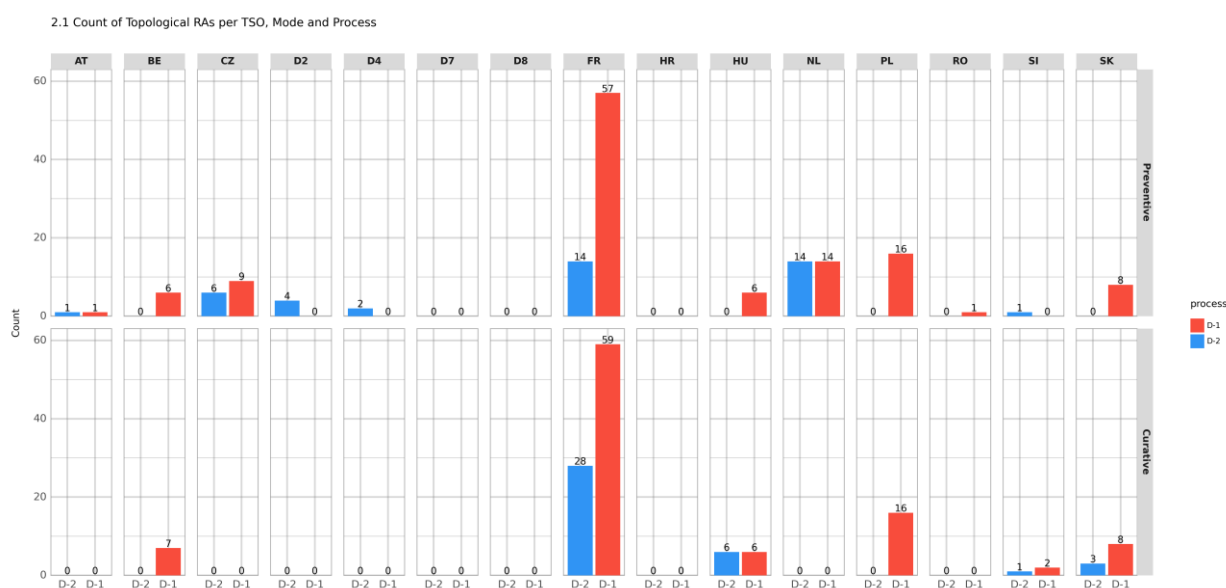


RA potential – Topological RAs

A topological RA is a change or subset of changes in the grid topology, with the result of impacting the active power flow on certain network element or several network elements. A non-exhaustive list of topological RAs include:

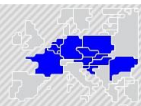
- 2-node operation in a substation voltage level (by opening the busbar coupler)
- Closing/opening of a circuit (line, transformer)
- Moving one line from one busbar to another (in the case of 2-node or 3-node operation)

Count of Topological RAs by TSO, Mode (Preventive/Curative) and Process (D-2 vs D-1)



Shown in the figure above is an overview of the number of topological RAs provided by each Core TSO for D-2 and D-1 for the period.

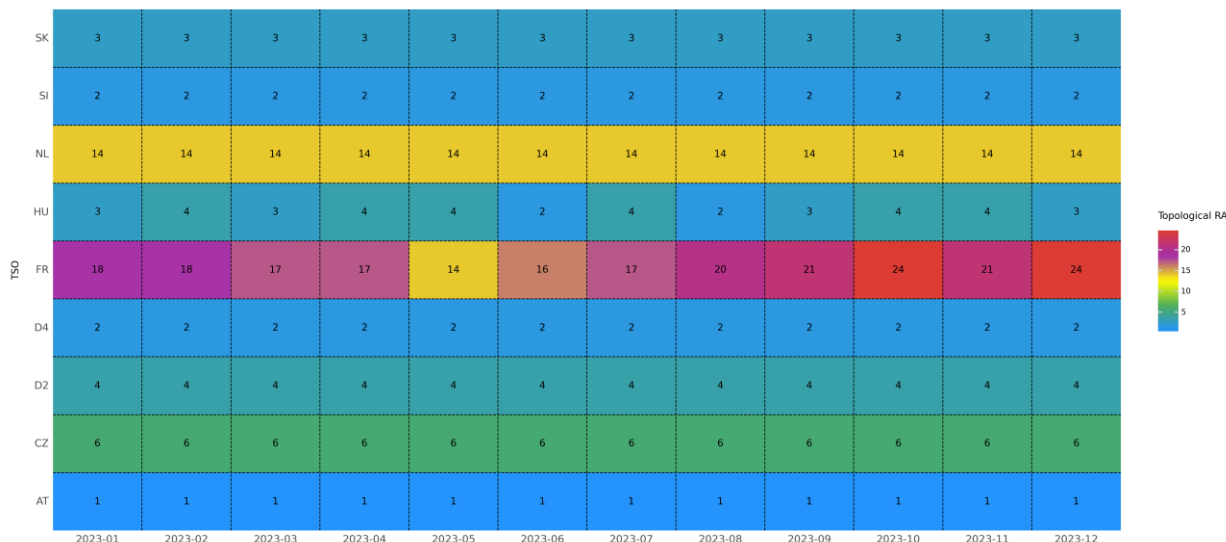
In the case of D-1 and D-2 data, the same topological RA can be provided for both preventive and curative measures for the same TS. In the figure, a distinct count of PSTs is considered for preventive and curative modes, even if the same Topological RA is provided for both modes.



Timeseries indicators for Topological RAs

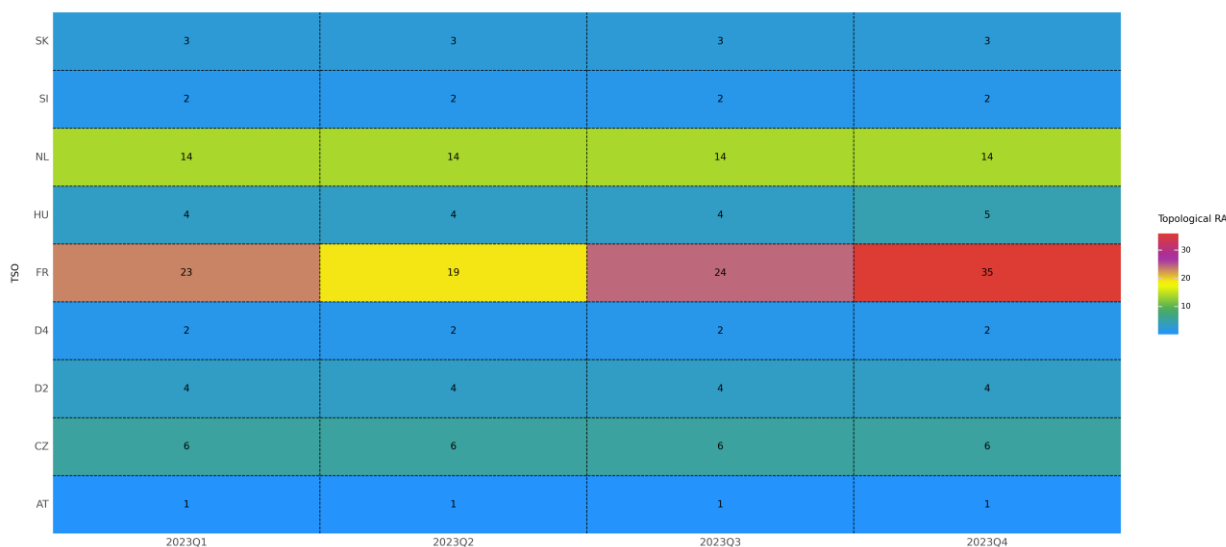
The following figures include both curative and preventive RAs. In case the same RA has been offered as curative and preventive, it is only counted once.

2.2.1 Count of Topological RAs from D-2 per TSO and month



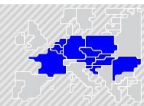
The figure above shows a monthly overview of the number of unique topological RAs provided by each Core TSO for the D-2 process. If the same remedial action is provided for multiple MTUs, it is only counted once.

2.2.1 Count of Topological RAs from D-2 per TSO and quarter



The figure above shows a quarterly overview of the number of unique topological RAs provided by each CORE TSO for the D-2 process. If the same remedial action is provided for multiple months, it is only counted once in the quarterly overview.

Note: For RTE a RA can be composed by several single actions (example: to perform to nodes in a substation you can use different combination of opening/closing circuit breakers). The figures above represent the number of single actions.

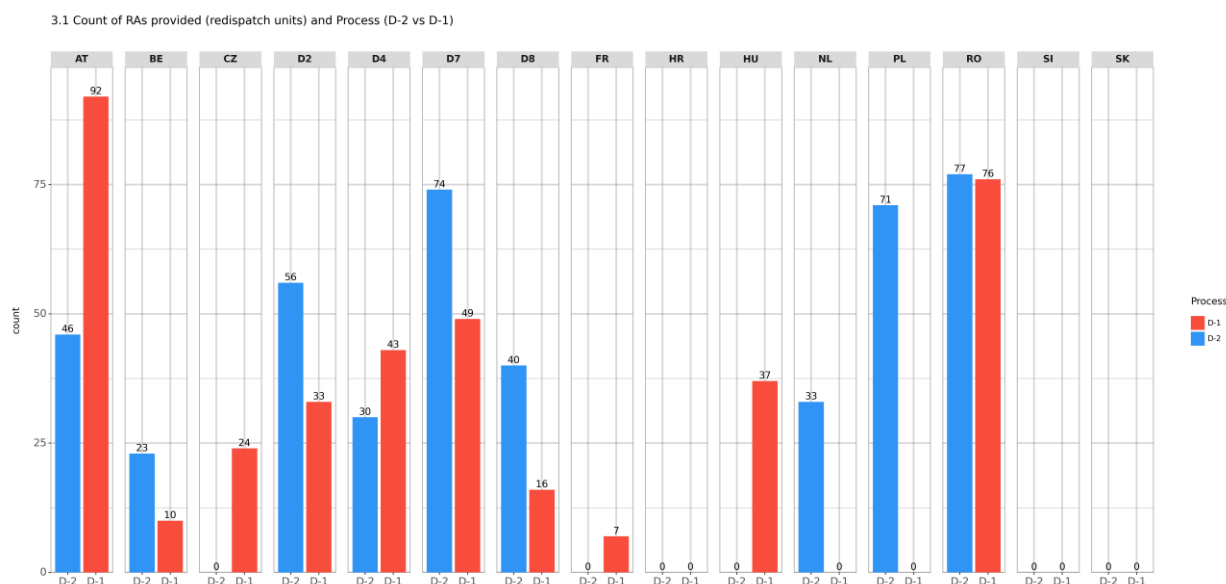


RA potential – Redispatch potential

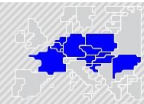
Redispatch is a costly RA which consists of modifying (increasing or decreasing) the generation value of one or several generating or production units, with the aim of relieving an overload on certain network element or several network elements. Countertrading is not in the scope of this report.

The upward *RDP+* and downward *RDP-* redispatch potential of a generating unit is relative to the initial (before applying redispatch) operating point *P0*. *RDP+*, *RDP-* and *P0* are subject to the physical or technical restrictions of the generating unit, such as *Pmax* and *Pmin*. The total redispatch volume of a redispatching unit is a sum of *RDP+* and *RDP-*.

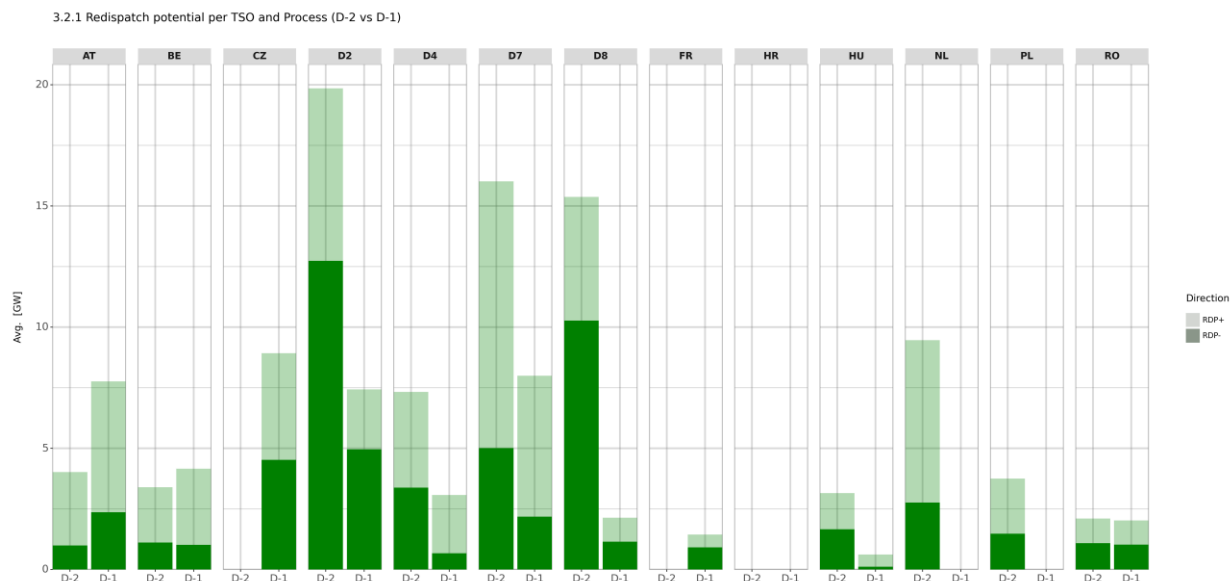
Count of RD units provided by TSO per Process (D-2 vs D-1)



The figure above shows the number of redispatch units provided by each TSO for the D-1 - and the D-2 process.

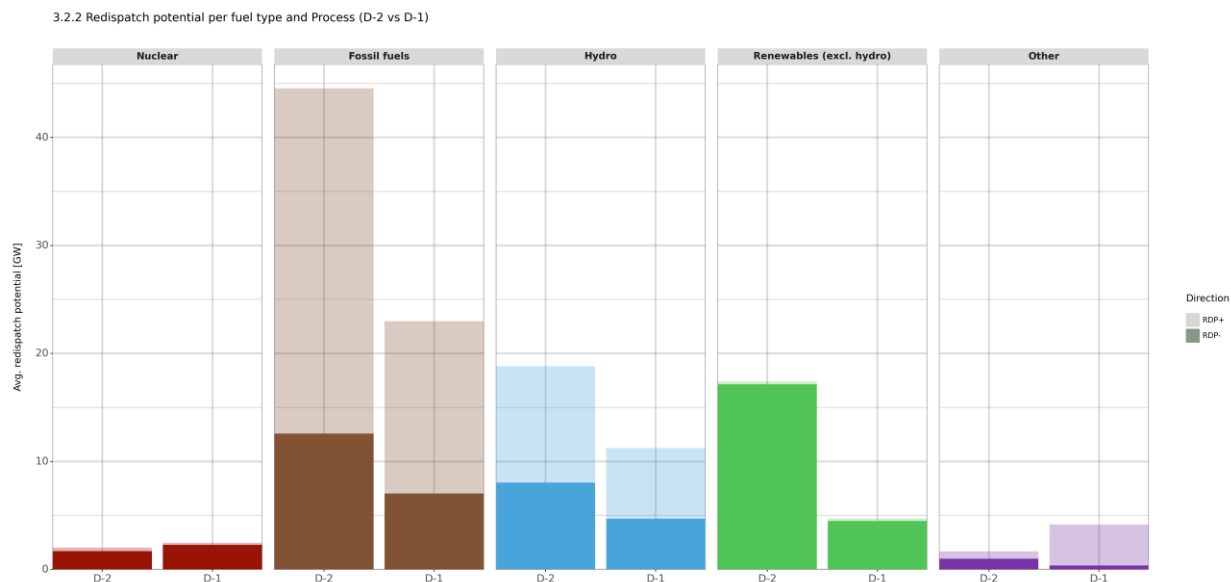


Redispatch volume by TSO, Fuel Type and Process (D-2 vs D-1)

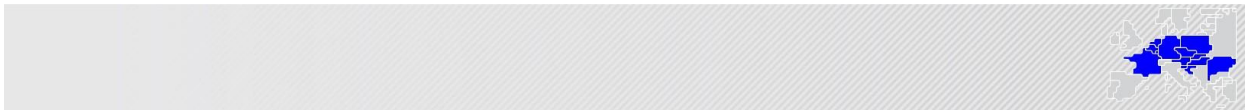


The figure above shows the cumulative redispatch potential per TSO for each process D-1 and D-2 for the year 2023. The transparent colour is showing the upward redispatch potential and the solid colour is showing the downward redispatch potential.

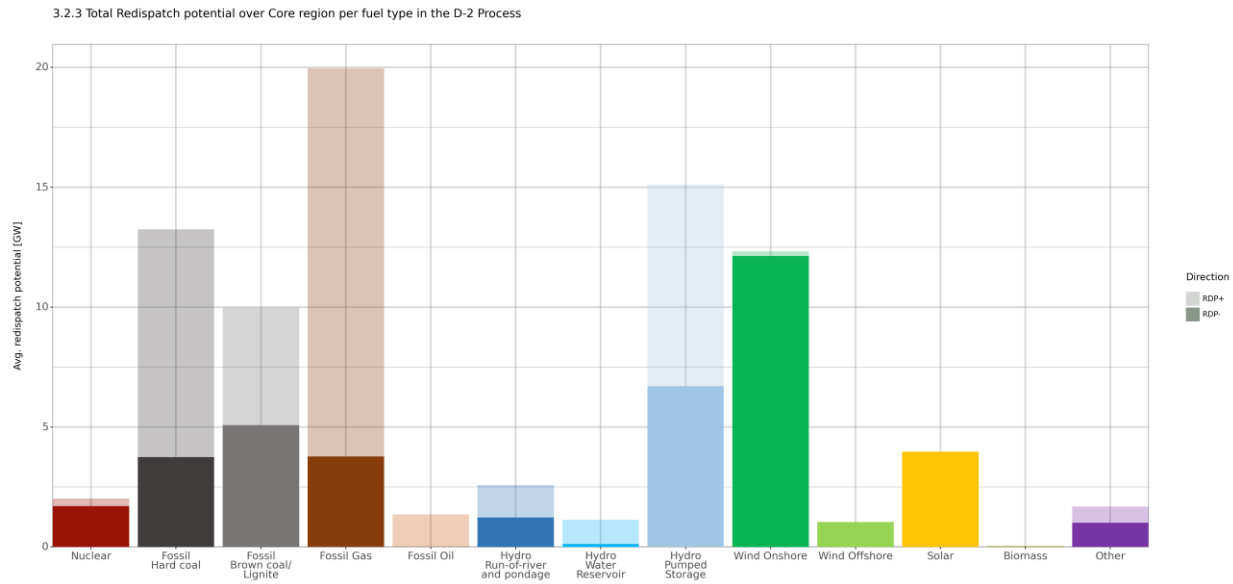
Redispatch potential per fuel type and Process (D-2 vs D-1)



The figure above shows the cumulative redispatch potential per fuel type for each process D-1 and D-2 for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

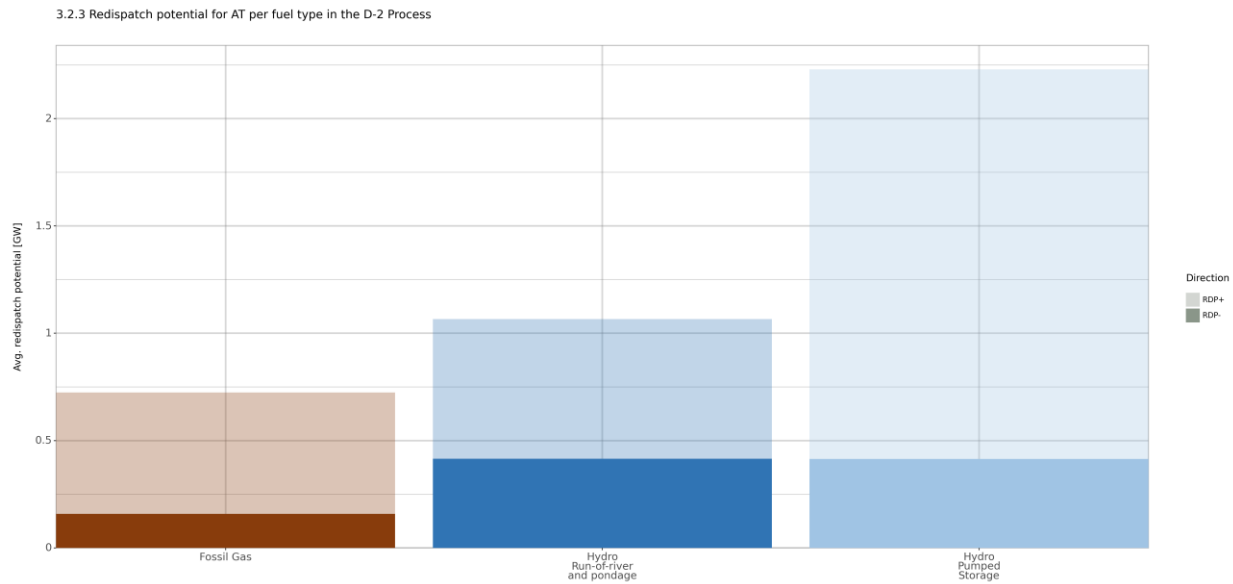


Total Redispatch potential over Core region per fuel type in the D-2 Process

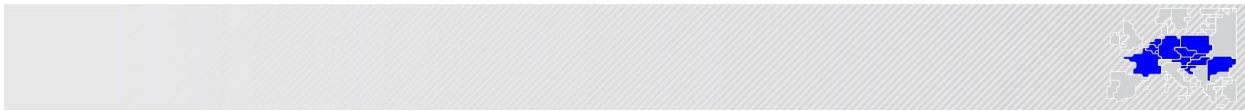


The figure above shows the total redispatch potential per fuel type for the D-2 process for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

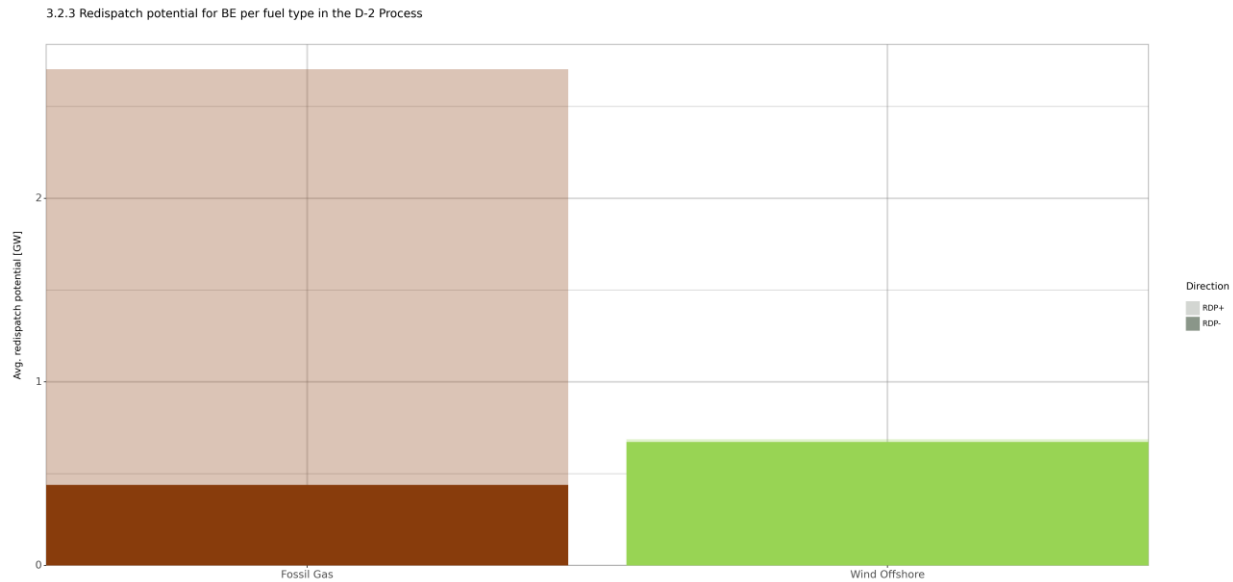
Redispatch potential for APG per fuel type in the D-2 Process



The figure above shows the redispatch potential per fuel type for the D-2 process for APG for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

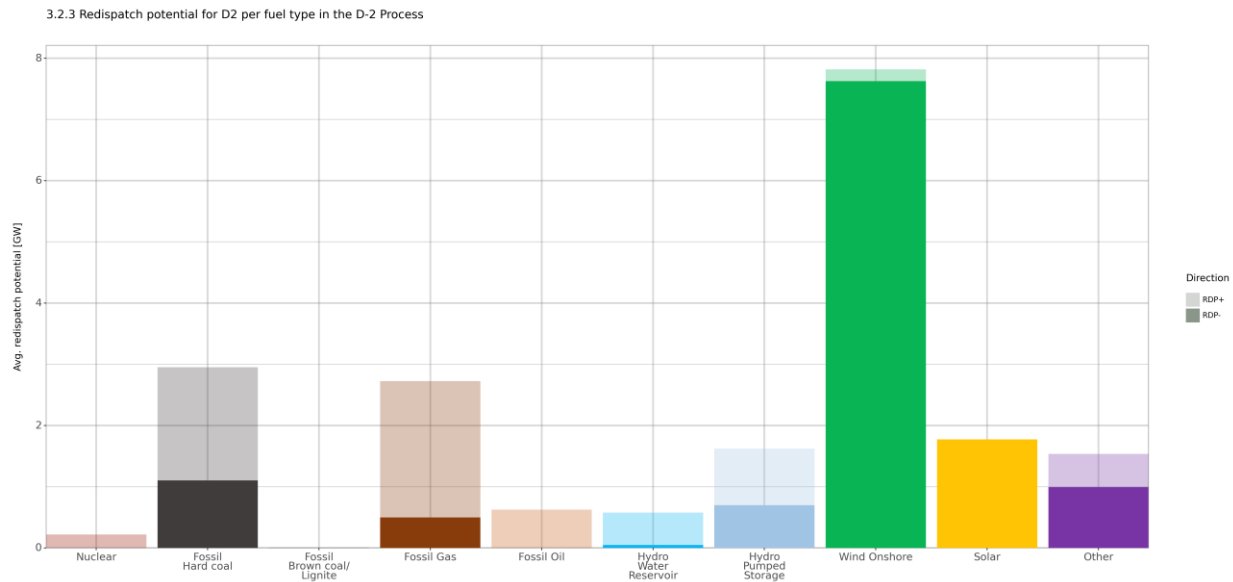


Redispatch potential for Elia per fuel type in the D-2 Process

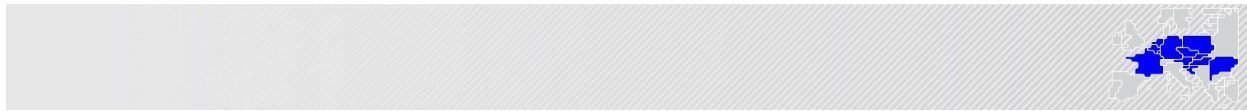


The figure above shows the redispatch potential per fuel type for the D-2 process for Elia for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

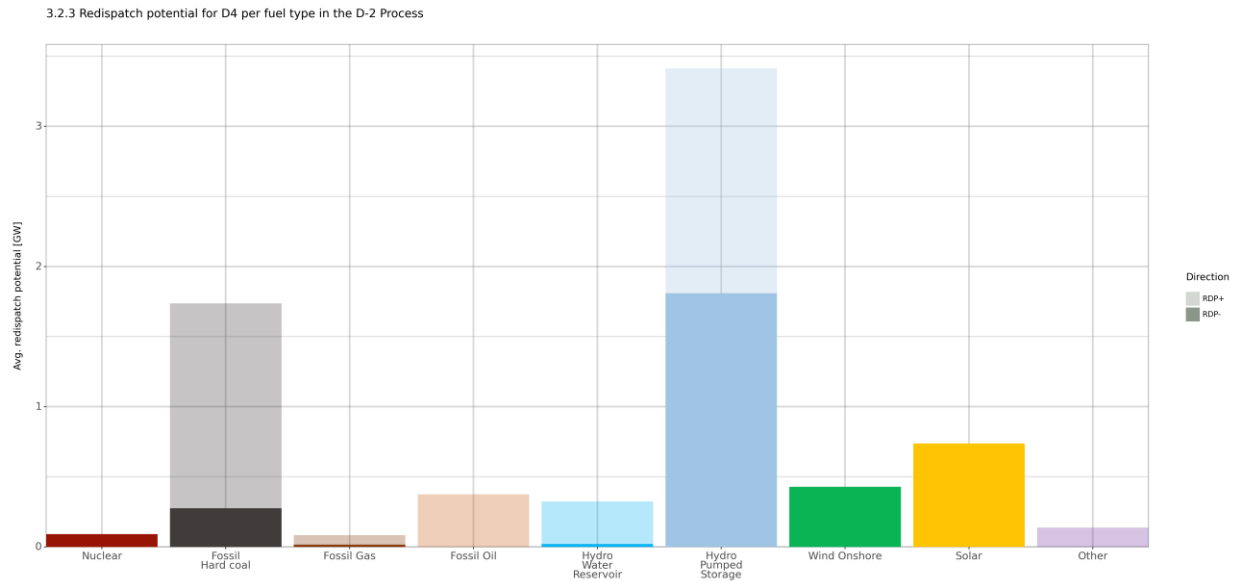
Redispatch potential for TenneT DE per fuel type in the D-2 Process



The figure above shows the redispatch potential per fuel type for the D-2 process for TenneT TSO GmbH for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

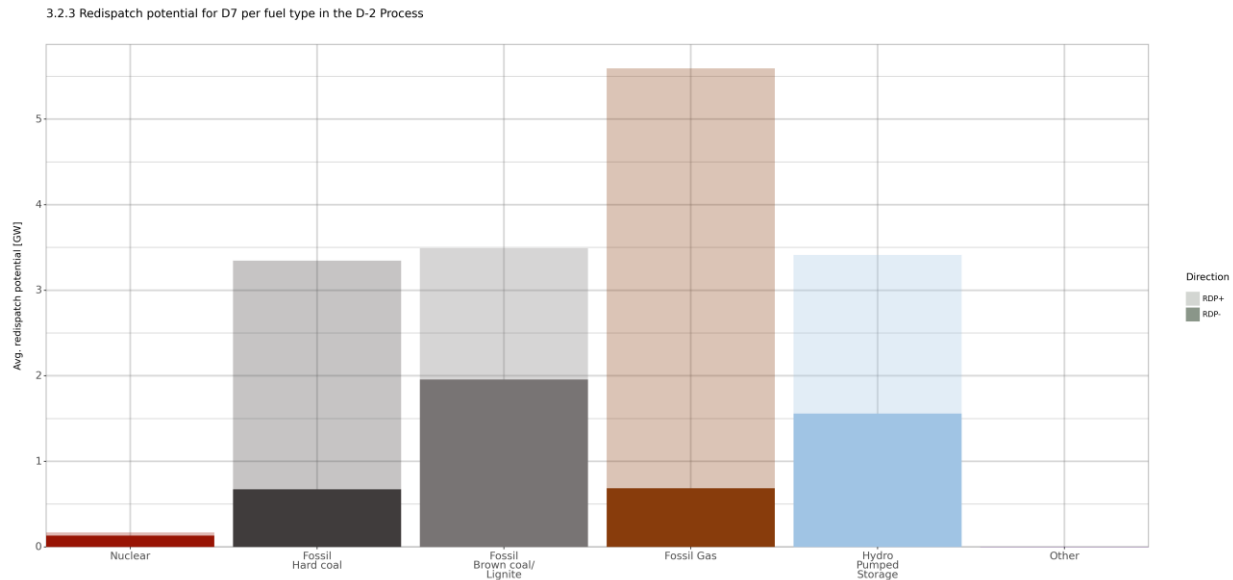


Redispatch potential for TransnetBW per fuel type in the D-2 Process

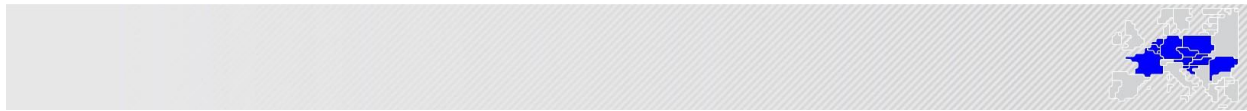


The figure above shows the redispatch potential per fuel type for the D-2 process for TransnetBW for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

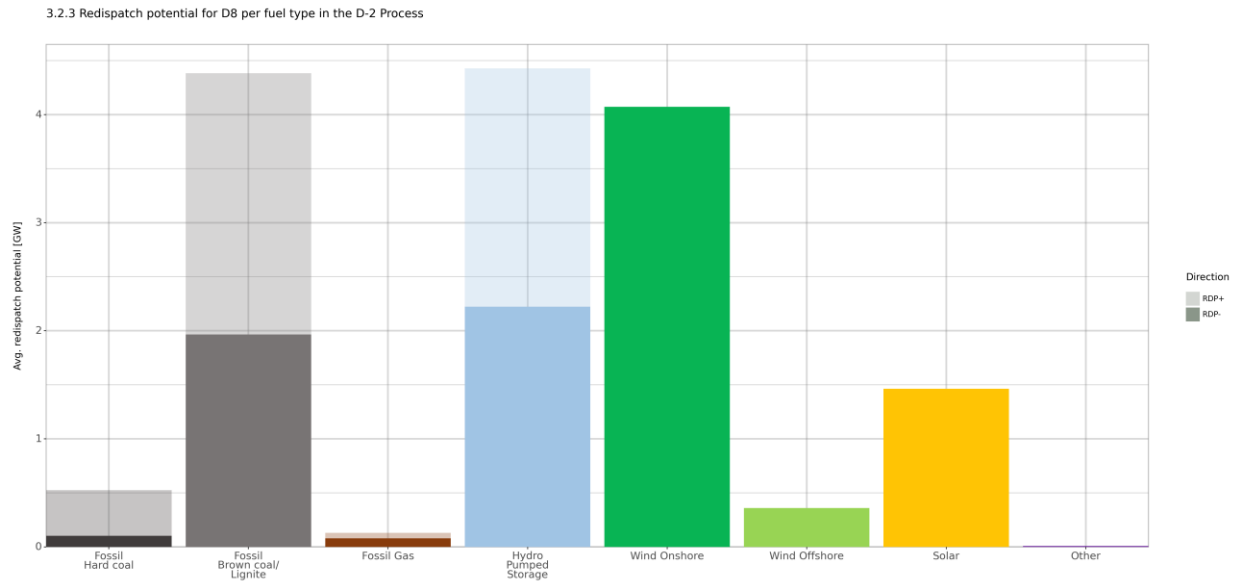
Redispatch potential for Amprion per fuel type in the D-2 Process



The figure above shows the redispatch potential per fuel type for the D-2 process for Amprion for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

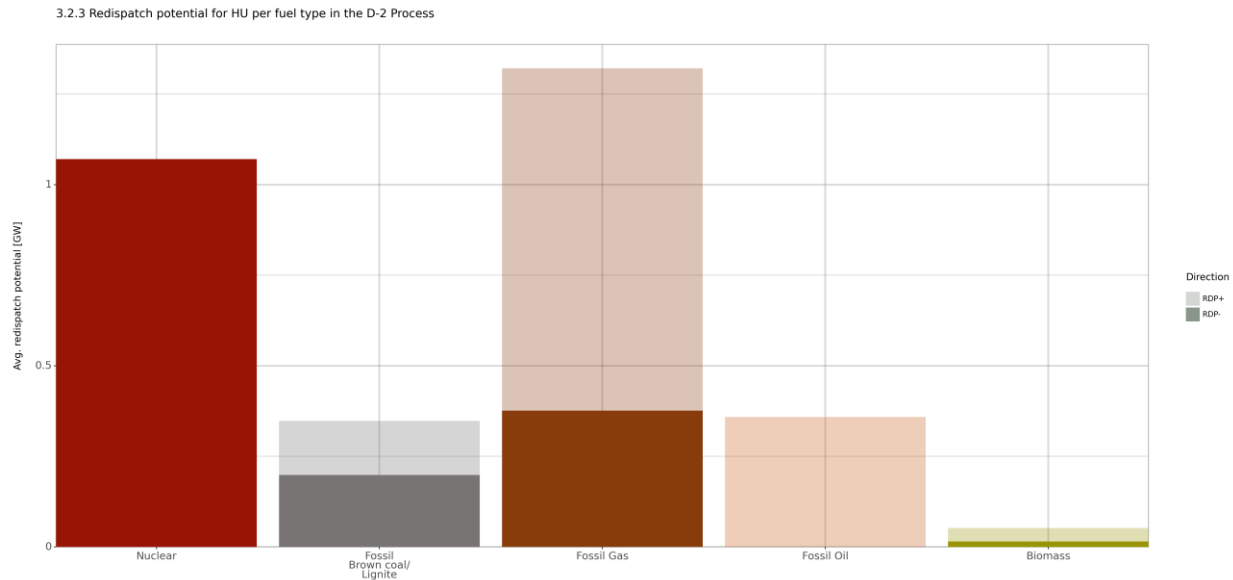


Redispatch potential for 50Hertz per fuel type in the D-2 Process

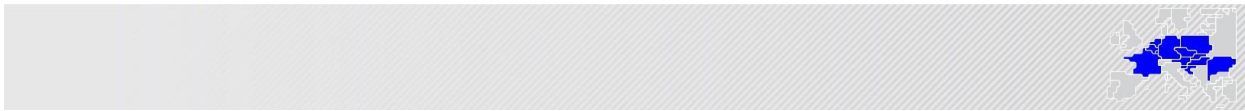


The figure above shows the redispatch potential per fuel type for the D-2 process for 50Hertz for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

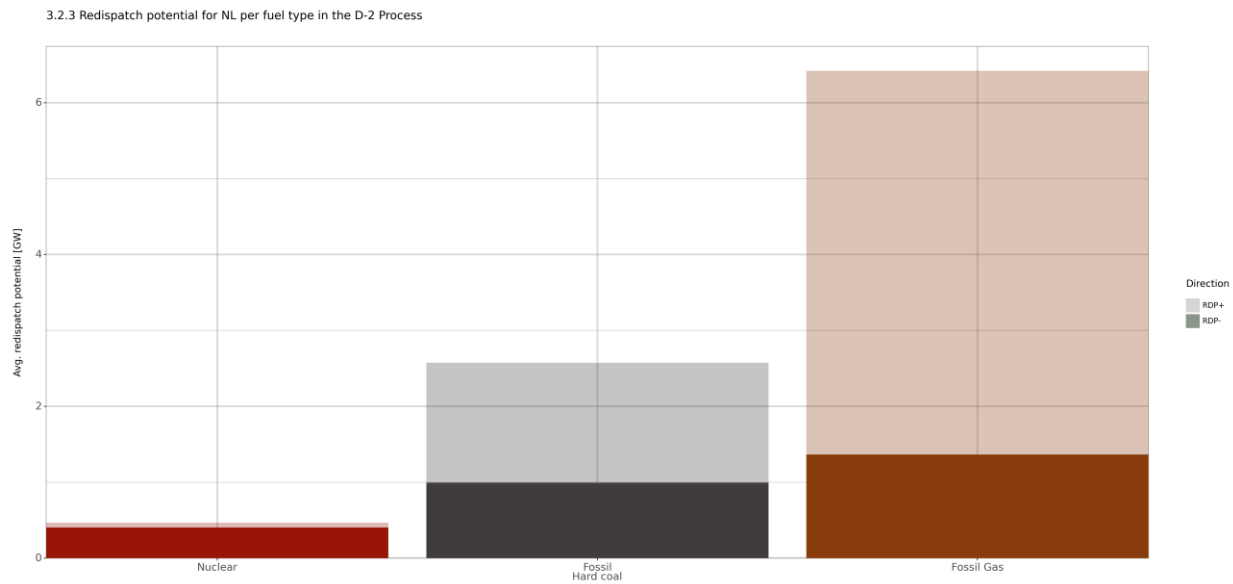
Redispatch potential for Mavir per fuel type in the D-2 Process



The figure above shows the redispatch potential per fuel type for the D-2 process for Mavir for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

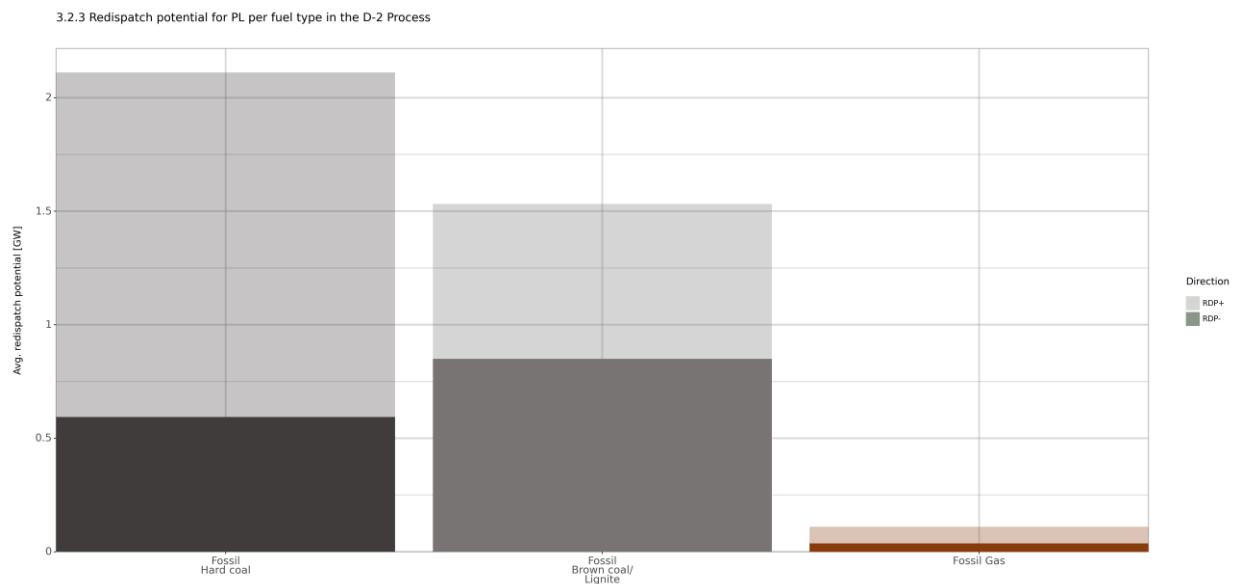


Redispatch potential for TenneT NL per fuel type in the D-2 Process

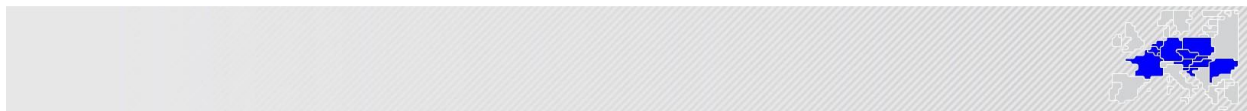


The figure above shows the redispatch potential per fuel type for the D-2 process for TenneT TSO B.V. for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

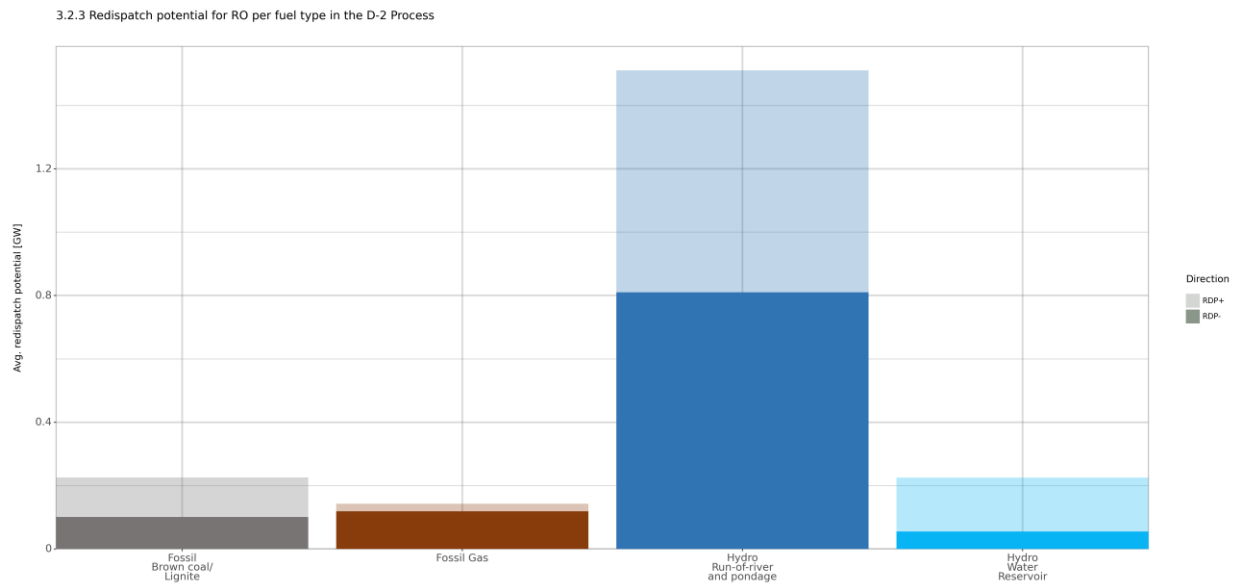
Redispatch potential for PSE per fuel type in the D-2 Process



The figure above shows the redispatch potential per fuel type for the D-2 process for PSE for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

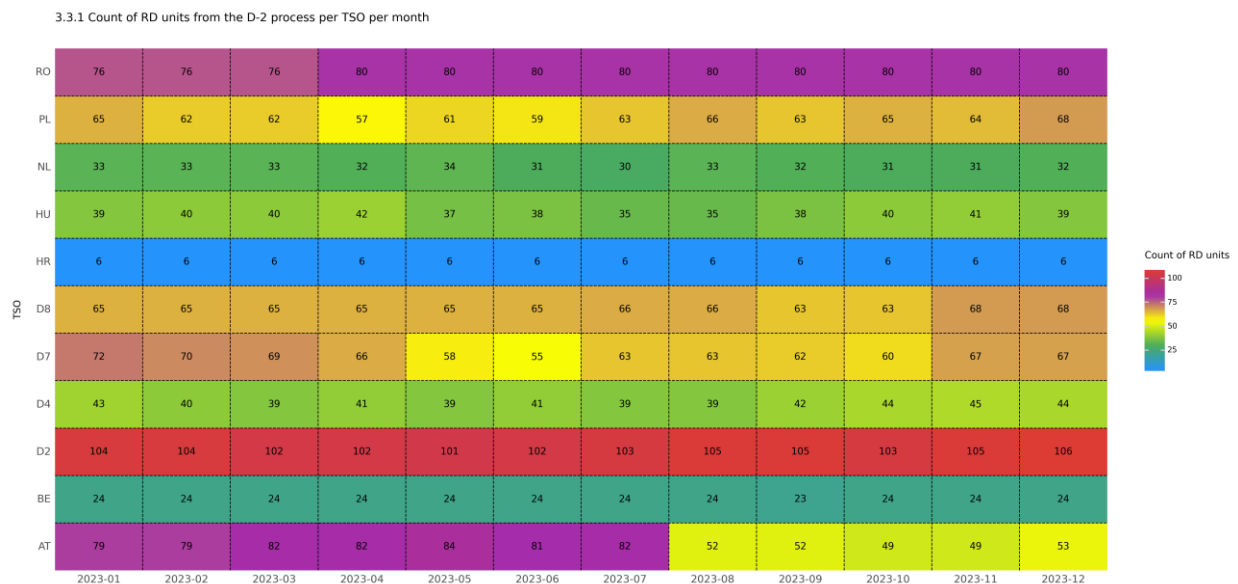


Redispatch potential for Transelectrica per fuel type in the D-2 Process

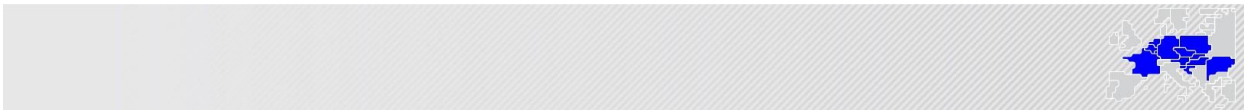


The figure above shows the redispatch potential per fuel type for the D-2 process for Transelectrica for the year 2023. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

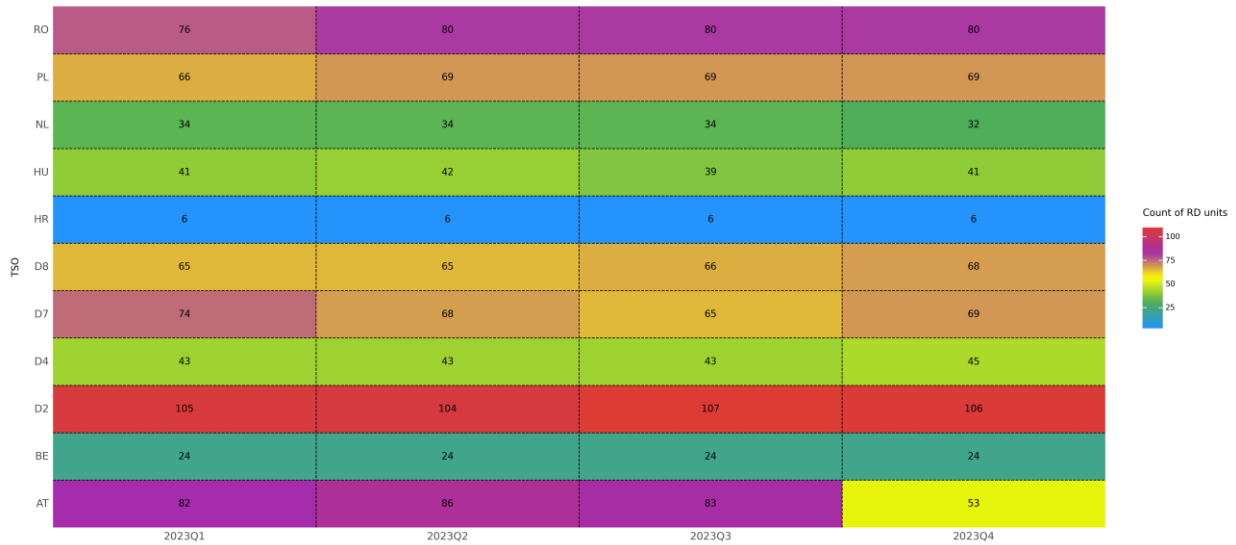
Timeseries indicators for Redispatch potential



The figure above shows the number of redispatch units provided by each TSO for the D-2 process per TSO during each month of the reporting period. This includes cases for which redispatch units; RD+ and RD- have zero values. The colour coding indicates the range in which the counted number belong.



3.3.1 Count of RD units from the D-2 process per TSO per quarter

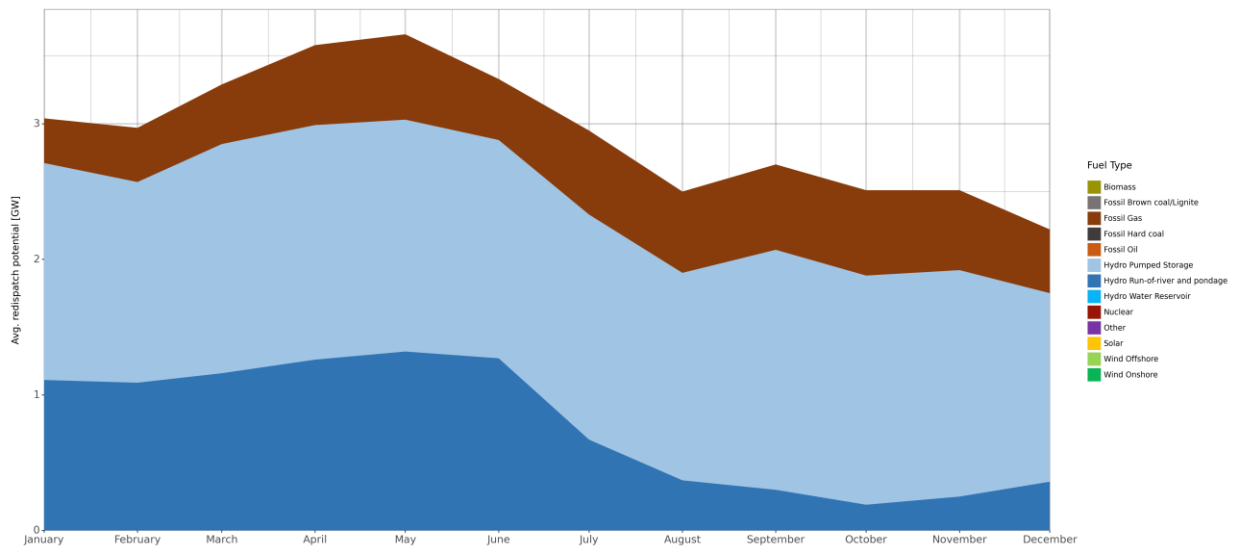


The figure above shows the average number of redispatch units provided by each TSO for the D-2 process per TSO during each quarter of the reporting period. This includes cases for which redispatch units; RD+ and RD- have zero values. The colour coding indicates the range in which the counted number belong.

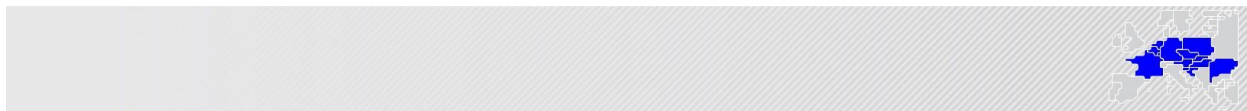
The figures below show lower values for the month of June. As mentioned in the introduction, it should be noted that the reporting period includes the period 9th of June to 30th of June.

TSOs Monthly Redispatch Potential in the D-2 Process

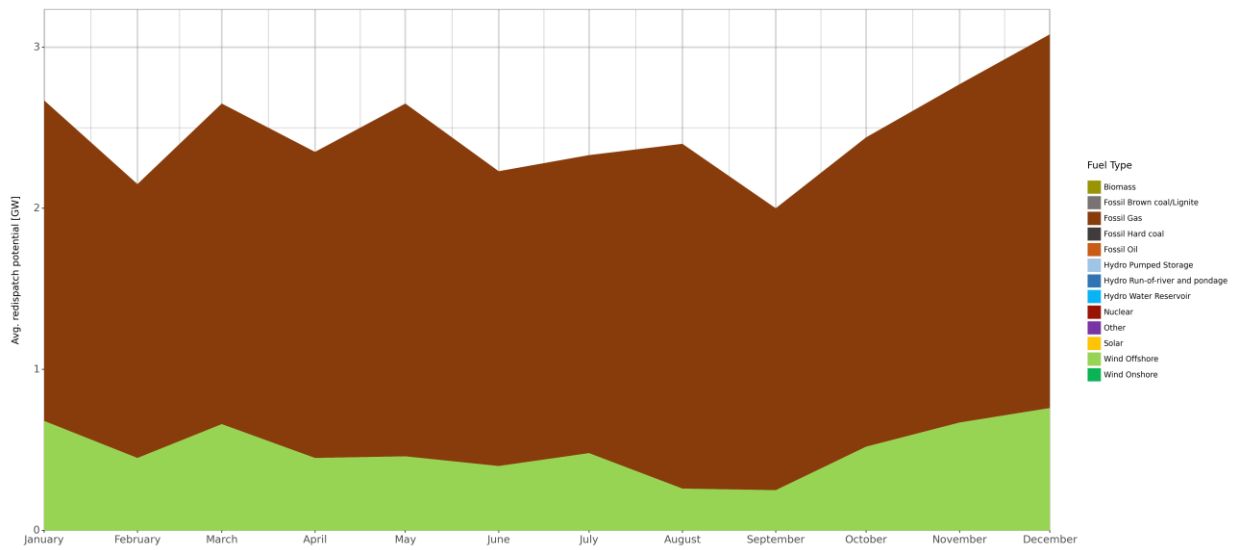
3.3.2 Redispatch potential for AT per month and fuel type in the D-2 Process



The figure above shows the monthly redispatch potential per fuel type for the D-2 process for APG.

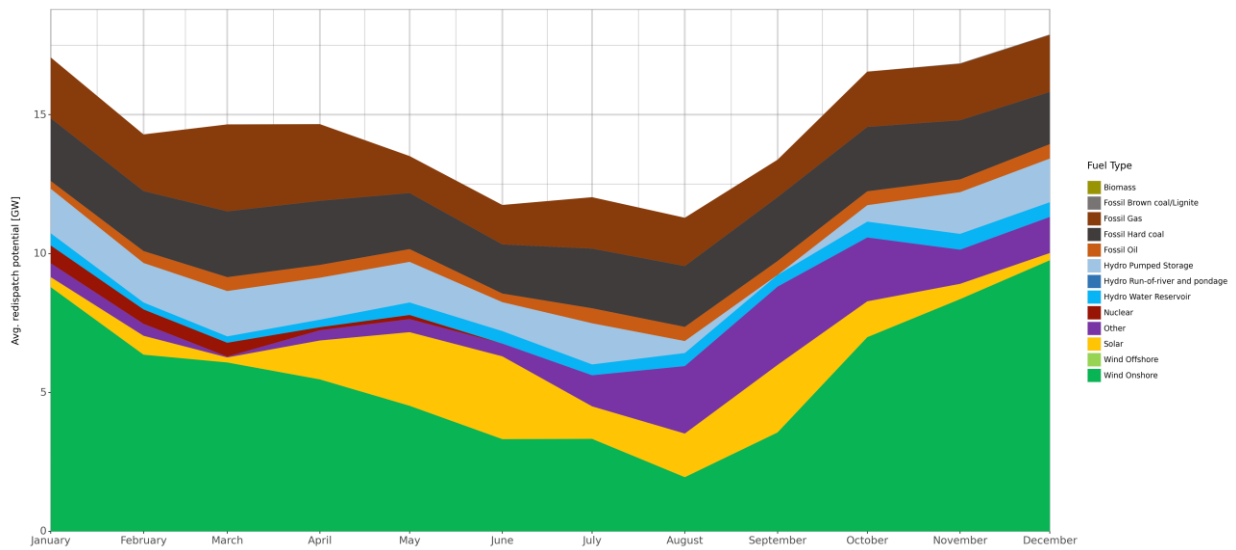


3.3.2 Redispatch potential for BE per month and fuel type in the D-2 Process

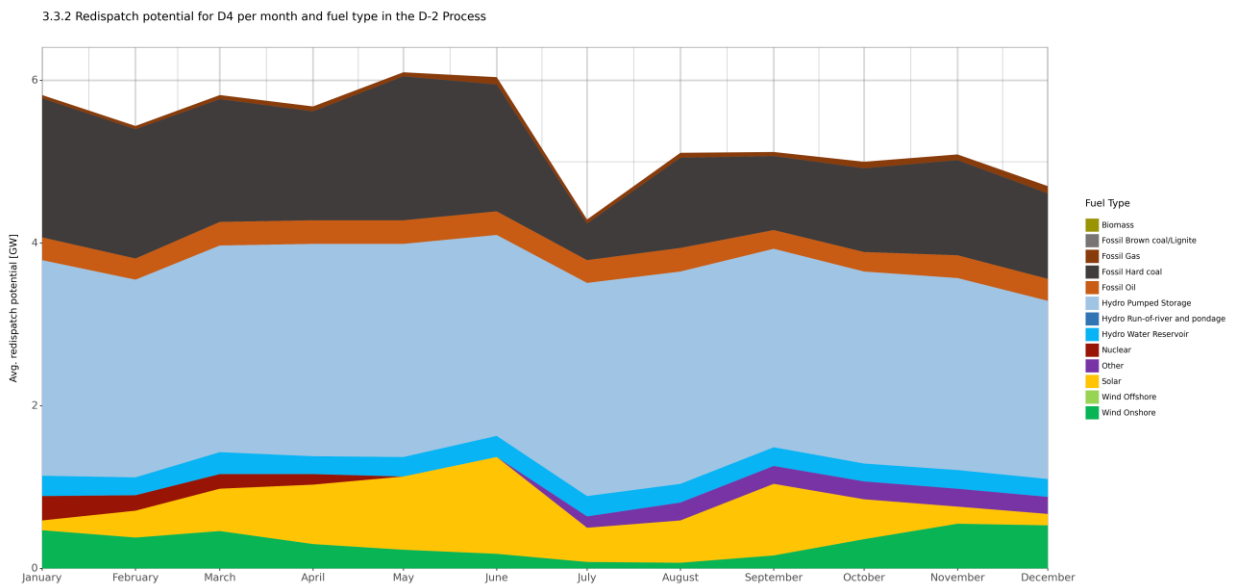
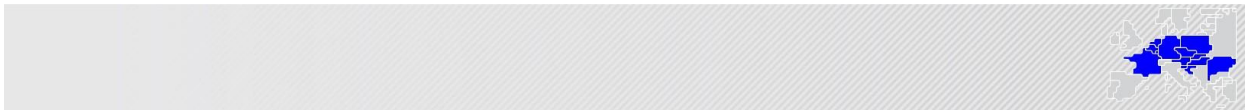


The figure above shows the monthly redispatch potential per fuel type for the D-2 process for Elia.

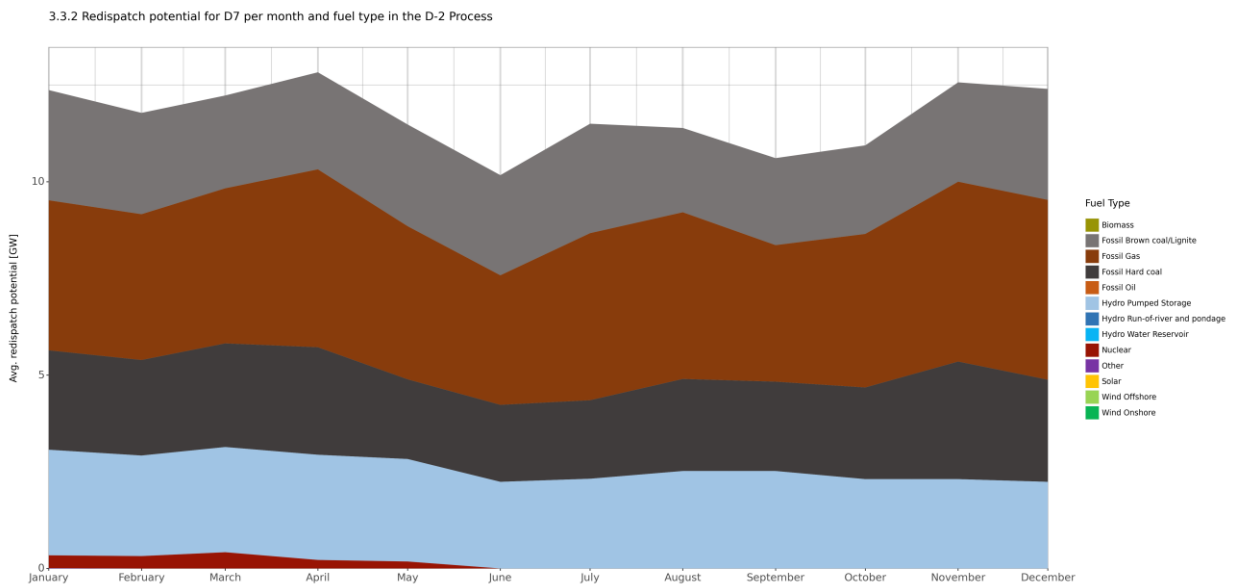
3.3.2 Redispatch potential for D2 per month and fuel type in the D-2 Process



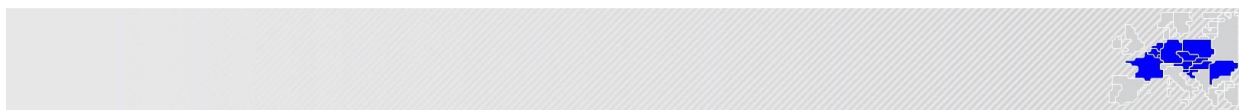
The figure above shows the monthly redispatch potential per fuel type for the D-2 process for TenneT TSO GmbH.



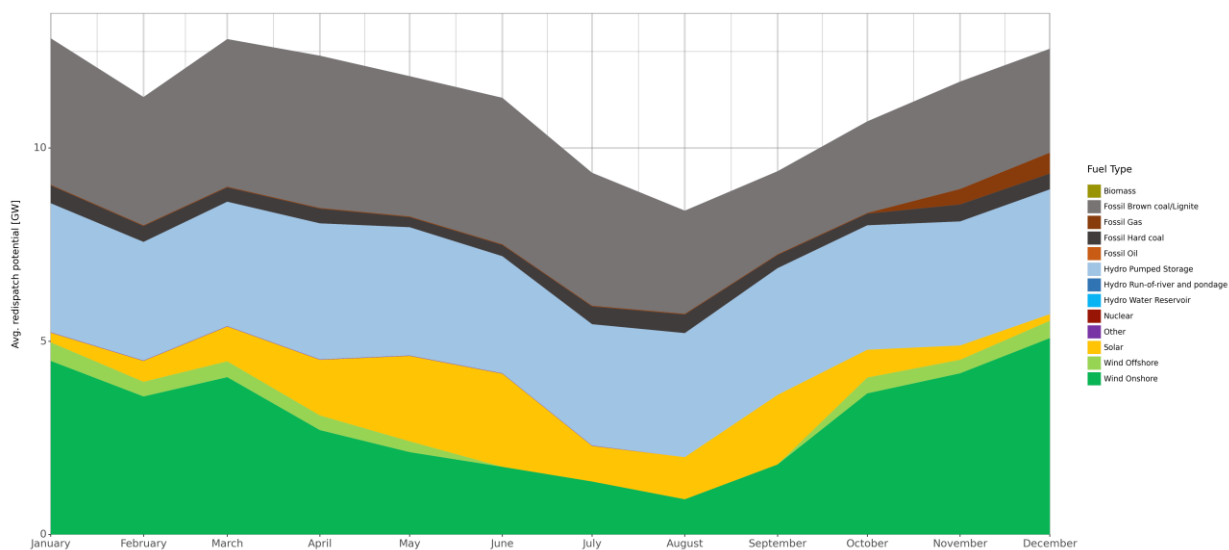
The figure above shows the monthly redispatch potential per fuel type for the D-2 process for TransnetBW.



The figure above shows the monthly redispatch potential per fuel type for the D-2 process for Amprion.

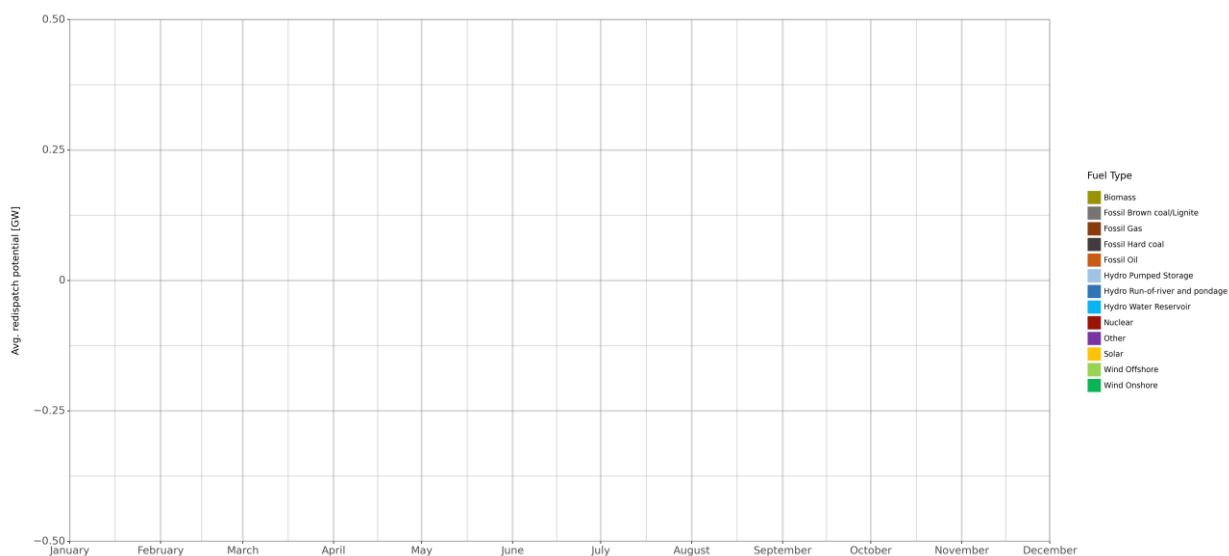


3.3.2 Redispatch potential for D8 per month and fuel type in the D-2 Process

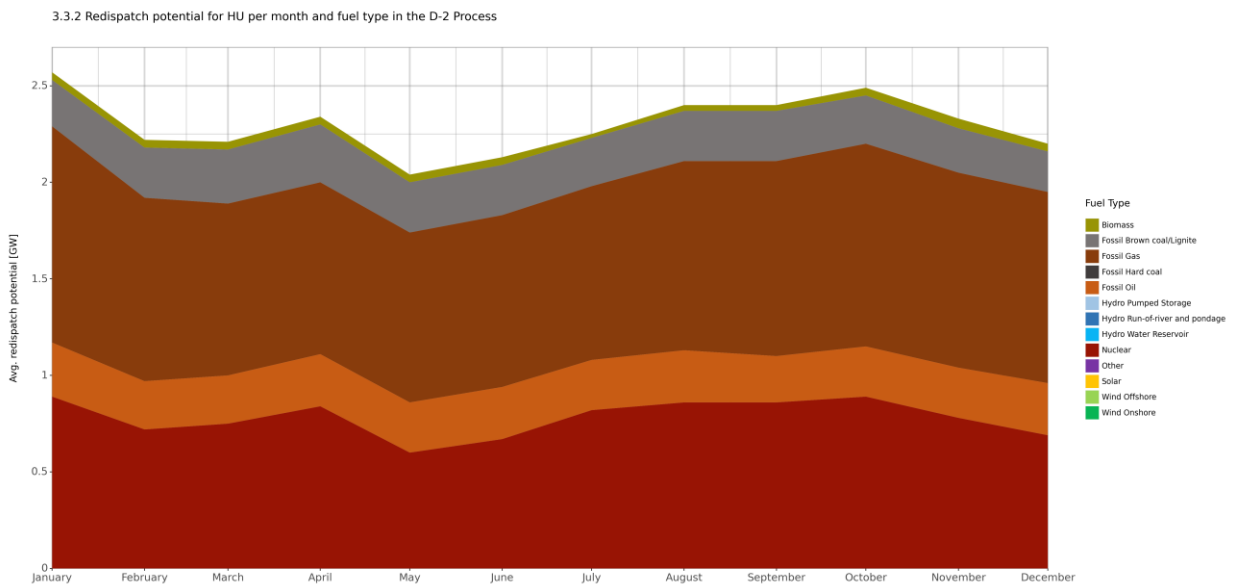
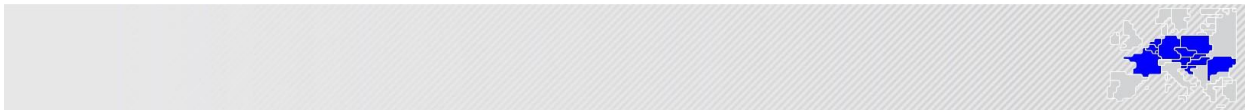


The figure above shows the monthly redispatch potential per fuel type for the D-2 process for 50 Hertz.

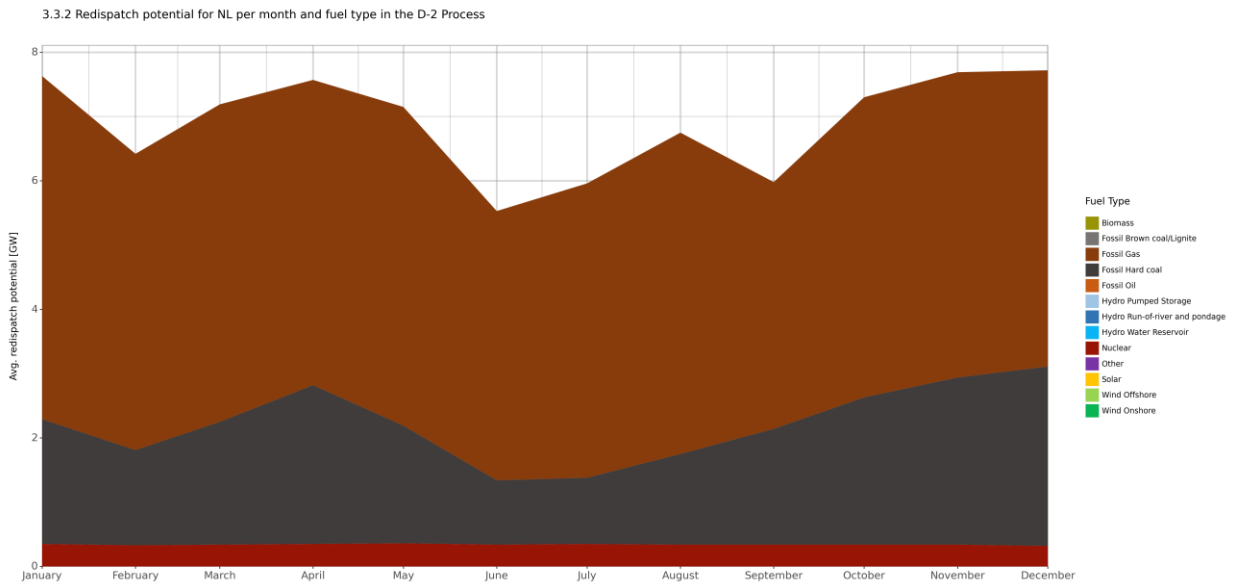
3.3.2 Redispatch potential for HR per month and fuel type in the D-2 Process



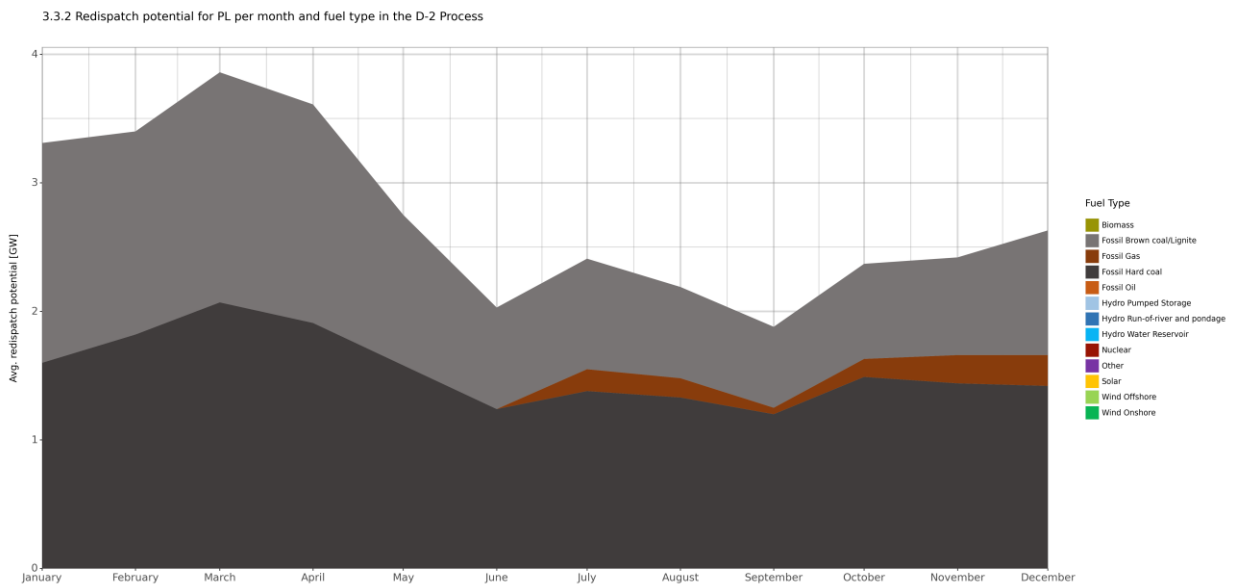
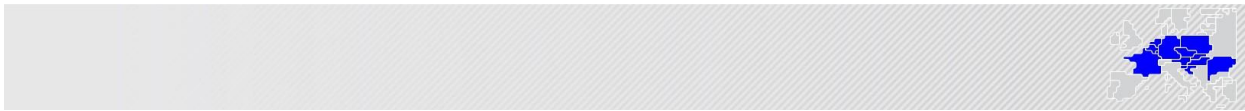
The figure above shows the monthly redispatch potential per fuel type for the D-2 process for HOPS. As HOPS delivered no redispatch potential for the provided units, no data is shown in the figure.



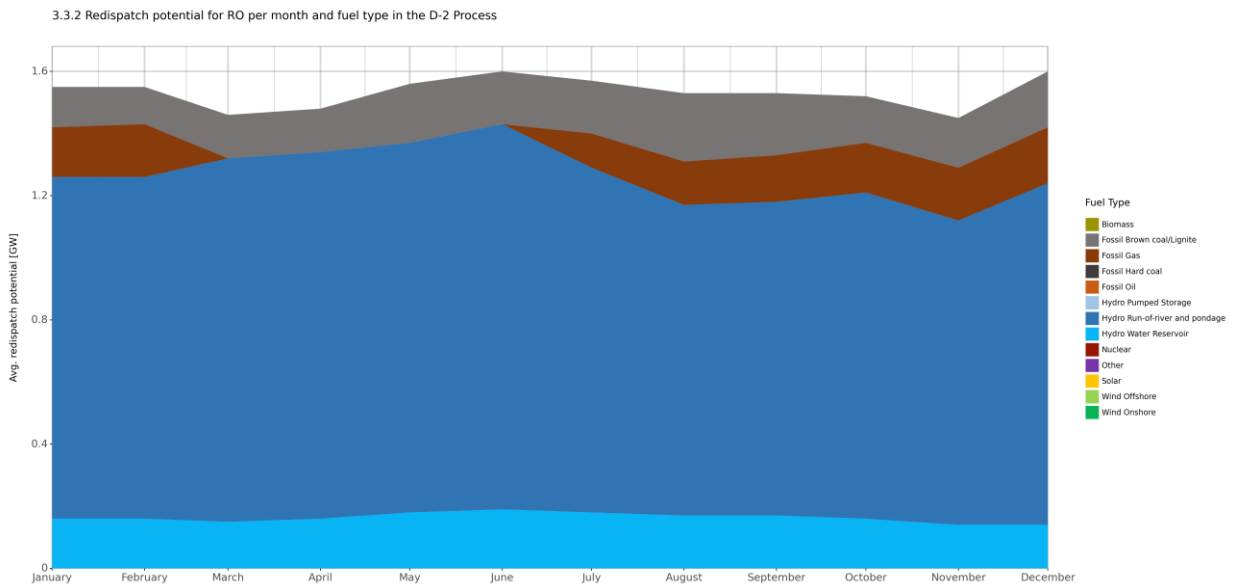
The figure above shows the monthly redispatch potential per fuel type for the D-2 process for Mavir.



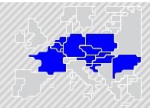
The figure above shows the monthly redispatch potential per fuel type for the D-2 process for TenneT TSO B.V.



The figure above shows the monthly redispatch potential per fuel type for the D-2 process for PSE.



The figure above shows the monthly redispatch potential per fuel type for the D-2 process for Transelectrica.



Accuracy of non-Core Exchanges

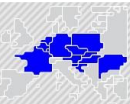
The obligation of Core TSOs to monitor and report on the accuracy of non-Core exchanges is outlined in this chapter, offering an overview of the DA CCM requirements and their fulfilment.

Reporting obligations from DA CCM

As per Article 13(5) of the Core DA CCM:

“Until the AHC is implemented, the Core TSOs shall monitor the accuracy of non-Core exchanges in the CGM. The Core TSOs shall report in the annual report to all Core regulatory authorities the accuracy of such forecasts.”

The reporting requirement is fulfilled by the KPI *Non-Core exchanges delta flow* from the Operational KPI reports, published on the JAO platform [\[LINK\]](#). Additionally, for an annual overview of this KPI, please also refer to the chapter **Aggregated operational KPIs** from this report.



Efficiency of NRAO

This chapter includes an overview of the reporting obligations outlined in the DA CCM. The chapter covers the analysis of the efficiency of NRAO, the presentation of results, justification by Core TSOs in case non-costly RAs were not provided. The chapter includes simulation results assessing the benefit of the Non-Costly Remedial Action Optimising process step. Additionally, it addresses the quality of data published, including summaries of data quality, as well as the output of a satisfaction survey regarding the use of JAO Core FB MC page and JAO Publication Tool by Market Participants.

Reporting obligations from DA CCM

As per Article 16(7) of the Core DA CCM:

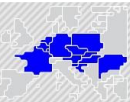
“Every year after the implementation of this methodology in accordance with Article 28(3), the CCC, in coordination with the Core TSOs, shall analyse the efficiency of the NRAO and present the results of this analysis in the annual report. This analysis shall contain an ex-post analysis on whether the NRAO effectively increased cross-zonal capacity in the most valuable market direction. The analysis shall focus on data from the last year of operation, and shall include at least the following information:

- (a) an assessment of the availability of non-costly RAs provided by the Core TSOs, including the average number of non-costly RAs provided by each Core TSO*
- (b) for the Core TSOs which did not provide non-costly RAs, a justification why they did not do so*
- (c) for each CNEC with non-zero shadow price: \overline{PTDF}_{init} , \overline{PTDF}_f , $F_{ref,init}$ and F_{nrao}*
- (d) an estimate of the market clearing point (and related market welfare) which may have occurred, should the NRAO not have taken place (but including other capacity calculation steps such as minRAM, LTA inclusion and an estimate of the validation phase)”*

And as per Article 16(8) of the Core DA CCM:

“Based on the conclusion of the analysis mentioned in the previous paragraph, the Core TSOs may propose changes to the NRAO by submitting to all Core regulatory authorities a proposal for amendment of this methodology in accordance with Article 9(13) of the CACM Regulation.”

Each of the reporting obligations from this Article corresponds to a dedicated subchapter in this report.



Article 16(7)(a)

This subchapter presents an overview of the total number of unique non-costly RAs offered by the Core TSOs for NRAO. If the same remedial action is provided for multiple MTUs, it is only counted once.

The table below contains the total cumulative number of unique non-costly RAs offered for NRAO by each of the Core TSOs during the reporting period.

Core TSO	Total number of unique non-costly RAs offered for NRAO
AT	4
BE	7
CZ	10
D2	6
D4	4
D7	1
D8	7
FR	40
HR	0
HU	6
NL	16
PL	12
RO	2
SI	2
SK	3

As can be observed from above overview table, **HR** (HOPS) did not provide any non-costly RAs to NRAO and have provided a justification on why they did not do so in the following subchapter of this report, in line with Article 16(7)(b) of the Core DA CCM.

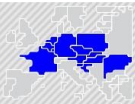
Article 16(7)(b)

This subchapter contains justifications provided by the Core TSOs which did not provide any non-costly RAs to NRAO.

HR

HOPS delivers daily an individual remedial action file with prepared static data of remedial action potential that can be used. This static data is associated to the costly RAs.

Topological changes of the internal grid are done during the preparation of individual grid models and do not have any additional option for non-costly RAs. HOPS does not have a PST in the 220kV and 400kV grid in use. TR 400/220kV Zerjavinec reported in static grid model (<https://www.jao.eu/static-grid-model>) which can be used for NRAO as PST (it can work in angle mode or phase shifting mode) works all the time in angle mode. HOPS does not count it as a real PST, but only as available. Regardless, TR 400/220kV Zerjavinec in phase shifting mode does not have any effect in the region.



Article 16(7)(c)

This reporting obligation requires the following parameters for each CNEC with non-zero shadow price:

\overline{PTDF}_{init} , \overline{PTDF}_f , $F_{ref,init}$ and F_{nrao}

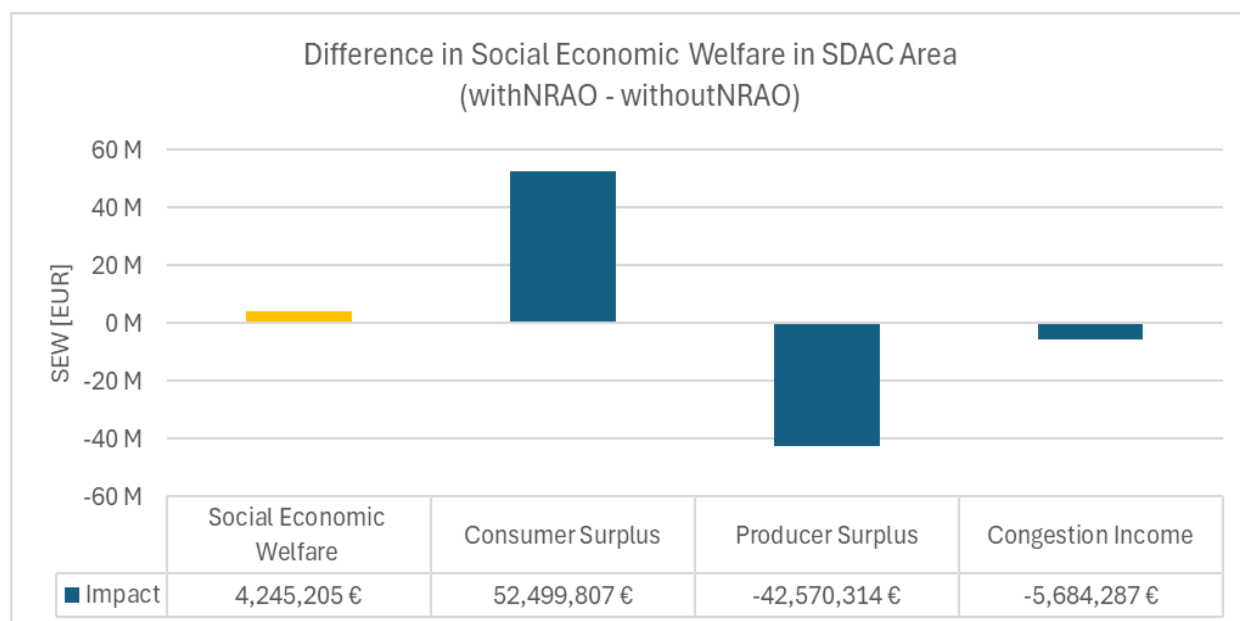
The data is provided separately in the file [2023 CNECs with non-zero shadow price.xlsx](#)

Estimated impact of NRAO – Article 16(7)(d)

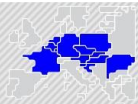
This subchapter presents the results of the study evaluating the effect of implementing the non-costly remedial action optimization (NRAO) on market coupling outcomes, with a particular focus on social welfare.

The study involved rerunning the capacity calculation process for the entire year of 2023 without including the NRAO step and comparing these results with the operational results that do include the NRAO step. The Core Capacity Calculation tool was configured as it was in production in 2023 to minimize the impact of tool differences in the comparison analysis. However, it is important to note that the Individual Validation Adjustment (IVA) step and minRAM adjustments were not recomputed; instead, the same values used in operations in 2023 were applied in the rerun analysis. The NRAO step may impact the IVAs and minRAMs applied, which can significantly modify the final results of the capacity calculation process.

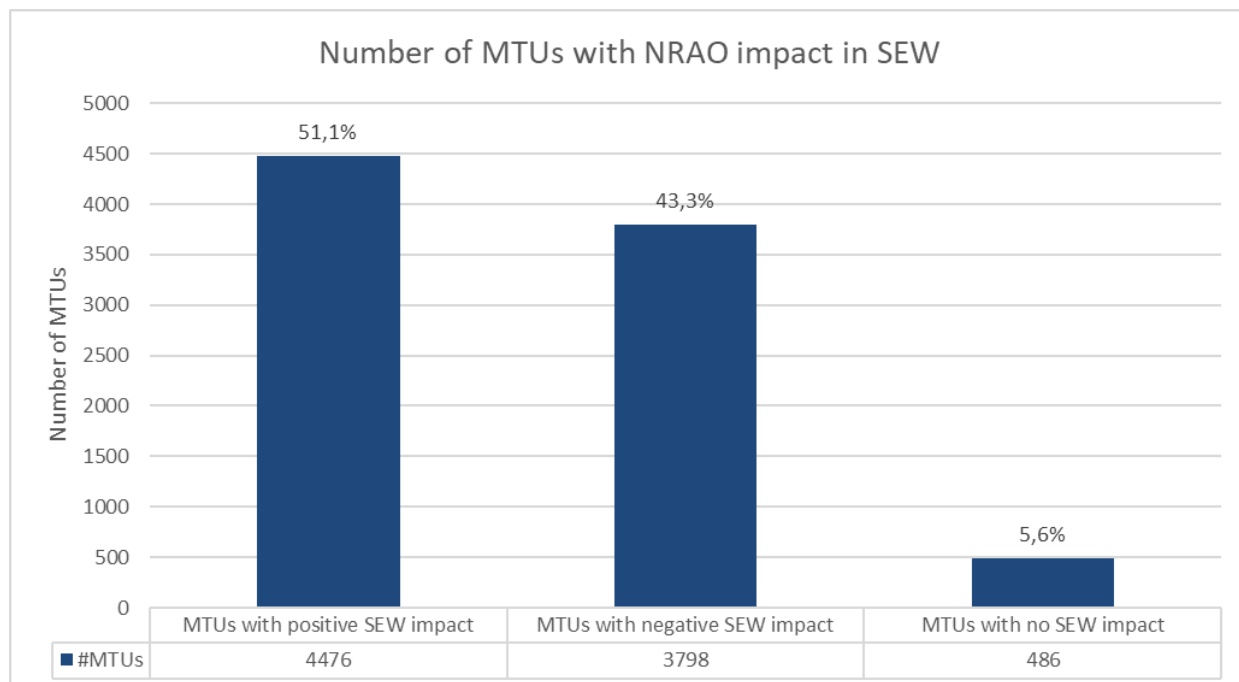
The final flow-based domain derived from the capacity calculation process was applied to simulate the day-ahead market coupling using the Simulation Facility, which houses the historical market and network data as well as the network topology. Notably, only the Core flow-based domain parameters were altered for the simulation, all other variables remained unchanged. The simulation was conducted using Simulation Facility version 4.36.0 and Euphemia 11.3 fix1.



The graph above shows the added value of the NRAO step for the entire 2023. A positive value indicates a positive impact of NRAO. The yellow column “Social Economic Welfare” is the sum of the blue bars “Consumer Surplus”, “Producer Surplus”, and “Congestion Income”.



Analysing the results at a MTU level, the following results are obtained:



In the figure above, it can be observed that NRAO can have either a positive or negative impact on Social Economic Welfare. This behaviour can be explained by the fact that the market direction is unknown at the moment of the NRAO step, so, even though NRAO optimizes the domain in the most likely market direction, the market may ultimately move towards a completely different situation. Therefore, this behaviour underscores the importance of an accurate Net Position Forecast to properly optimize the Capacity Calculation process.

Additionally, looking at the most extreme MTUs in the analysed period, impacts of over 1,5M€ can be observed in both directions: positive impact and negative impact.

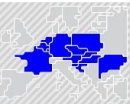
MTU with highest SEW impact	1,580,752 €
MTU with lowest SEW impact	-1,598,982 €

These numbers suggest that applying non-costly remedial actions could have a significant impact on the Social Economic Welfare on an MTU level. However, the impact can be positive or negative depending on the grid and market situation, resulting in a limited aggregated SEW benefit.

Some further figures regarding the NRAO analysis can be seen in the Annex 4: NRAO analysis figures.

NRAO analysis summary

The analysis results indicate that, with the current implementation, the NRAO creates and destroys SEW at similar levels. However, the extreme MTUs, which have an impact exceeding €1.5 million, suggest that implementing non-costly remedial actions could significantly influence market outcomes.



As it can be seen in “KPI 9: Average variation of relative RAM before and after NRAO

the NRAO tools effectively achieve the defined objective function by consistently increasing the minimum relative RAM. Nonetheless, there is a certain degree of independence between increasing the domain in the direction of the minimum relative RAM and increasing market capacities. This behaviour can be attributed to the market potentially moving towards a Clearing Point¹ that is not in the most likely market direction at the time of the NRAO process, but rather in an alternative direction.

Observations from Operational Process

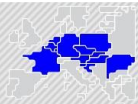
This subsection contains key observations from the operational process during 2023.

The following table display the monthly overview of the number and percentage of timestamps in which at least one RA was applied during the individual months of 2023.

Month	Number of timestamps with RAs applied	Share of timestamps with RAs applied [%]
Jan	633	85,1
Feb	547	81,4
Mar	628	84,5
Apr	593	82,4
May	648	87,1
Jun	705	97,9
Jul	611	82,1
Aug	579	77,8
Sep	600	83,3
Oct	571	76,6
Nov	583	81,0
Dec	639	85,9

- The chapter “Aggregated operational KPIs” contain several KPIs that provides insights to the performance of NRAO including KPI 9 (KPI 9: Average variation of relative RAM before and after NRAO) which shows the average variation of relative RAM before and after NRAO and it is reflected in this figure that the NRAO tools are increasing the minimum relative RAM by applying non-costly remedial actions as defined in the objective function of the NRAO tools.

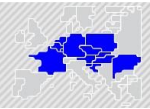
¹ The Market Clearing Point (MCP) refers to the price and net positions at which the electricity supply matches the demand. In the context of this report, the MCP is the outcome of the Single Day-Ahead Coupling (SDAC) process.



Individual Validation Adjustment Applied as Fallback

Following RAO and the intermediate FB computation, the individual validation takes place. The objective of the individual validation is, for each Core TSO, to conduct a separate analysis to determine if the cross-zonal capacity could potentially violate the operational security limits within its own control area. This allows TSOs apply IVA values to reduce RAM for its own CNECs as a part of the normal process. Individual Validation Adjustment values can also be applied as a fallback in individual validation in the event that TSO operator needs to deviate from the normal process due to reasons like failure of local validation. This section contains an overview of the number and percentage of timestamps in 2023 in which IVA was applied as fallback.

Month	Number of timestamps with IVA applied as fallback	Share of timestamps with IVA applied as fallback [%]
Jan	31	6,8
Feb	19	5,8
Mar	71	18,2
Apr	16	3,7
May	0	0
Jun	15	3,0
Jul	24	6,0
Aug	5	0,9
Sep	9	1,8
Oct	42	7,5
Nov	67	13,5
Dec	0	0



Quality of Data Published

Reporting obligations from DA CCM

As per Article 26(3) of the Core DA CCM:

“The CCC shall provide in the annual report at least the following:

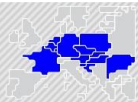
- (a) the summary of the quality of the data provided by each data provider*
- (b) the assessment of the ease-of-use of data retrieval (both manual and automated)*
- (c) the results of the satisfaction survey performed annually with stakeholders and all Core regulatory authorities*
- (d) suggestions for improving the quality of the provided data and/or the ease-of-use of data retrieval”*

The reporting obligation pursuant to Article 26(3)(a) has a dedicated first subchapter in this report; Articles 26(3)(b)-(d) are tackled jointly in second subchapter.

Article 26(3)(a)

This subchapter includes an annual summary of the quality of data covering the following:

- Annual overview of the information published in the Monthly DQI reports, including the following indicators:
 - Individual Grid Model (IGM) replacement
 - Spanning
 - Default Flow-Based Parameters (DFP)
 - NRAO was not applied
- Data completeness and timeliness on JAO monitoring tool.
- This section includes an annual overview, with monthly granularity, of total number of occurrences for which follow up actions were initiated due to a delay in the publication.



Annual overview of Monthly DQI reports

IGM replacement heatmap

This section contains the overview of results of the quality indicator “IGM replacement was performed” for each month of the year by each TSO.

The ambition level for this DQI is: IGM replacement was performed ≤ 24 MTUs/month. In case the ambition level was not reached, detailed information for particular MTUs is provided in the [Annex 2](#)

TSO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AT	0	0	0	0	1	0	2	0	0	0	0	2
BE	0	0	0	0	0	0	9	0	0	0	24	0
CZ	0	0	0	0	0	0	0	0	1	0	0	0
D2	2	0	0	0	24	0	3	24	0	0	24	0
D4	0	0	0	0	0	0	1	0	0	0	0	0
D6	24	0	0	0	0	0	0	48	0	0	0	120
D7	0	0	0	0	0	0	2	0	0	0	0	0
D8	0	0	0	0	0	0	2	0	0	0	0	0
FR	0	0	1	0	0	0	0	0	0	5	0	0
HR	0	0	0	0	0	0	0	0	0	0	0	4
HU	0	24	24	0	0	0	0	0	49	0	24	0
NL	24	0	24	24	121	16	24	0	25	24	0	0
PL	0	0	0	0	0	0	0	0	0	0	0	0
RO	0	0	0	0	0	0	1	0	0	0	0	0
SI	0	0	0	1	0	0	0	0	0	0	0	0
SK	0	0	0	0	0	0	0	24	0	0	0	0



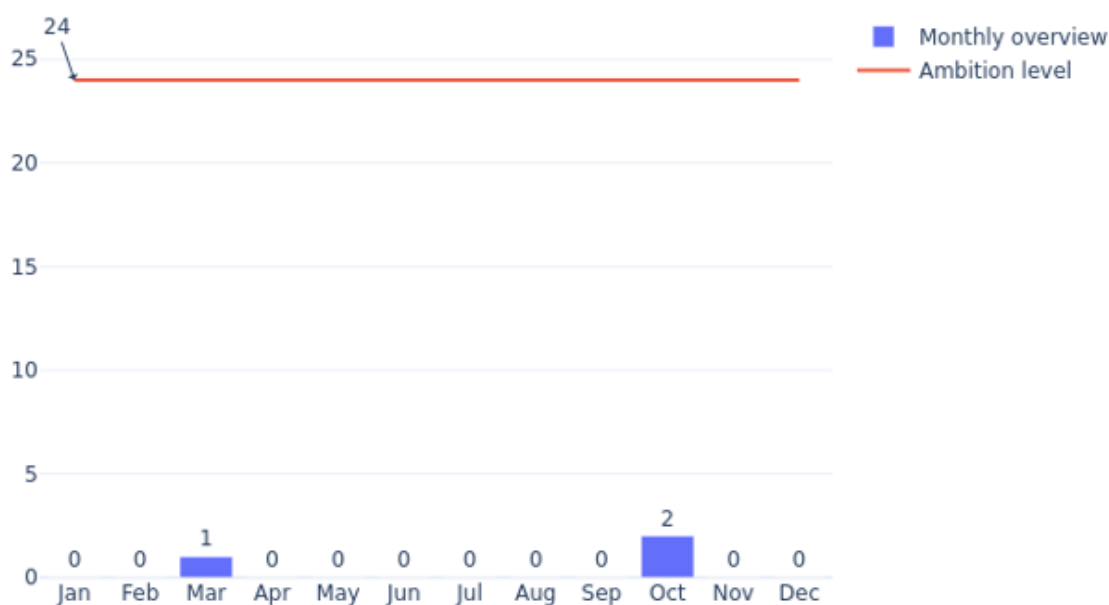
Spanning

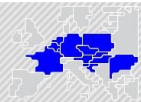
This section shows the results of the quality indicators “Spanning was applied” for each month of the year, for the Final FB computation.

Spanning is a fallback action that consists of calculating the capacity values for the missing timestamp(s) knowing the values of the neighbouring timestamps. This fallback assumes that the operational situation does not change excessively from one timestamp to another.

The ambition level for this DQI is: Spanning was applied ≤ 24 MTUs/month. In case the ambition level was not reached, detailed information for particular MTUs is provided in the [Annex 2](#)

Overview of the Spanning DQI in 2023





DFP

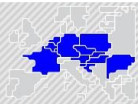
This section shows the results of the quality indicators “DFP was applied” for each month of the year, for the Final FB computation.

DFP is a fallback procedure that consists of replacing the capacity values of the missing timestamp(s) with default values.

The ambition level for this DQI is: DFP was applied = 0 MTUs/month. In case the ambition level was not reached, detailed information for particular MTUs is provided in the [Annex 2](#)

Overview of the DFP DQI in 2023



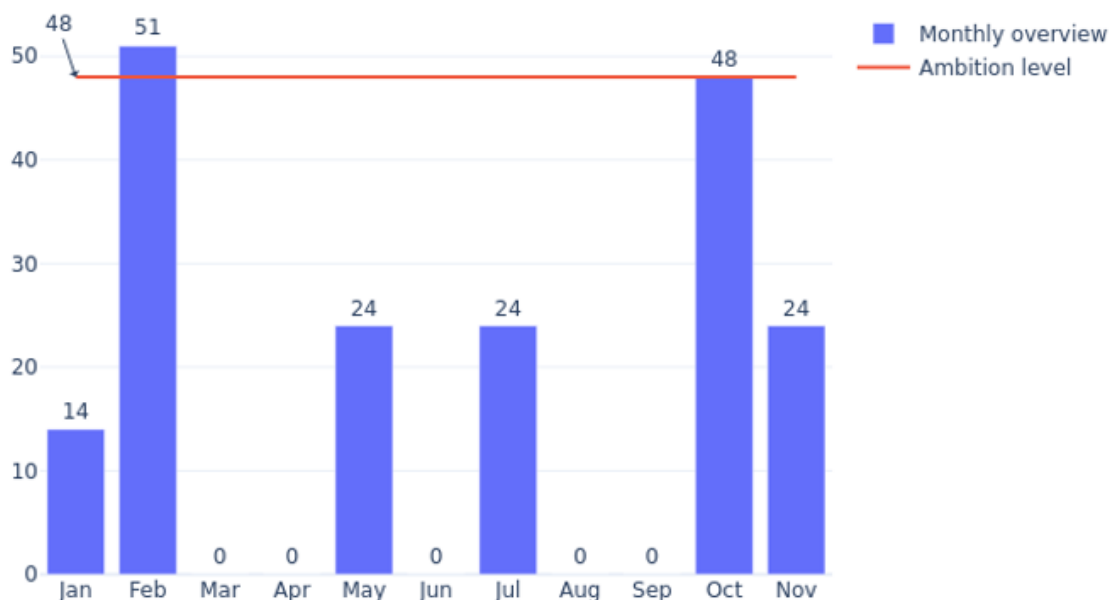


NRAO was not applied

This section contains the results of the quality indicator “NRAO was not applied” for each month of the year. For a particular MTU, NRAO is considered to not be applied if neither NRAO tool (TSCNET’s or CORESO’s) provided results. The expected number of MTUs is where NRAO was triggered (thus excluding spanned or DFP MTUs or occurrences where neither of the NRAOs were triggered, for example due to issues with CCct).

The ambition level for this DQI is: NRAO was not applied ≤ 48 MTUs/month. In case the ambition level was not reached, detailed information for particular MTUs is provided in the [Annex 2](#)

Overview of the NRAO DQI in 2023





JAO Monitoring Tool Completeness and Timely Data Publication

This section includes an annual overview, with monthly granularity, of total number of occurrences for which follow up actions were initiated due to a delay in the publication.

ATCs on CORE external borders	6	7	7	5	3	9	4	0	1	1	0	0
Allocation Constraints	2	2	0	2	2	0	0	0	0	0	0	0
Alpha factor from MCP			0	0	0	0	1	0	0	0	0	0
Border Data Overview	1	1	0	1	0	0	0	0	0	0	0	0
Congestion Income	0	0	1	0	0	0	1	0	0	1	0	2
Core MarketGraphs	0	2	0	2	2	0	0	0	0	0	0	0
Core MarketView	2	2	0	2	2	0	0	0	0	1	0	0
Core max net positions and bilateral exchanges	0	2	0	2	2	0	0	0	0	0	0	0
D2CF	0	1	0	0	1	0	0	0	0	0	0	0
Final Bilateral Exchange Restrictions	0	2	0	2	2	0	0	0	0	1	0	0
Final Computation	2	2	0	2	2	0	0	0	0	0	0	0
Initial Computation (Virgin Domain)	1	3	0	2	2	2	1	0	0	0	0	0
Intraday ATC	0	1	0	0	0	0	1	0	0	0	0	0
Intraday NTC	0	0	0	0	0	0	0	0	0	0	0	0
LTA	0	0	0	0	0	0	0	0	0	0	0	0
LTN	1	1	0	1	0	0	0	0	0	0	0	0
Max Exchanges (MaxBex)	0	2	0	2	2	0	0	0	0	0	0	0
Max Net Positions	0	2	0	2	2	0	0	0	0	0	0	0
Net Position	0	0	0	1	0	0	1	0	0	0	0	0
Pre-Final Computation (Early Publication)	0	3	0	4	2	1	2	2	1	1	3	2
Price Spread	0	0	0	1	0	0	1	0	0	0	0	0
Reference Net Position	0	1	0	0	1	0	0	0	0	0	0	0
Refprog	0	1	0	0	0	0	0	0	0	0	0	0
Remedial Action Curative	2	6	0	0	2	0	1	0	0	2	1	0
Remedial Action Preventive	2	6	0	0	2	0	1	0	0	2	1	0
Scheduled Exchanges	0	0	0	1	0	1	1	0	0	0	0	1
Shadow Auction ATC	6	7	7	5	3	9	4	0	1	1	0	0
Shadow Prices	0	0	0	1	1	0	1	0	0	1	0	0
Spanning / DFP	0	2	0	2	2	0	0	0	0	0	0	0
Validation Reductions	3	2	0	3	2	0	0	1	0	0	0	0
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec



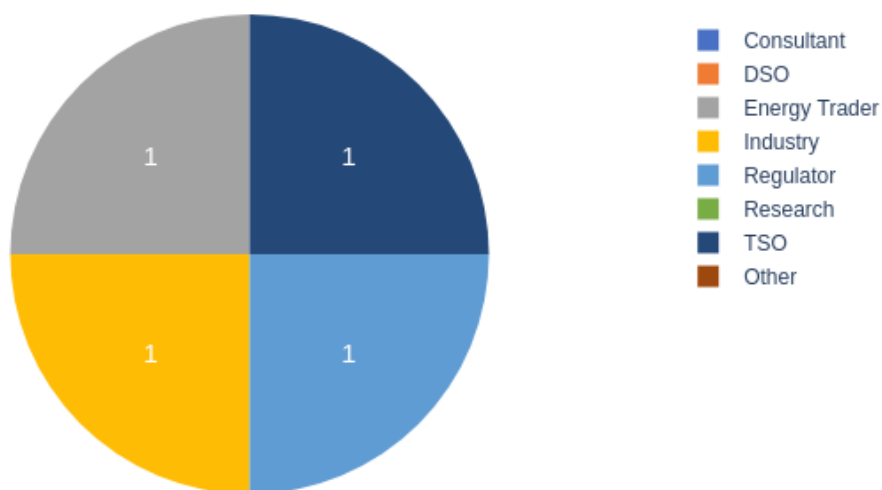
Article 26(3)(b)-(d)

This subchapter is related the output of the satisfaction survey related to the use of JAO Core FB MC page & JAO Publication Tool by Market Participant for 2023. The survey ran for 1 month on the ENTSO-E and the feedback received was processed by the Reporting TF.

4 survey responses were obtained:

- 1/4 responses were confidential

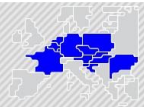
BREAKDOWN OF SURVEY RESPONSES, PER STAKEHOLDER CATEGORY



Observations on all functionalities covered by the survey – excluding the JAO Publication Tool pages:

Frequency of use - functionality with highest rating	Frequency of use - functionality with lowest rating
Monitoring Tool (5/5)	Monthly DQI reports (1.5/5)

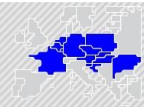
Clarity and completeness of information - functionality with highest rating	Clarity and completeness of information - functionality with lowest rating
Navigation, downloading the data (4.5/5)	Monthly DQI reports and Static Grid Model (2.3/5)



Observations on JAO Publication Tool pages:

- The most frequently used pages (>4/5) have a good average rating (>4/5)
- The lowest average rating for clarity and completeness of information was 3.0/5 for “Remedial Actions Preventive” page
- The least frequently used page is “Final Bilateral Exchange Restriction” with an average rating of 3.2/5





Aggregated operational KPIs

Reporting obligations from DA CCM

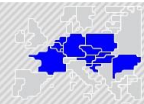
As per Article 28(4) of the Core DA CCM:

*“During the internal and external parallel runs, the Core TSOs shall continuously monitor the effects and the performance of the application of this methodology. For this purpose, they shall develop, in coordination with the Core regulatory authorities, the Agency and stakeholders, the monitoring and performance criteria and report on the outcome of this monitoring on a quarterly basis in a quarterly report. **After the implementation of this methodology, the outcome of this monitoring shall be reported in the annual report**”.*

After the go-live of the Core DA CC process, Operational KPI reports are prepared on monthly resolution and published on the JAO platform [\[LINK\]](#).

Additionally, in this report the values for each KPI are aggregated over the whole year, with data slicing per quarter basis, in order to facilitate potential observation of trends throughout the year. The KPIs are grouped into five broad categories:

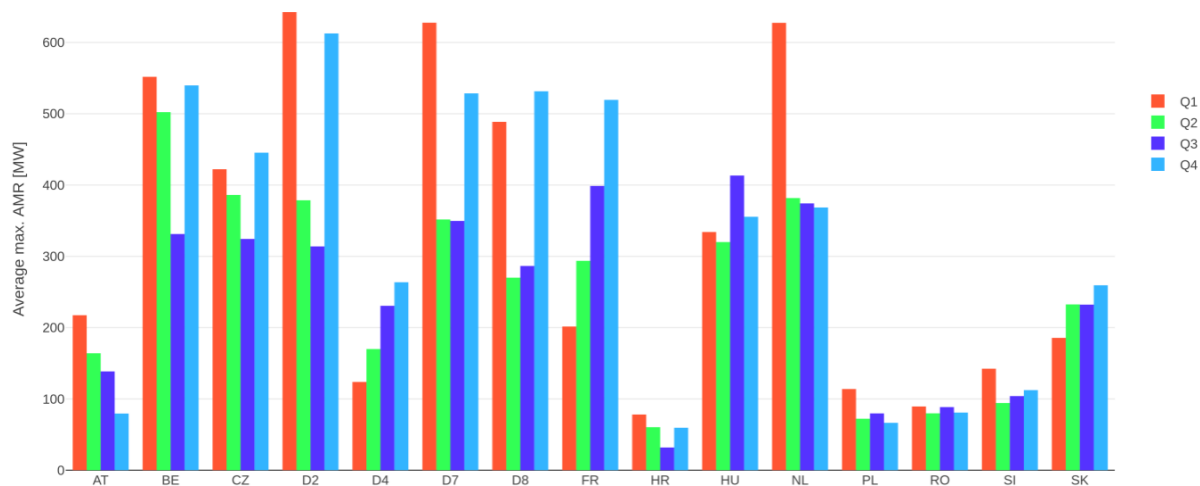
1. Adjustment for minimum RAM Inclusion
2. TSOs' adjustment after validation
3. Power system impact analysis
4. Non-costly remedial action optimisation analysis
5. Market impact assessment



KPI results

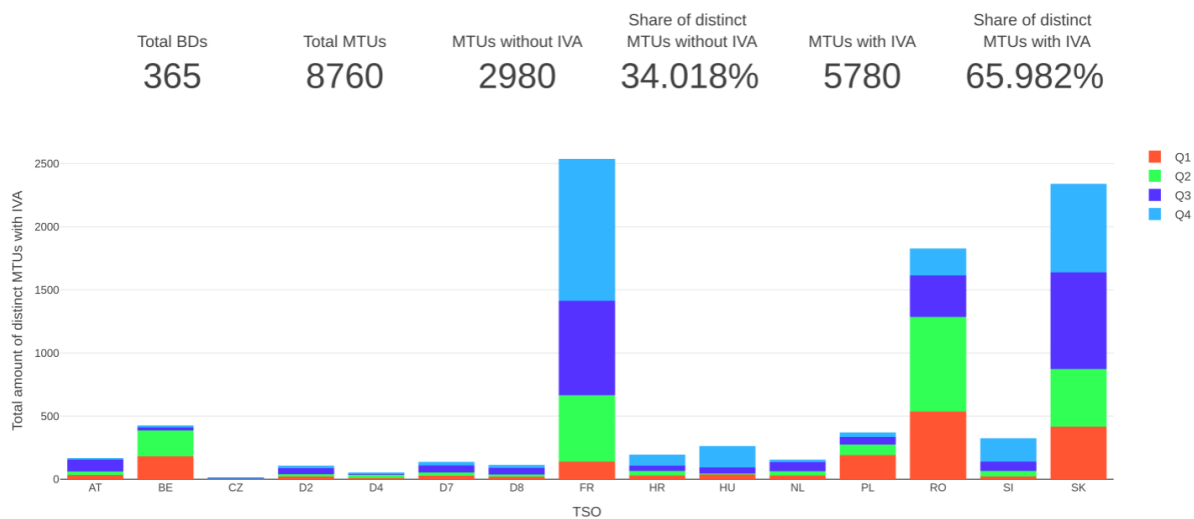
Adjustment for minimum RAM inclusion

- KPI 1: Average maximum AMR per TSO



TSOs' adjustment after validation

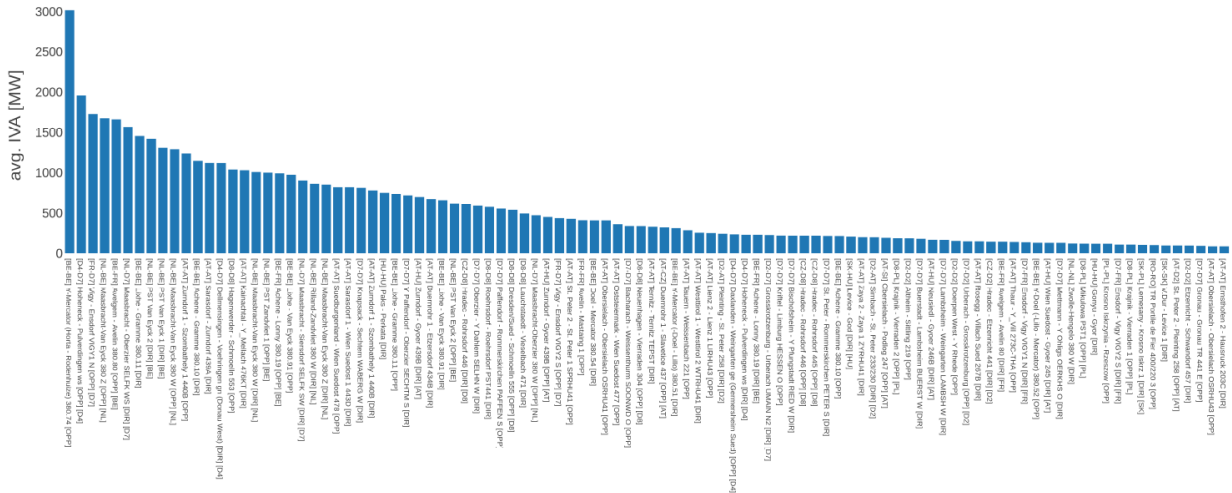
- KPI 2: Total amount of MTUs with intervention per TSO





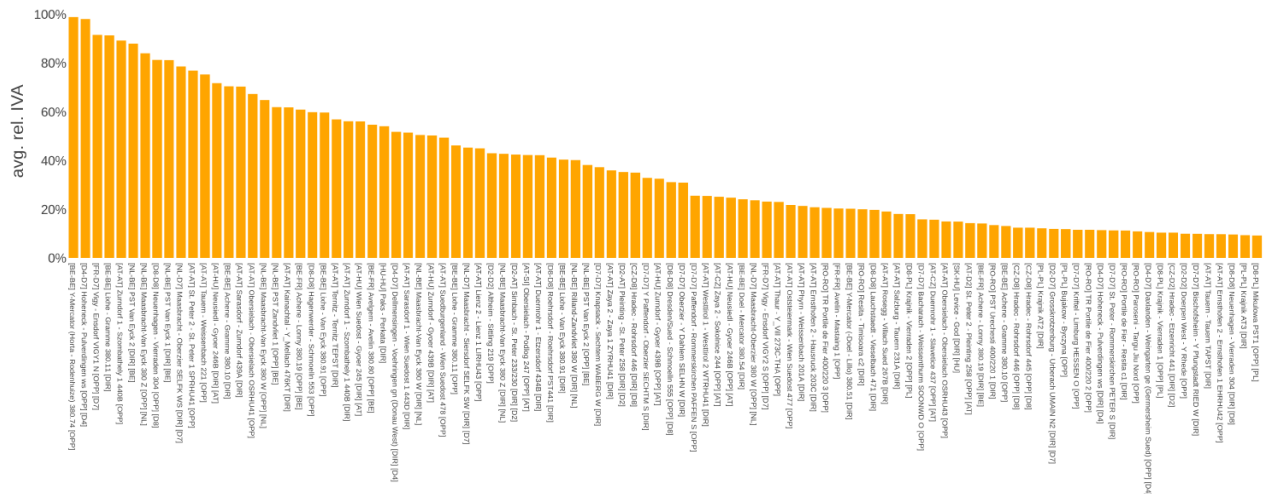
- KPI 2: Average IVA applied for each CNE affected by TSO intervention (Quarter 1)

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



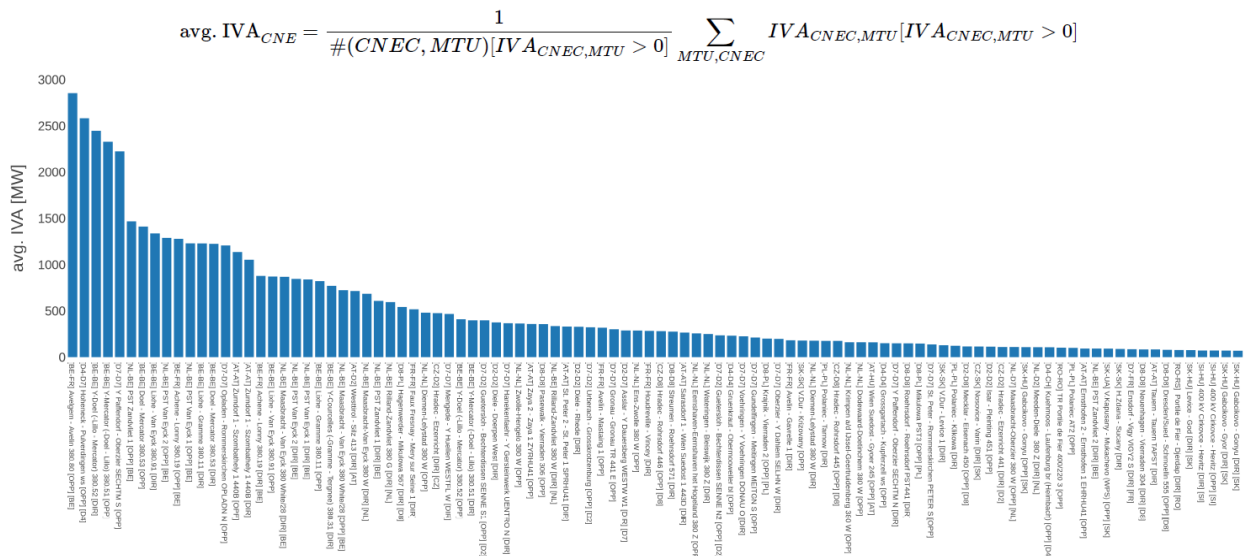
- KPI 2: Average relative IVA applied for each CNE affected by TSO intervention (Quarter 1)

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

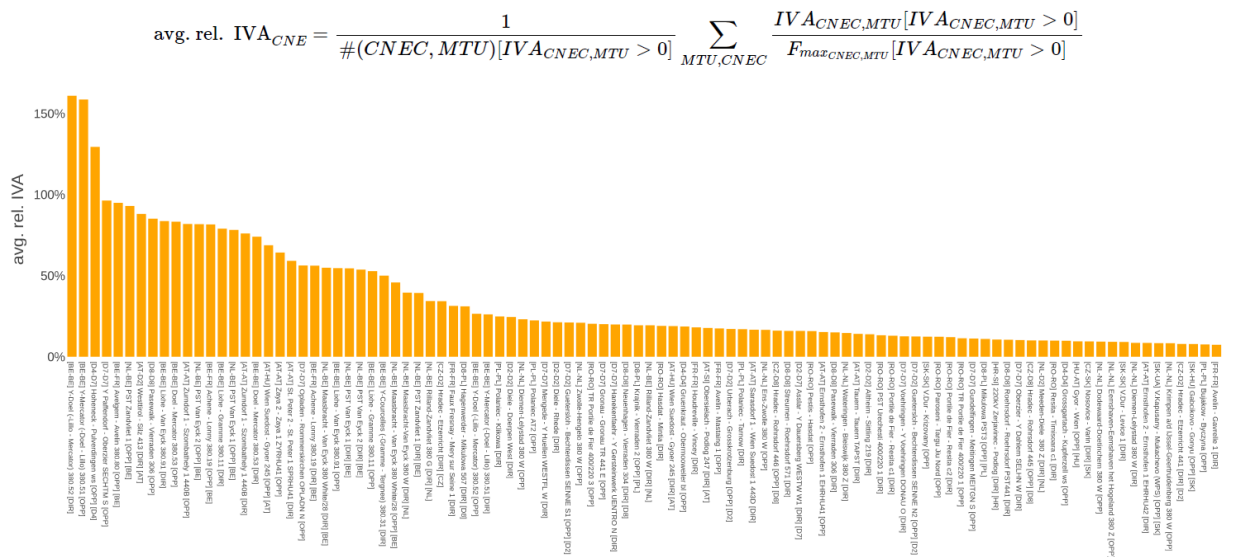


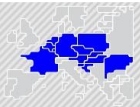


- KPI 2: Average IVA applied for each CNE affected by TSO intervention (Quarter 2)



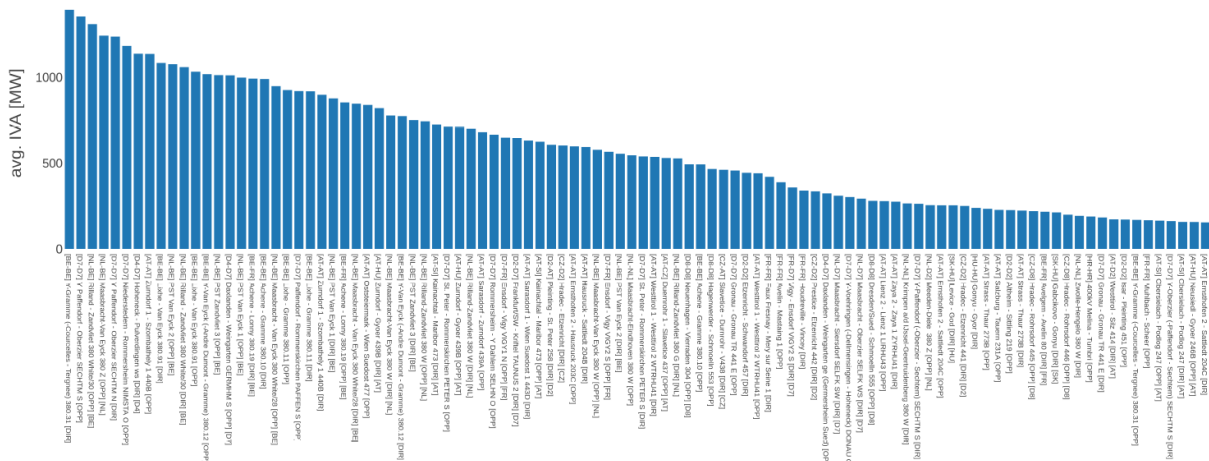
- KPI 2: Average relative IVA applied for each CNE affected by TSO intervention (Quarter 2)





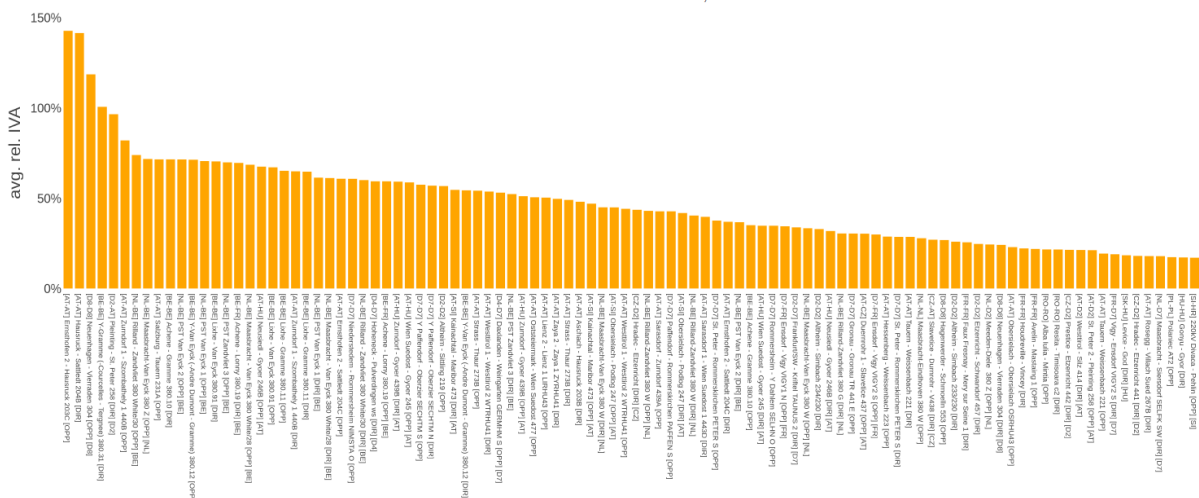
- KPI 2: Average IVA applied for each CNE affected by TSO intervention (Quarter 3)

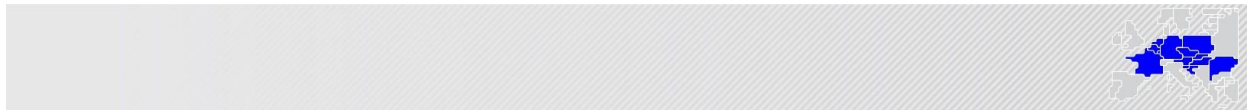
$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]$$



- KPI 2: Average relative IVA applied for each CNE affected by TSO intervention (Quarter 3)

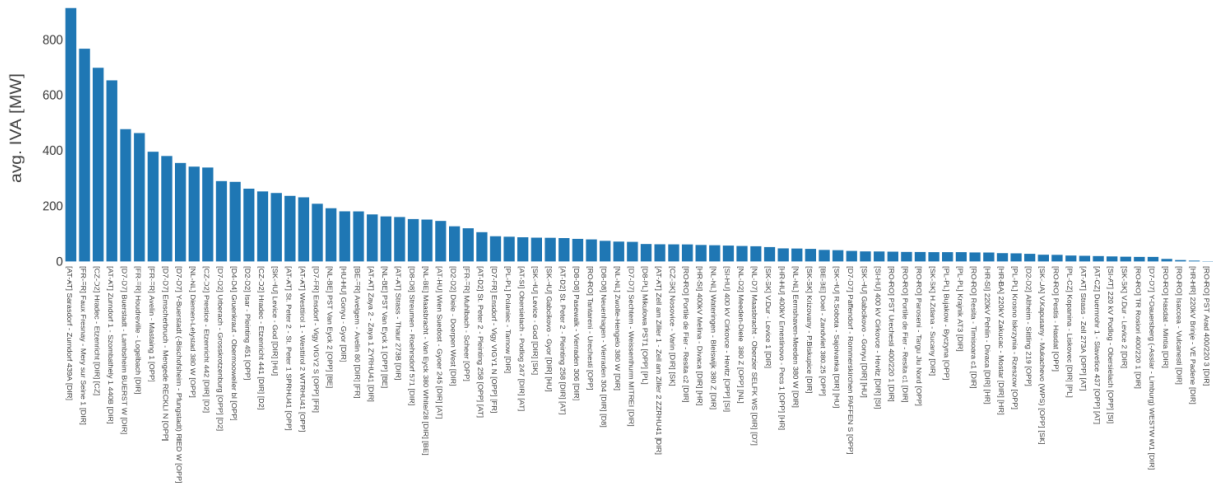
$$\text{avg. rel. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} \frac{IVA_{CNEC, MTU} [IVA_{CNEC, MTU} > 0]}{F_{max, CNEC, MTU} [IVA_{CNEC, MTU} > 0]}$$





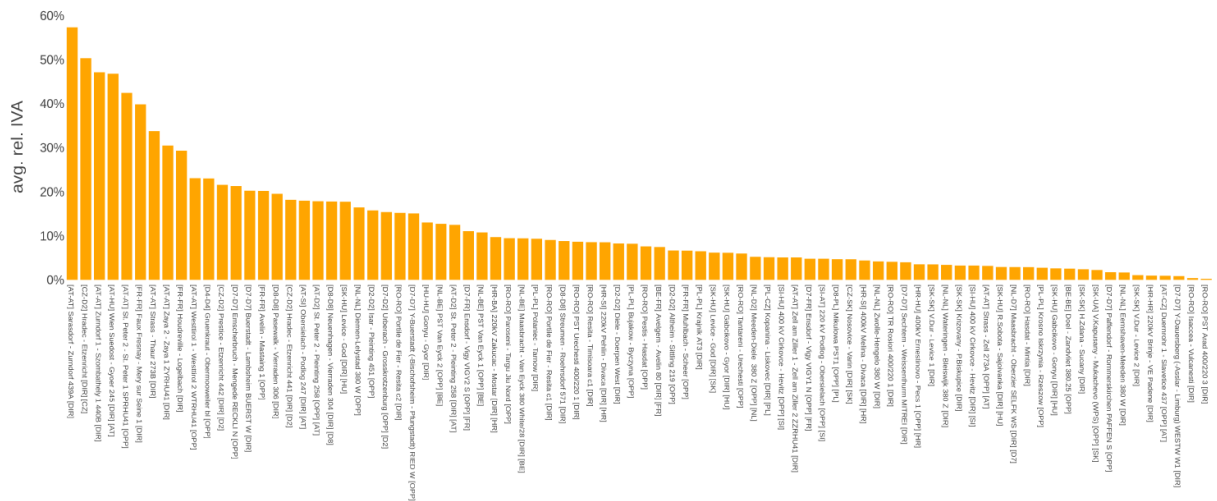
- KPI 2: Average IVA applied for each CNE affected by TSO intervention (Quarter 4)

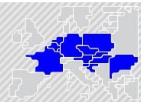
$$\text{avg. IVA}_{CNE} = \frac{1}{\#(CNEC, MTU)[IVA_{CNEC, MTU} > 0]} \sum_{MTU, CNEC} IVA_{CNEC, MTU}[IVA_{CNEC, MTU} > 0]$$



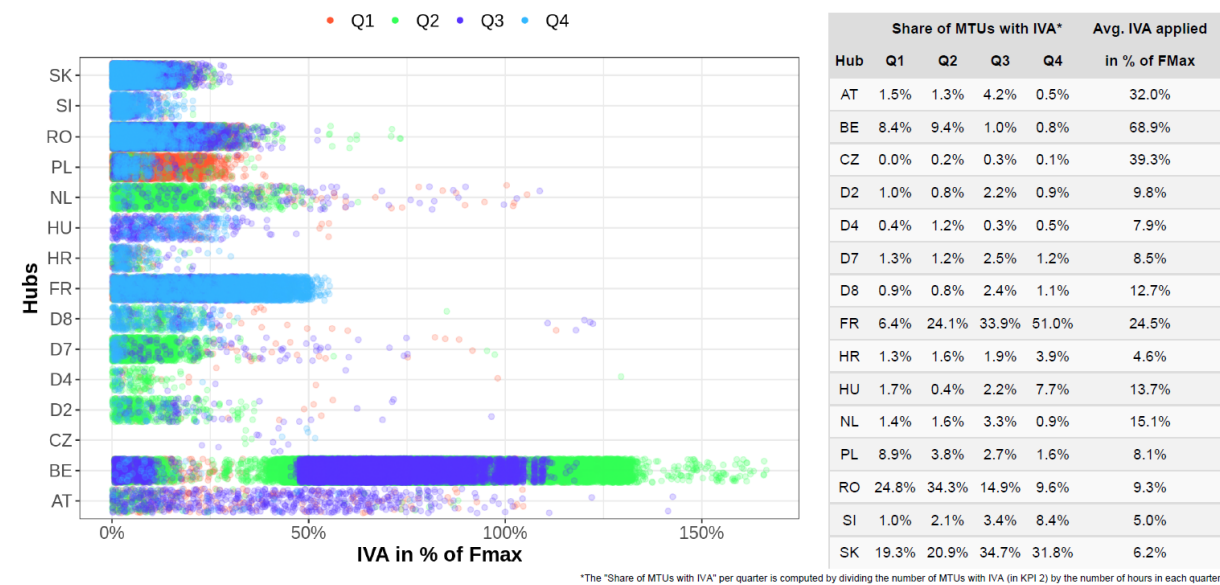
- KPI 2: Average relative IVA applied for each CNE affected by TSO intervention (Quarter 4)

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



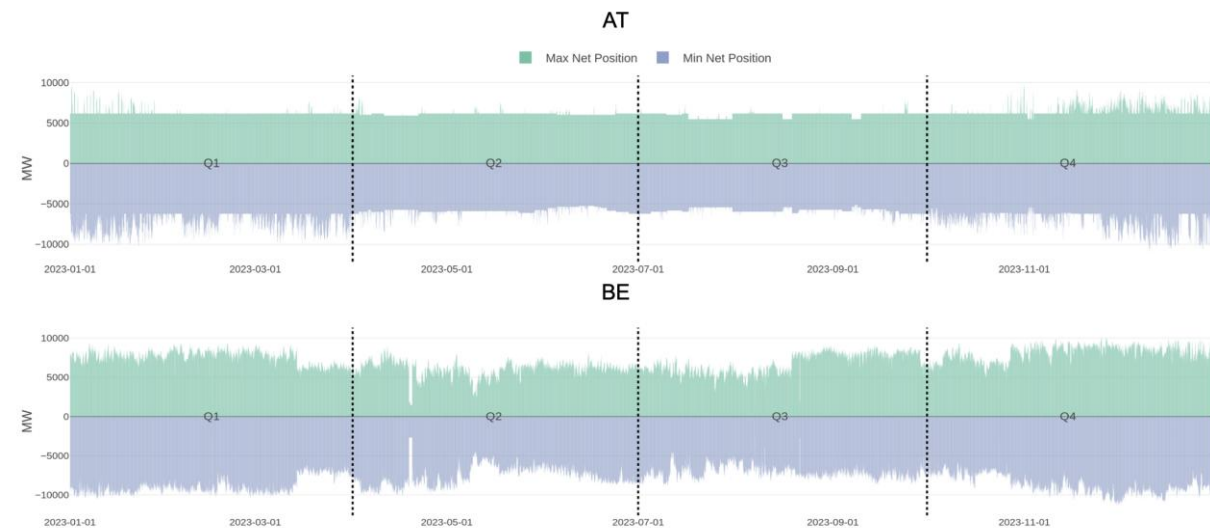


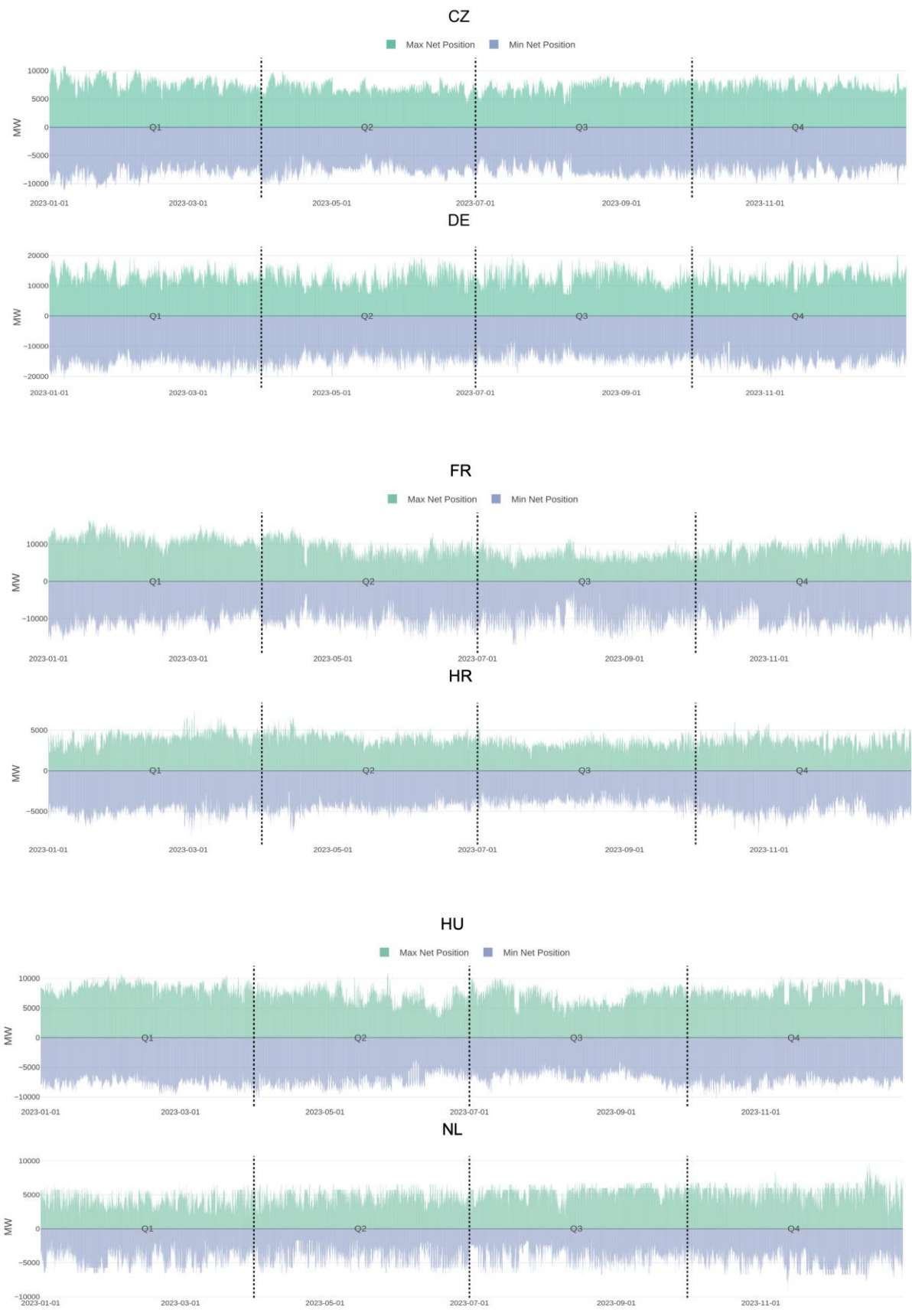
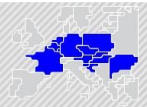
• KPI 3: Total IVA applied per TSO

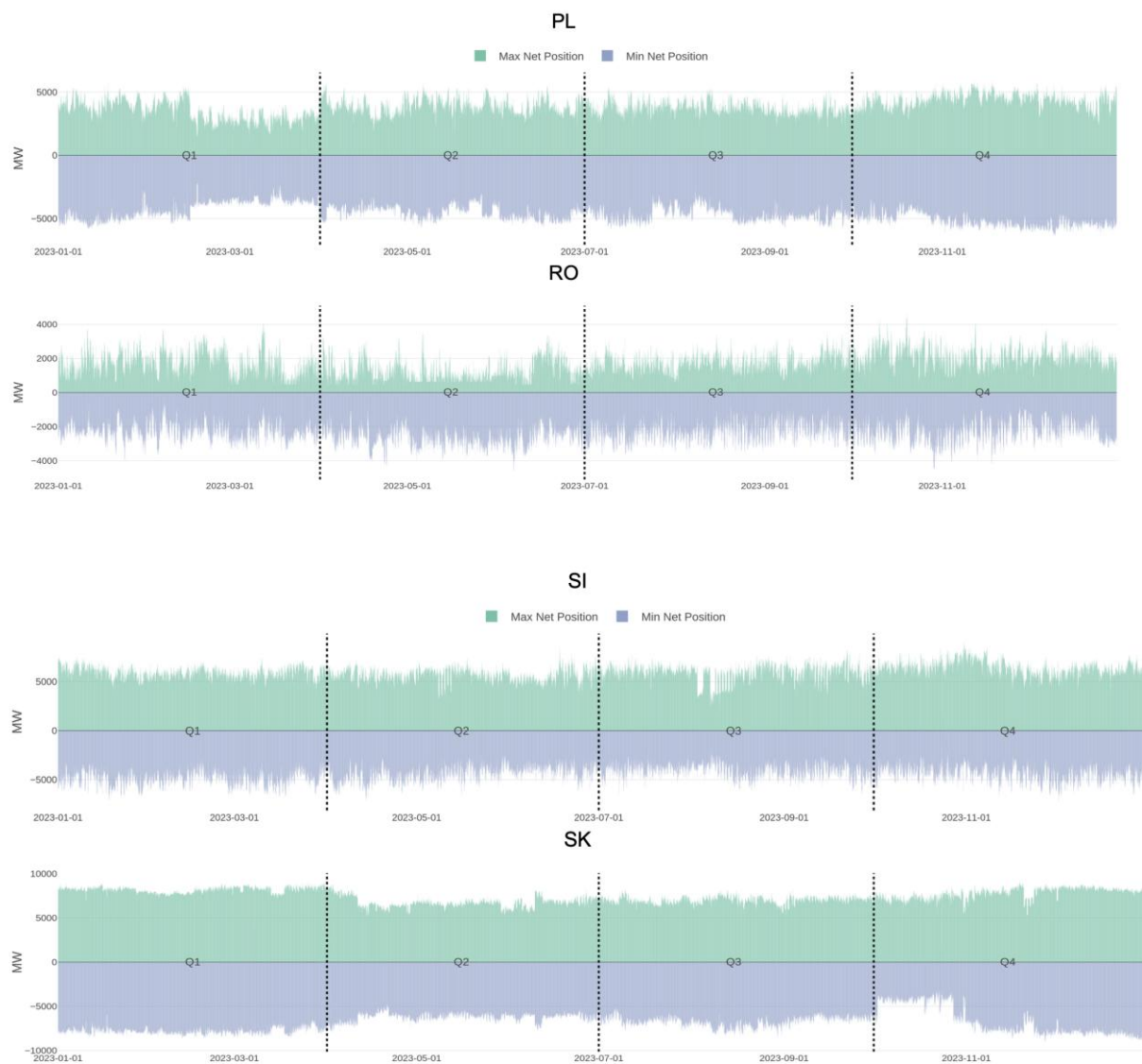
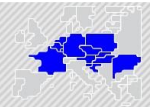


Power System Impact Analysis

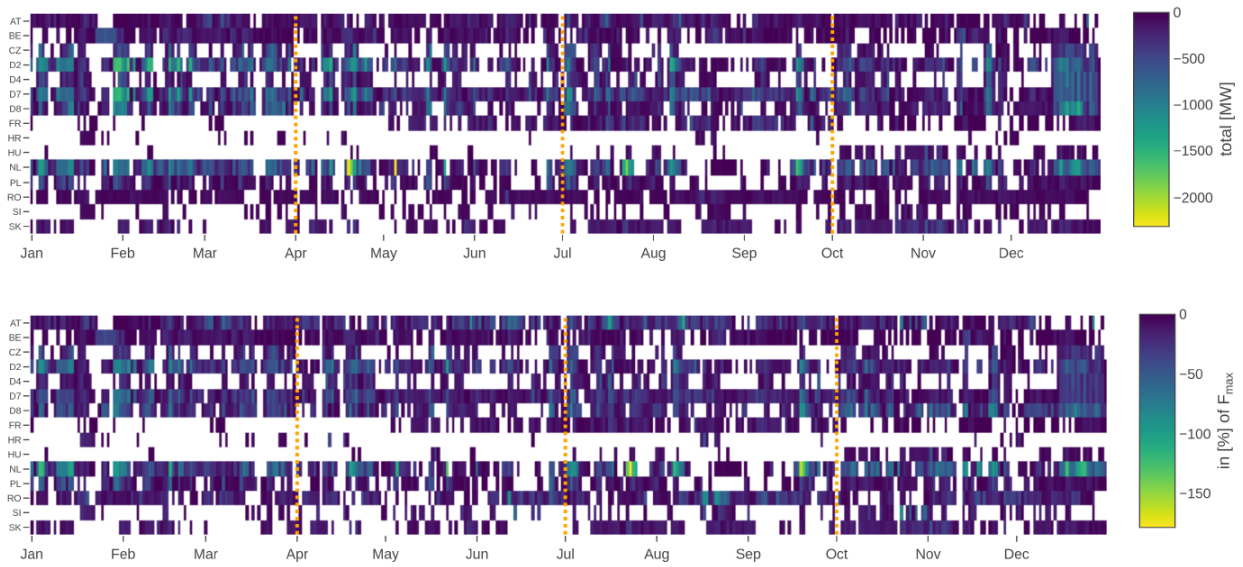
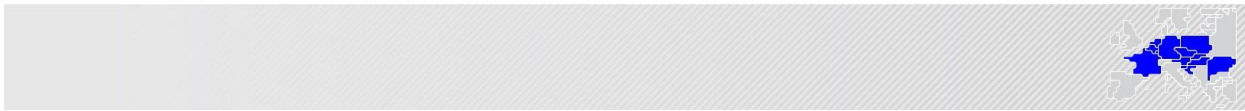
• KPI 4: Min and max net positions per BZ hub



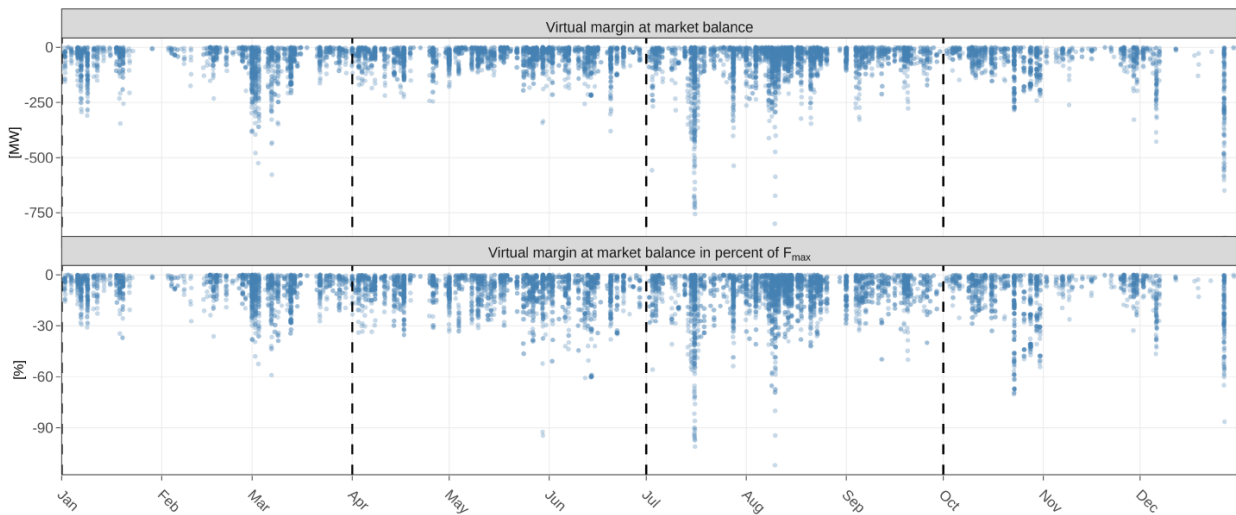




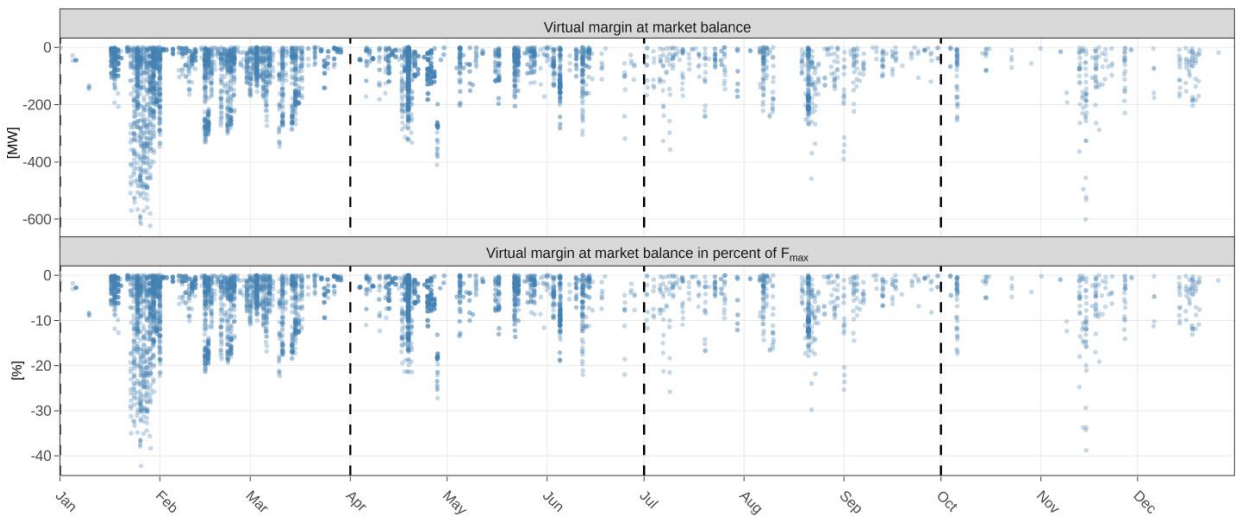
- KPI 5a: Highest virtual margins at market balance (all Core TSOs)



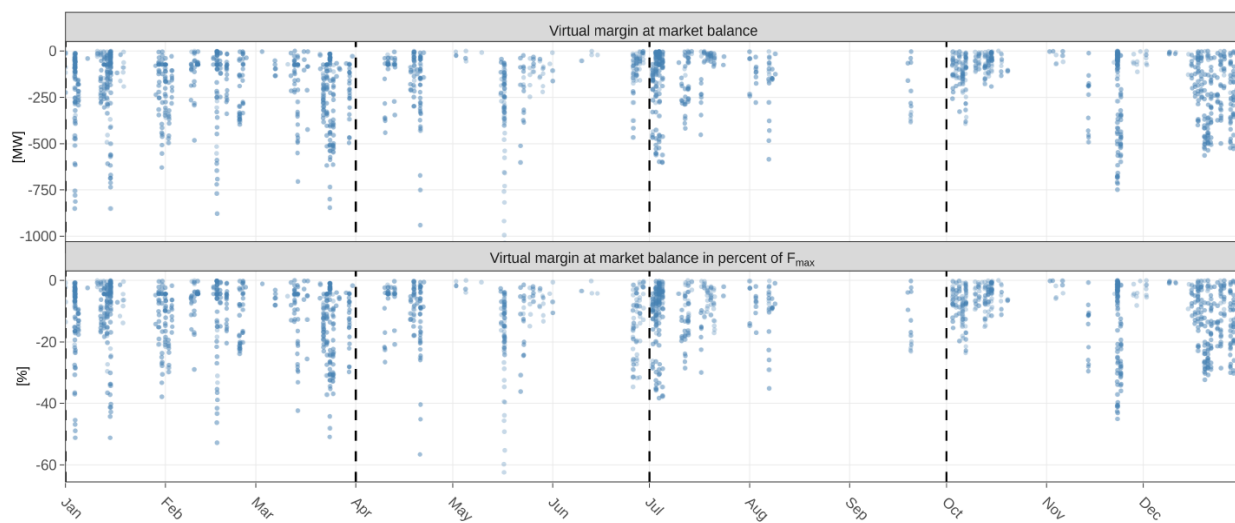
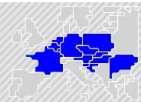
- KPI 5b: Virtual margins at market balance (AT)



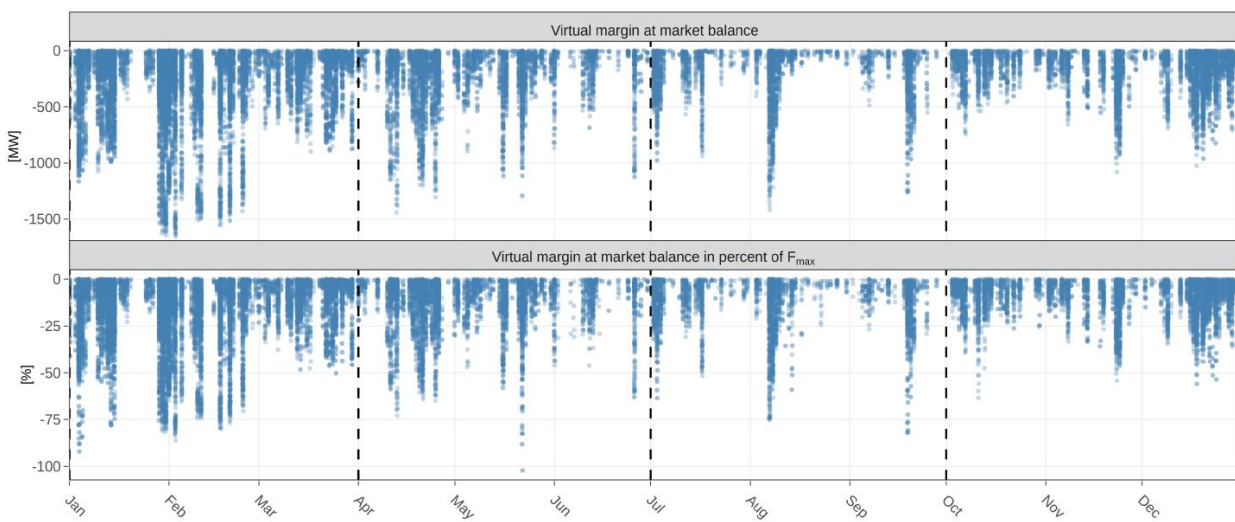
- KPI 5b: Virtual margins at market balance (BE)



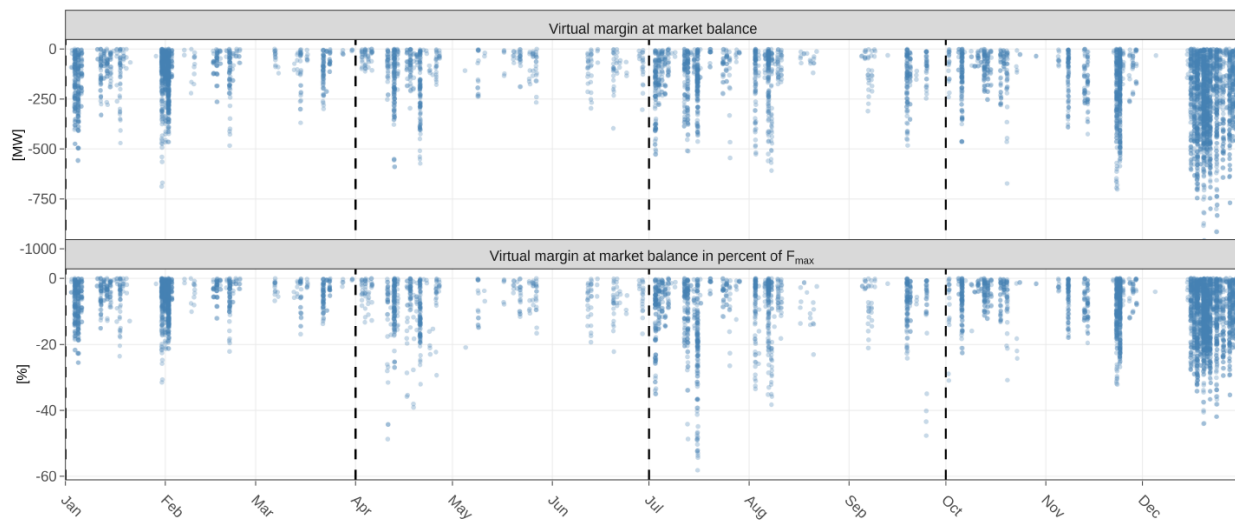
- KPI 5b: Virtual margins at market balance (CZ)

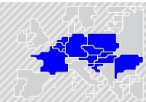


- KPI 5b: Virtual margins at market balance (D2)

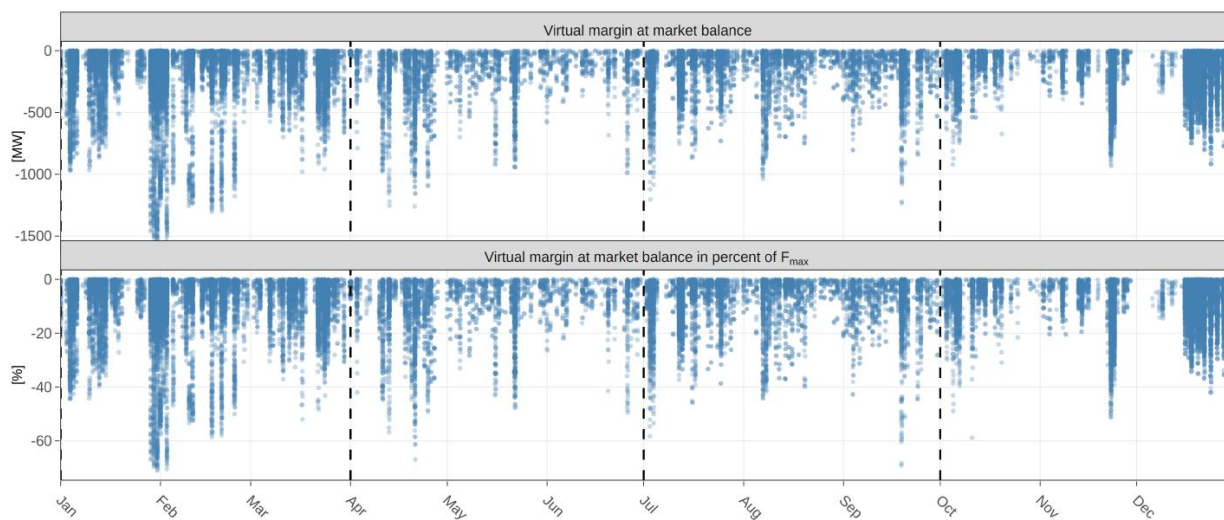


- KPI 5b: Virtual margins at market balance (D4)

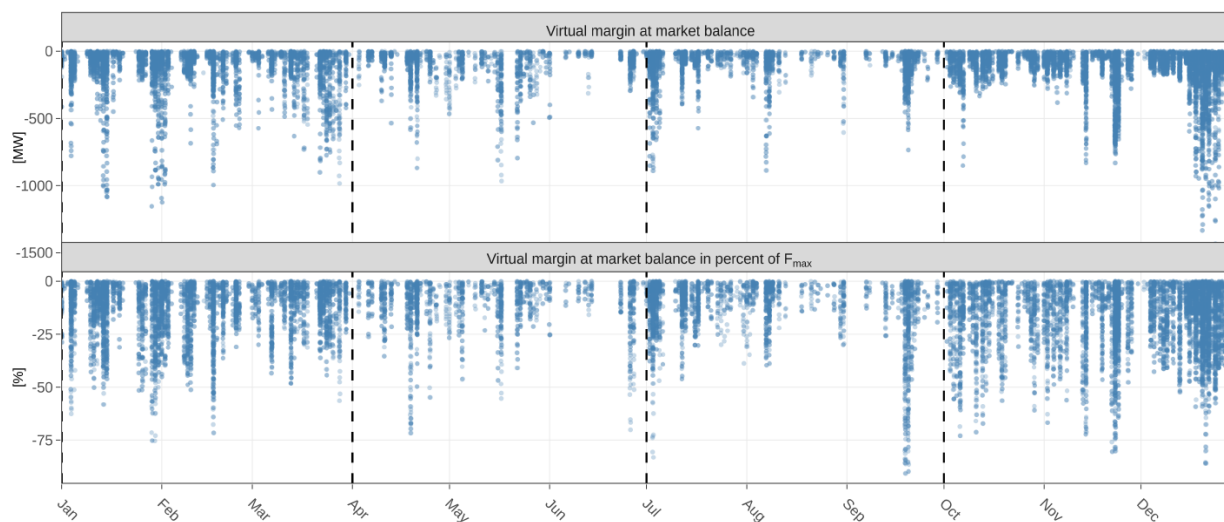




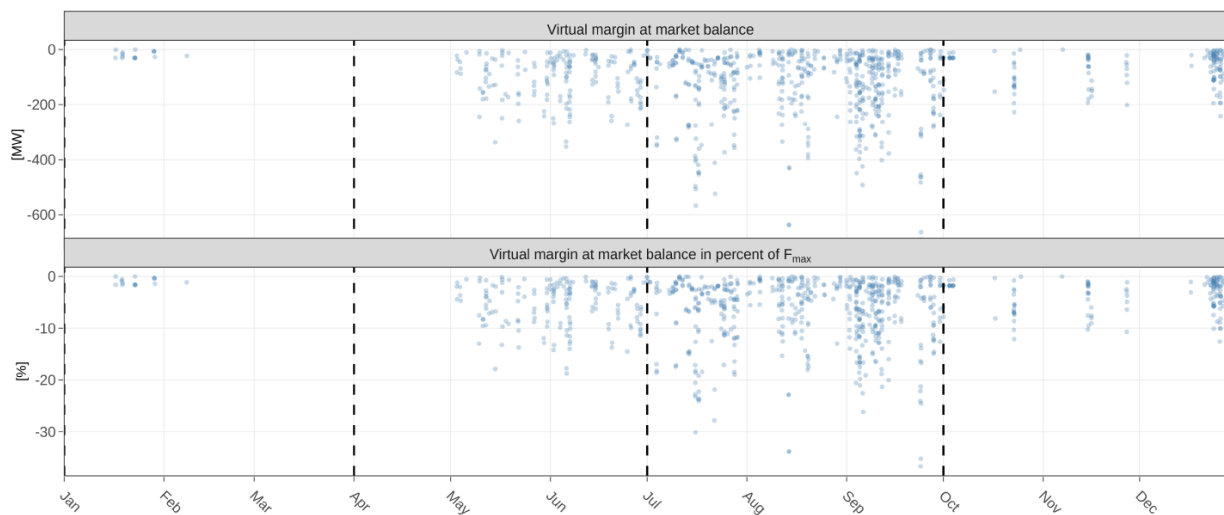
- KPI 5b: Virtual margins at market balance (D7)

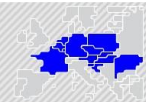


- KPI 5b: Virtual margins at market balance (D8)

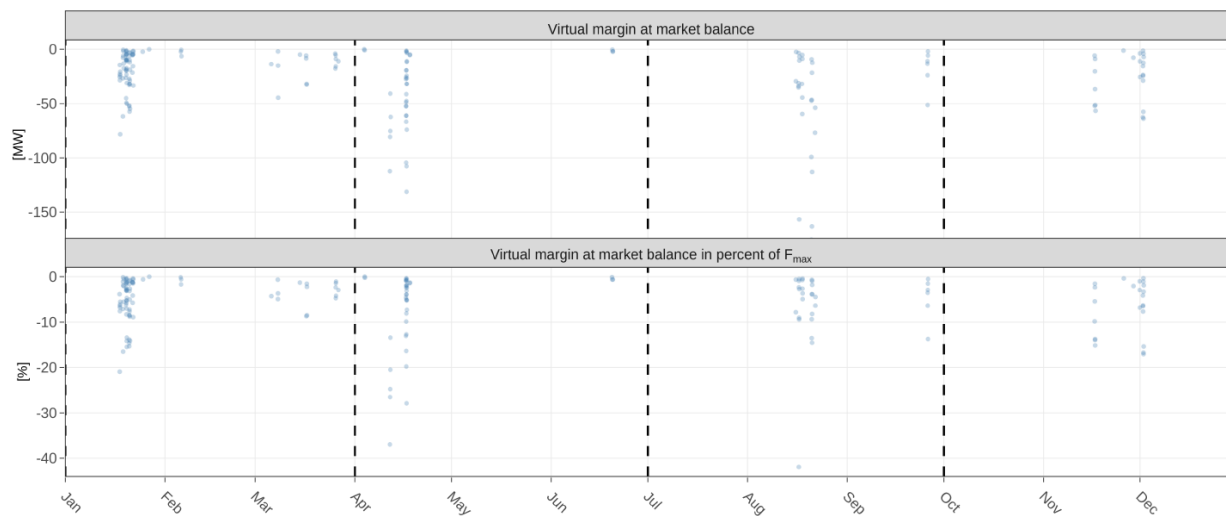


- KPI 5b: Virtual margins at market balance (FR)





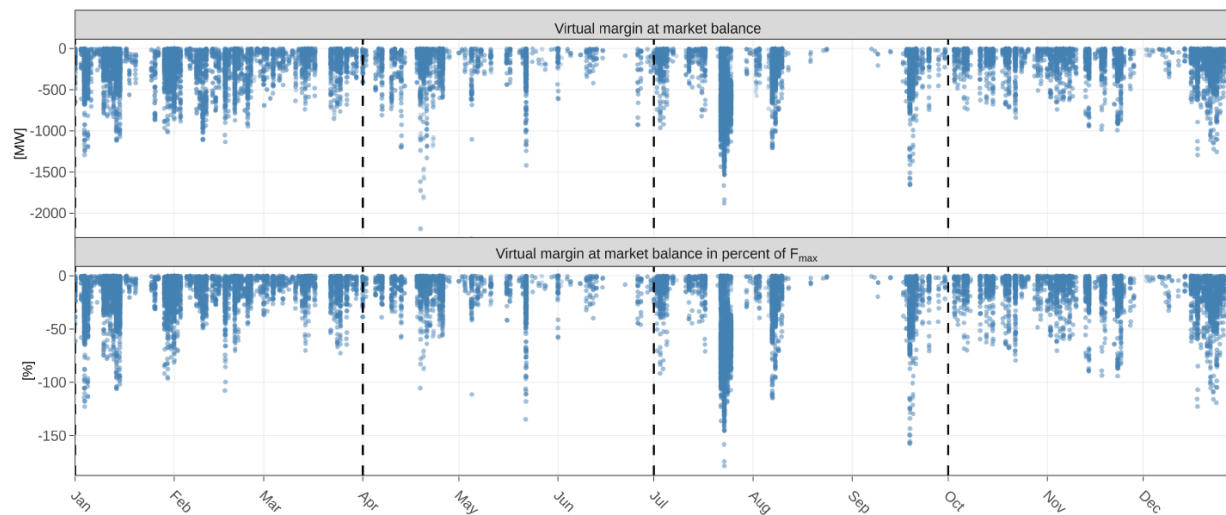
KPI 5b: Virtual margins at market balance (HR)

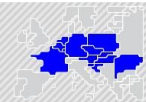


- KPI 5b: Virtual margins at market balance (HU)

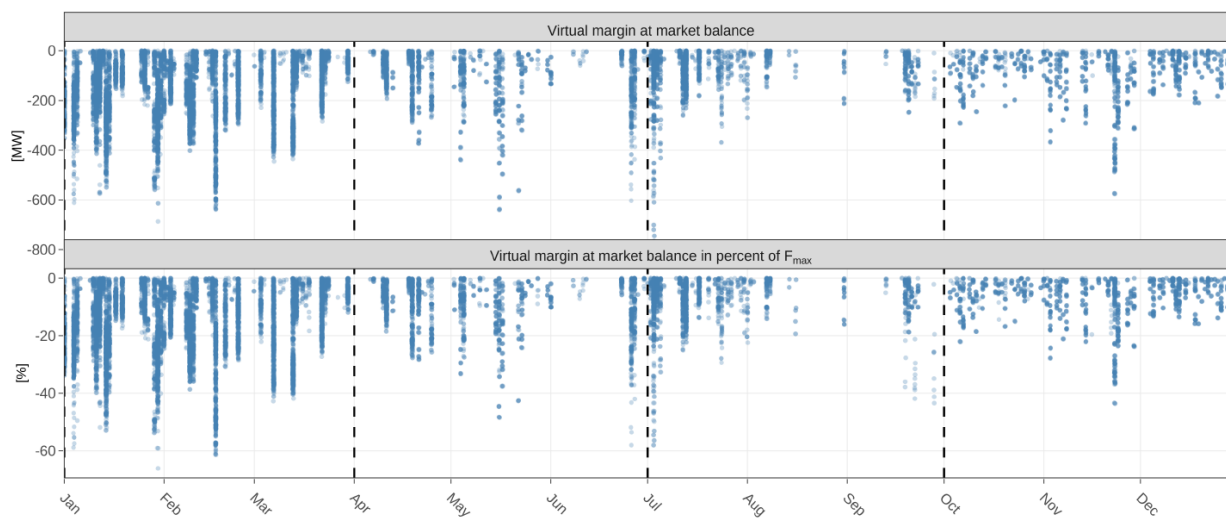


- KPI 5b: Virtual margins at market balance (NL)

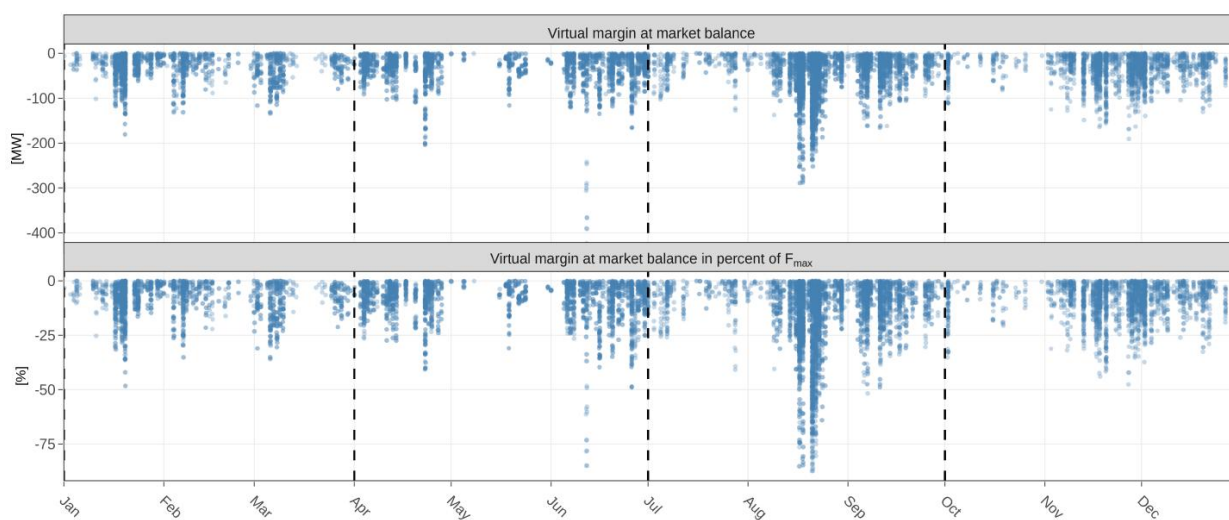




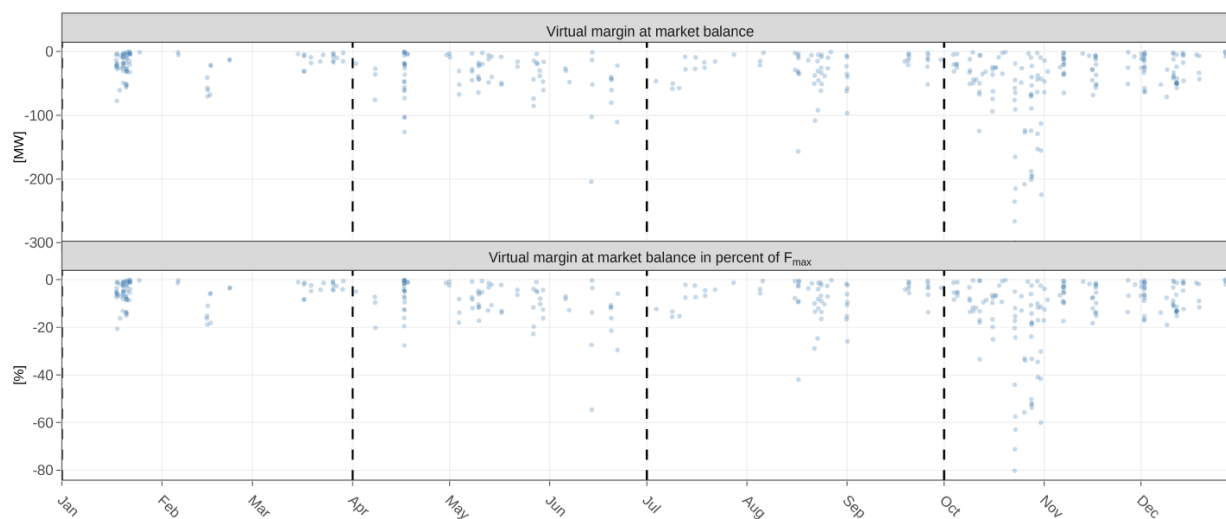
- KPI 5b: Virtual margins at market balance (PL)

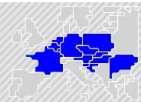


- KPI 5b: Virtual margins at market balance (RO)



- KPI 5b: Virtual margins at market balance (SI)

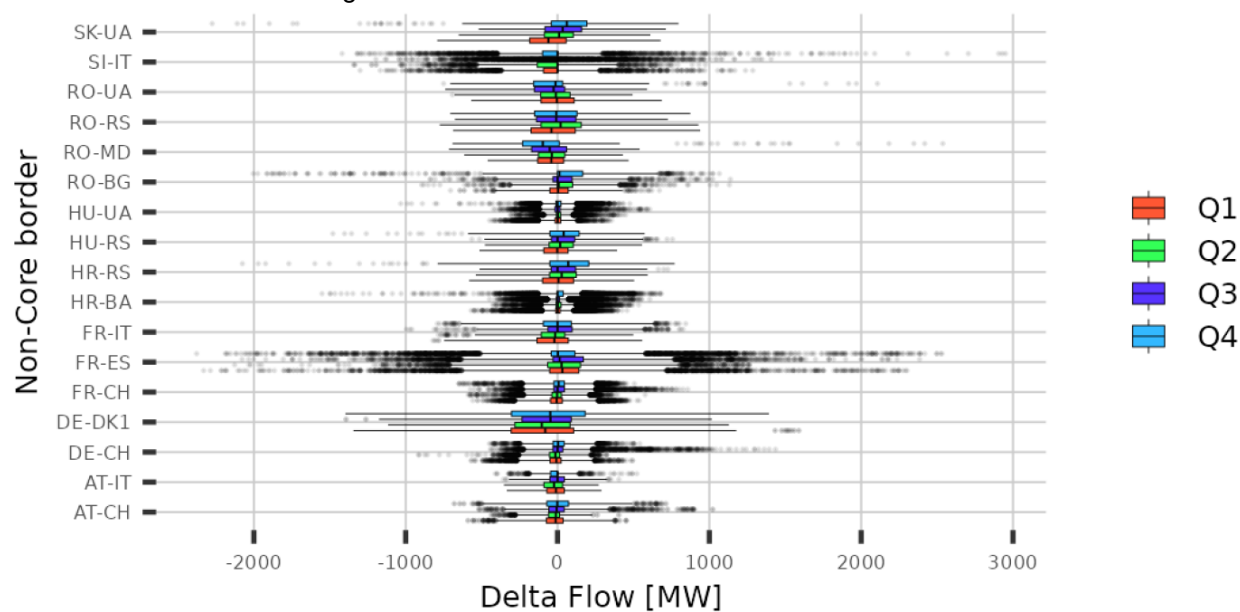




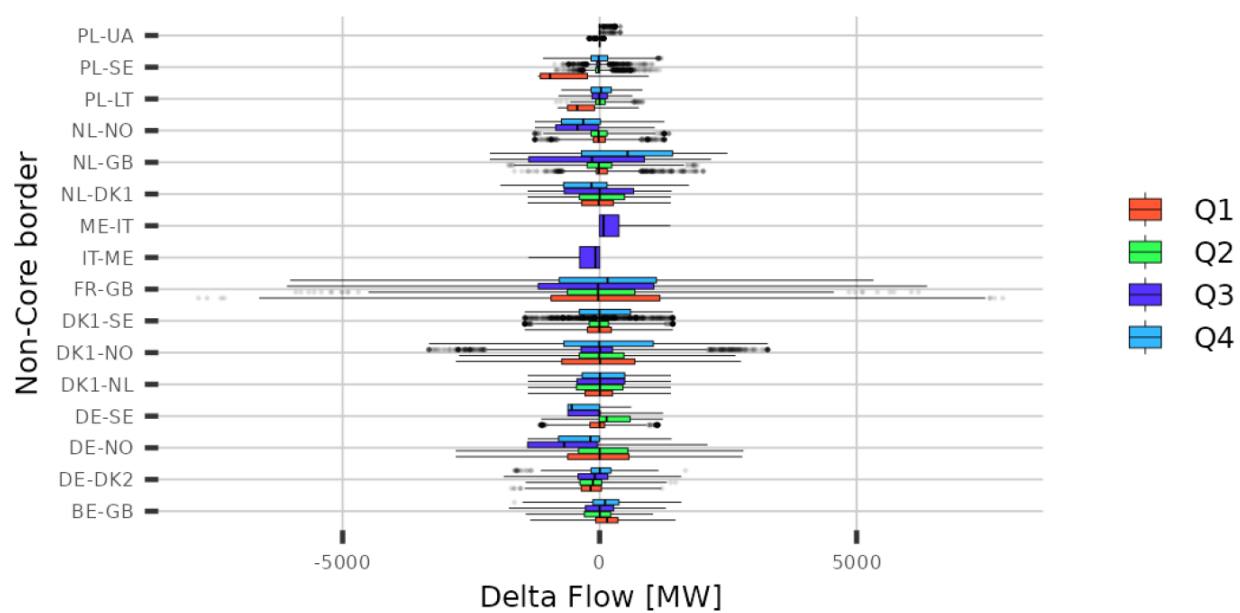
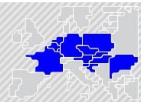
- KPI 5b: Virtual margins at market balance (SK)

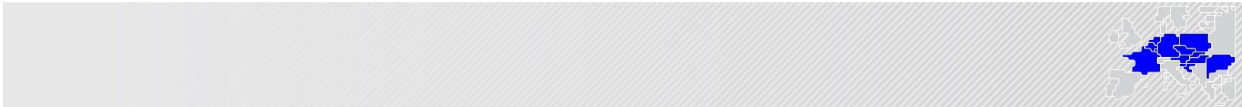


- KPI 6: Non-Core exchanges AC delta flow



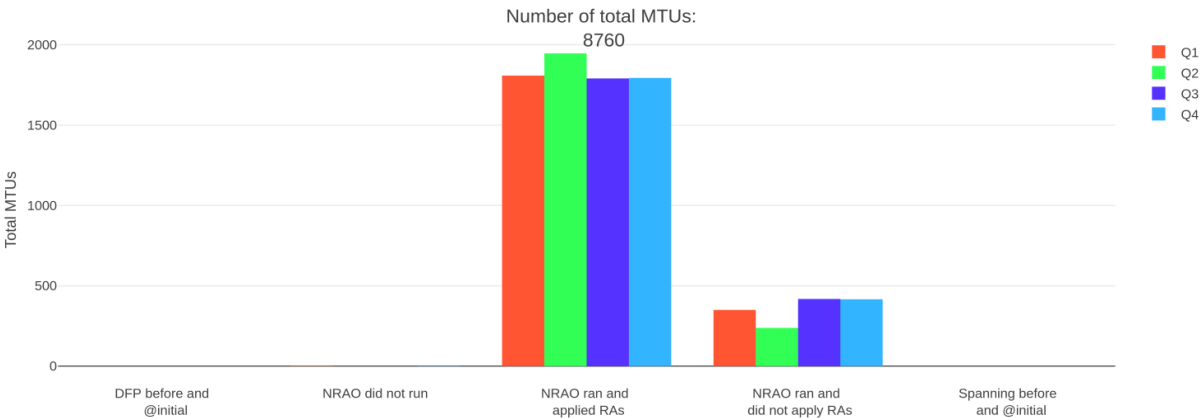
- KPI 6: Non-Core exchanges DC delta flow





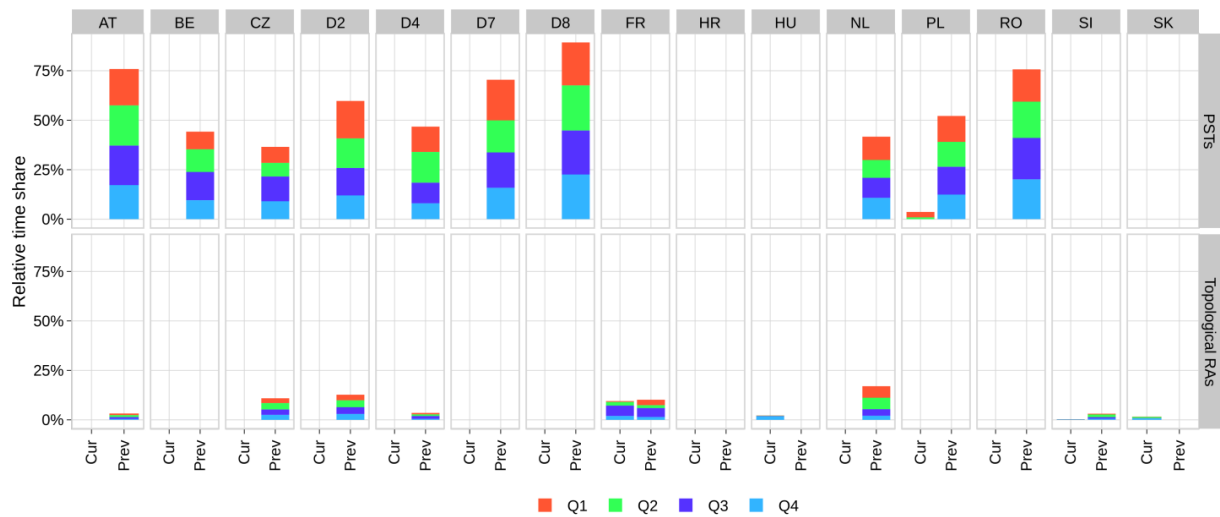
Non-costly Remedial Action Optimization Analysis

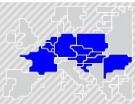
- KPI 7: NRAO – Applied Remedial Action



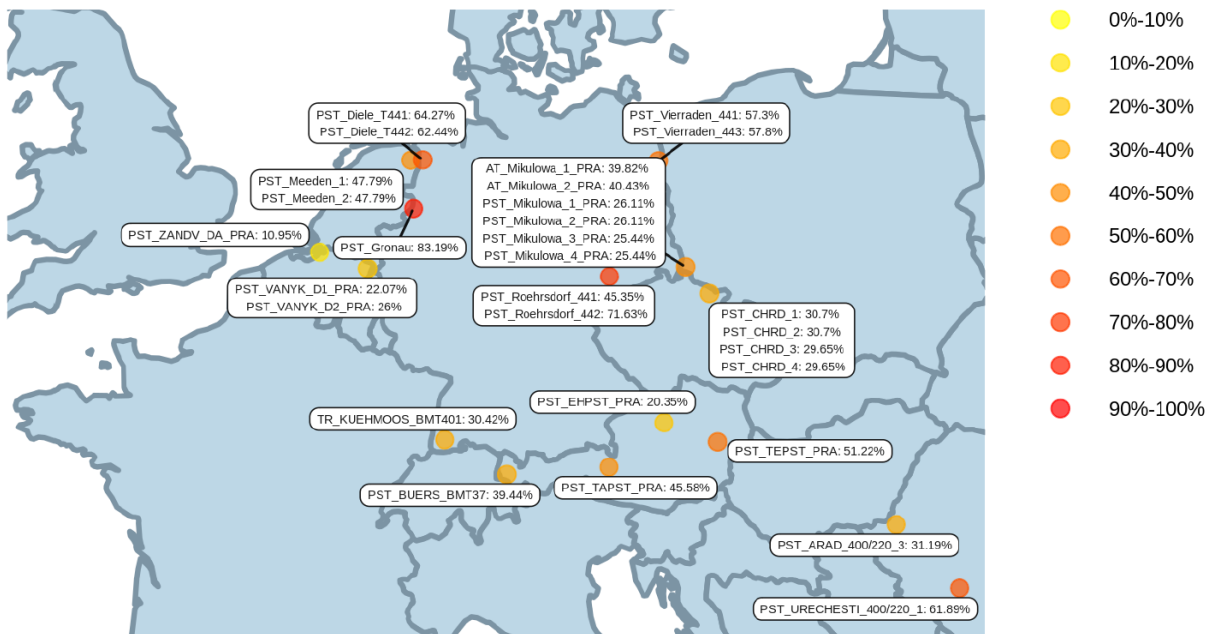
In the following plots, the relative time share relates to the hours labelled ‘NRAO ran and applied RAs’

- KPI 7: Relative time share of applied RAs by TSO, type and mode

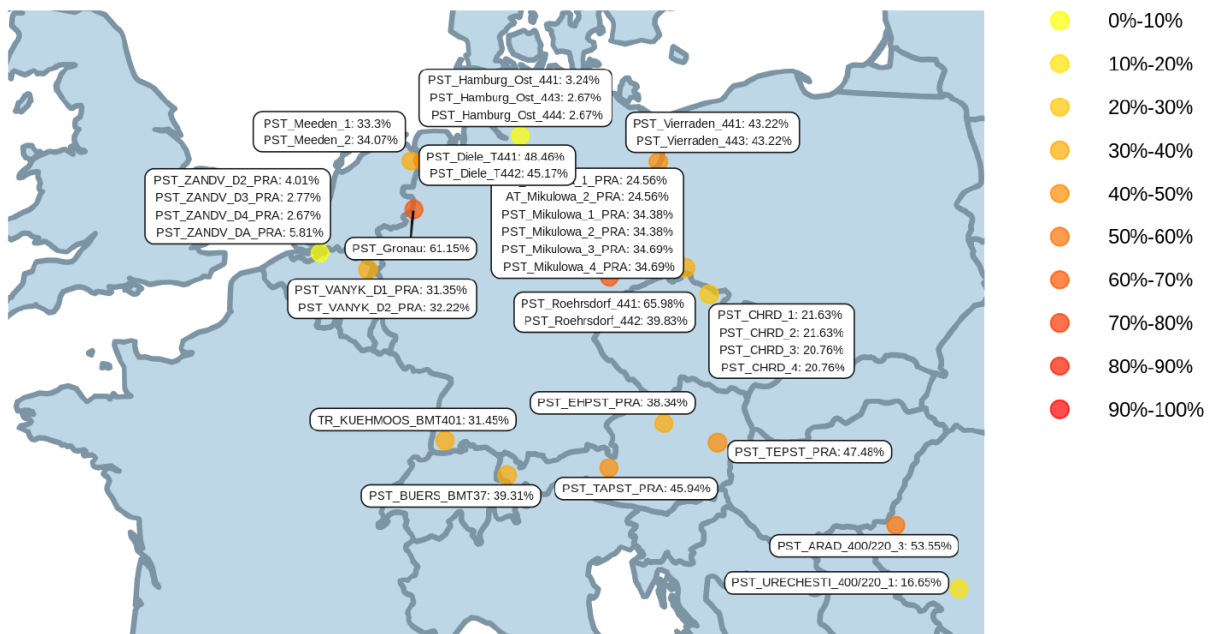


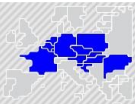


- KPI 7: Relative time share of applied PSTs in preventive mode (Quarter 1)

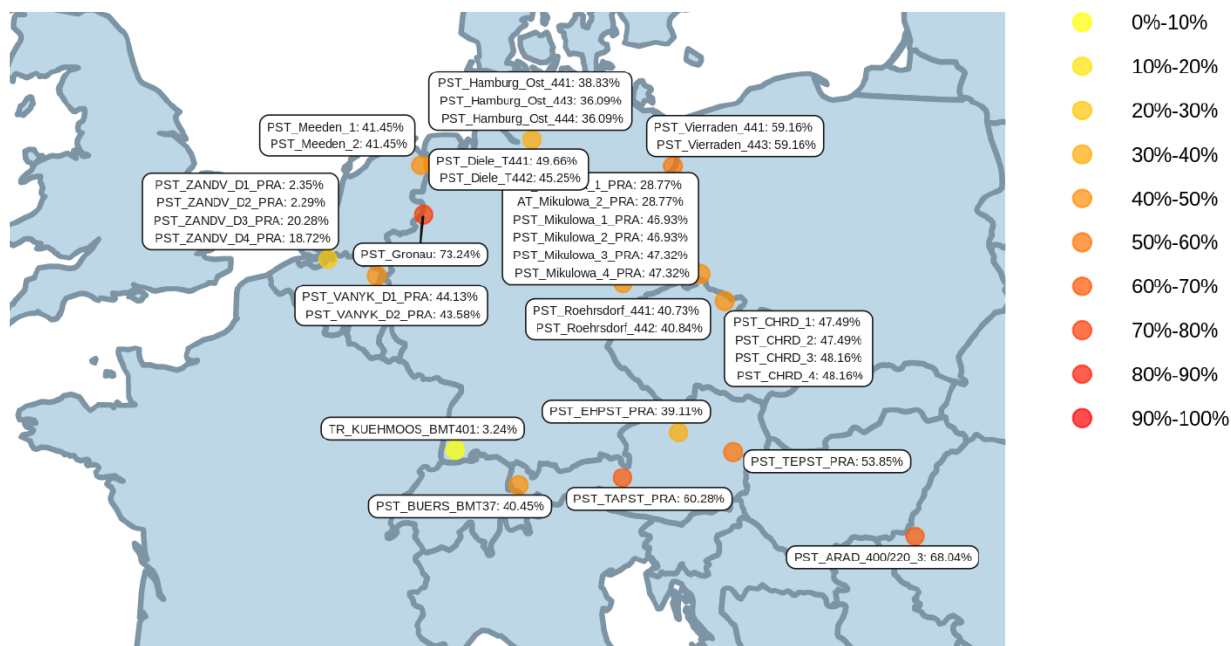


- KPI 7: Relative time share of applied PSTs in preventive mode (Quarter 2)

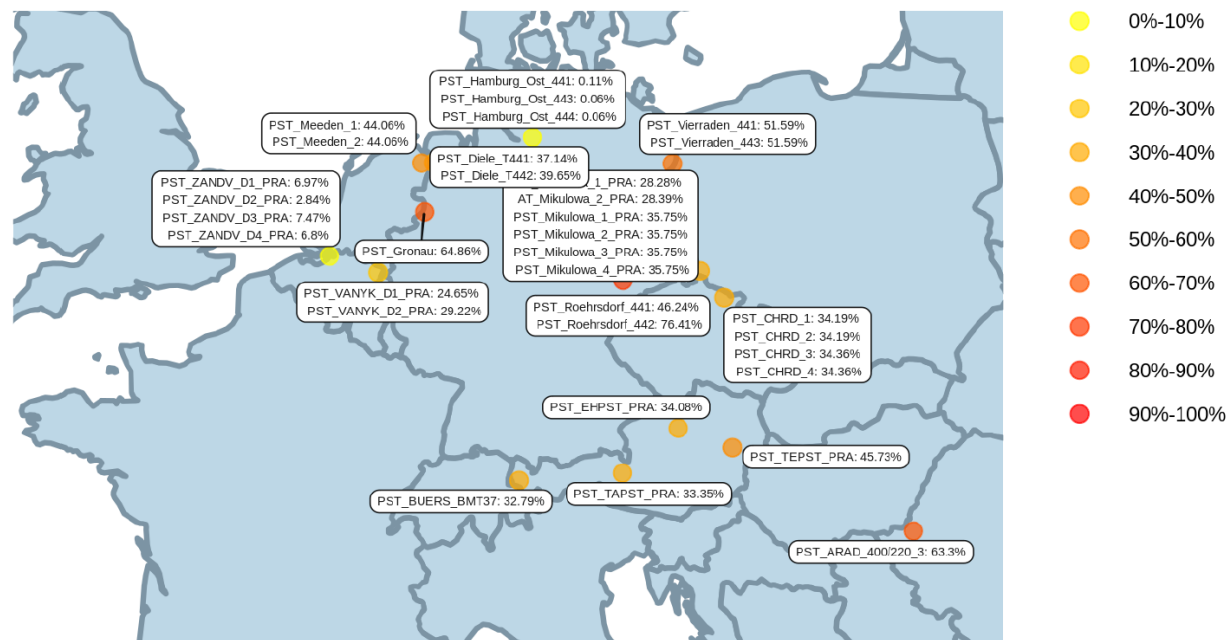


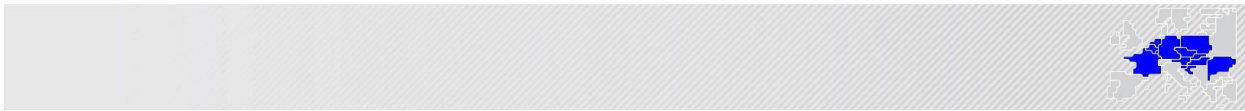


- KPI 7: Relative time share of applied PSTs in preventive mode (Quarter 3)



- KPI 7: Relative time share of applied PSTs in preventive mode (Quarter 4)

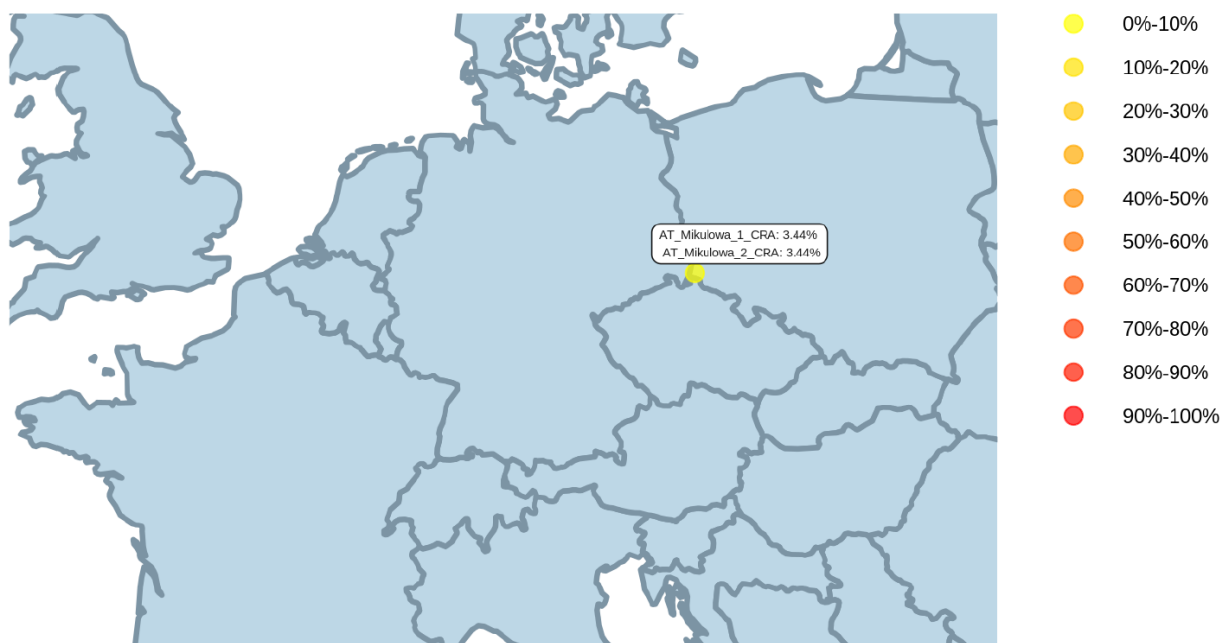


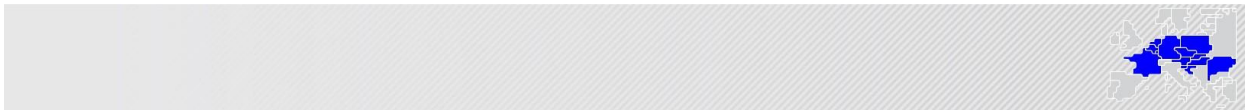


- KPI 7: Relative time share of applied PSTs in curative mode (Quarter 1)



- KPI 7: Relative time share of applied PSTs in curative mode (Quarter 2)



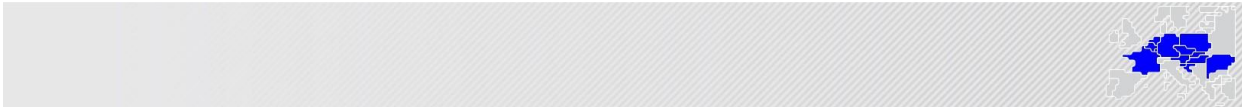


- KPI 7: Relative time share of applied PSTs in curative mode (Quarter 3)

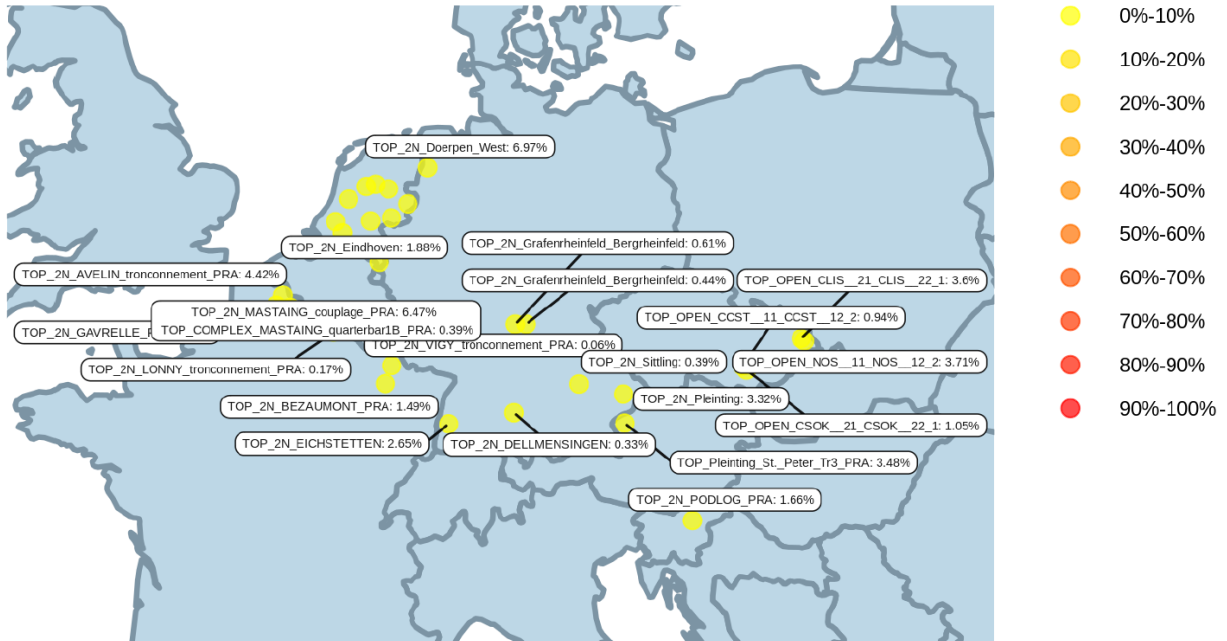


- KPI 7: Relative time share of applied PSTs in curative mode (Quarter 4)

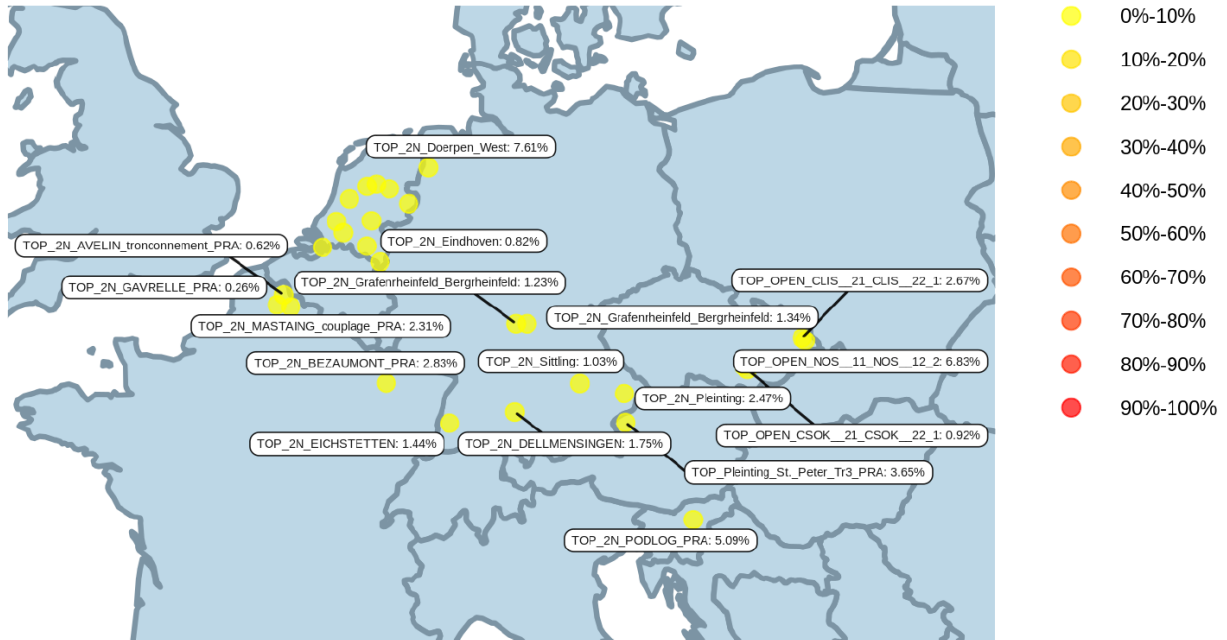


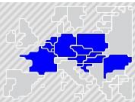


• KPI 7: Relative time share of topological RAs in preventive mode (Quarter 1)

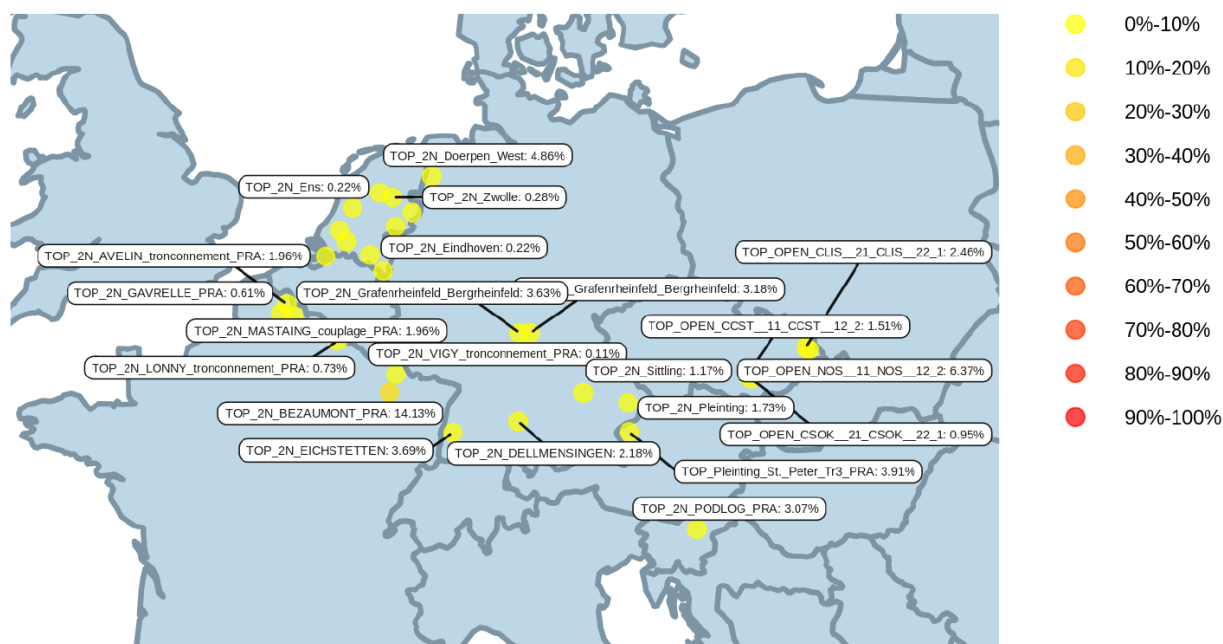


• KPI 7: Relative time share of topological RAs in preventive mode (Quarter 2)



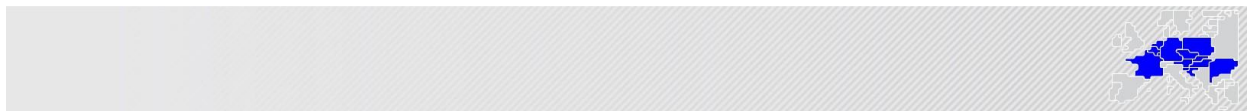


- KPI 7: Relative time share of topological RAs in preventive mode (Quarter 3)

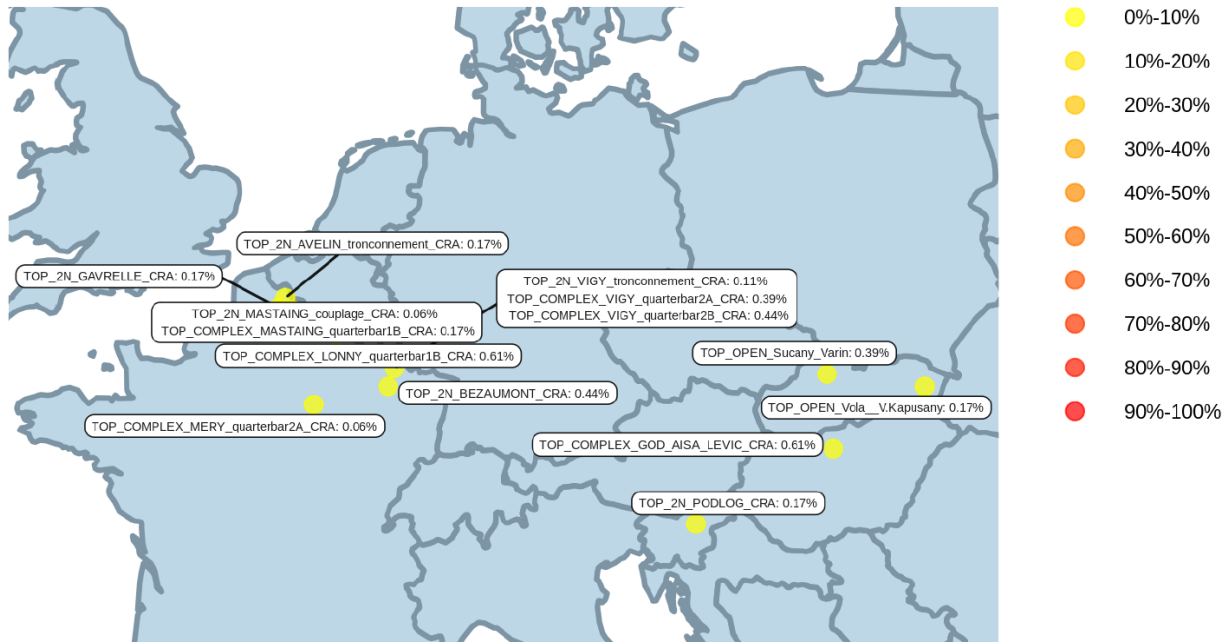


- KPI 7: Relative time share of topological RAs in preventive mode (Quarter 4)

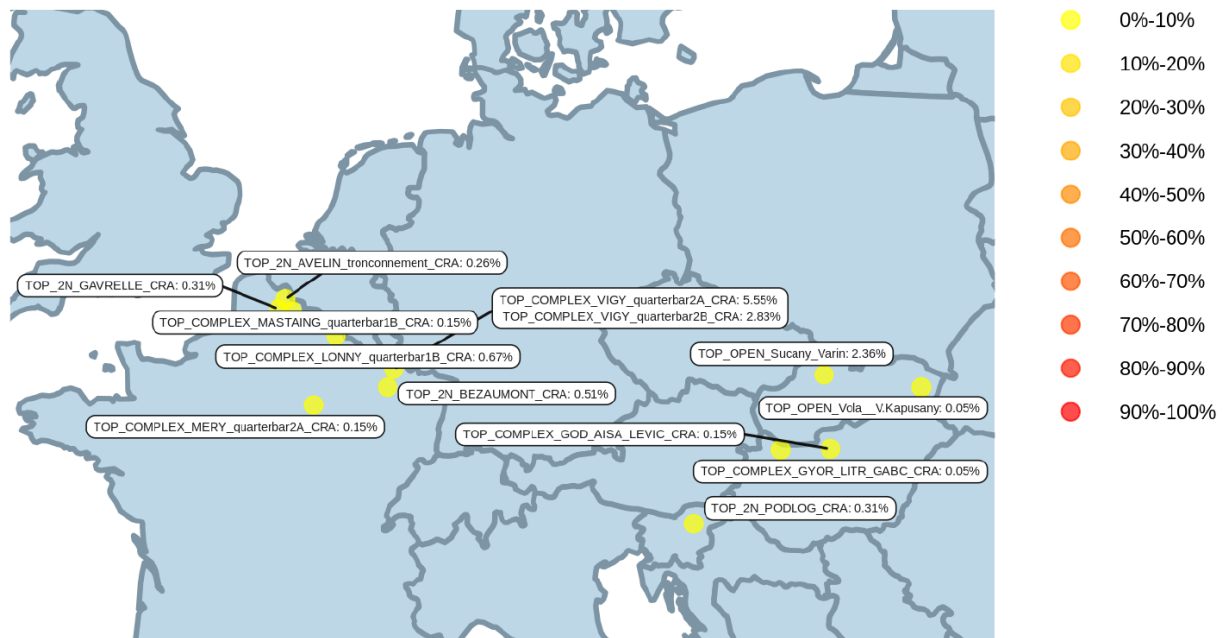


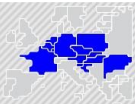


- KPI 7: Relative time share of topological RAs in curative mode (Quarter 1)

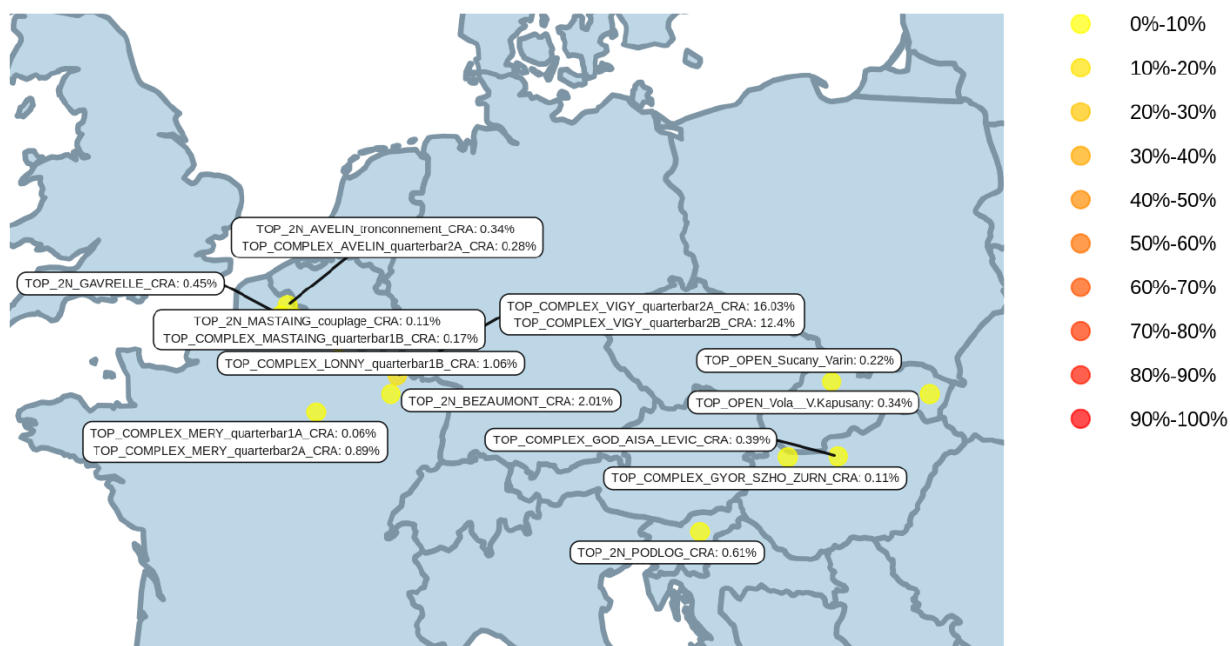


- KPI 7: Relative time share of topological RAs in curative mode (Quarter 2)

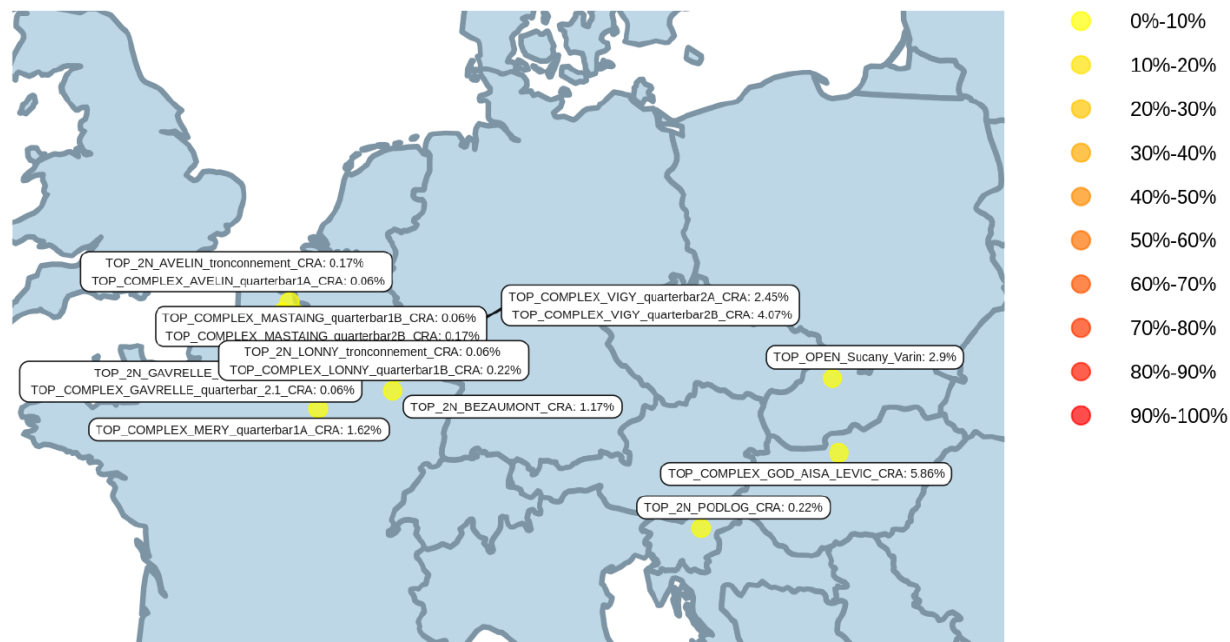


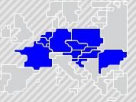


- KPI 7: Relative time share of topological RAs in curative mode (Quarter 3)



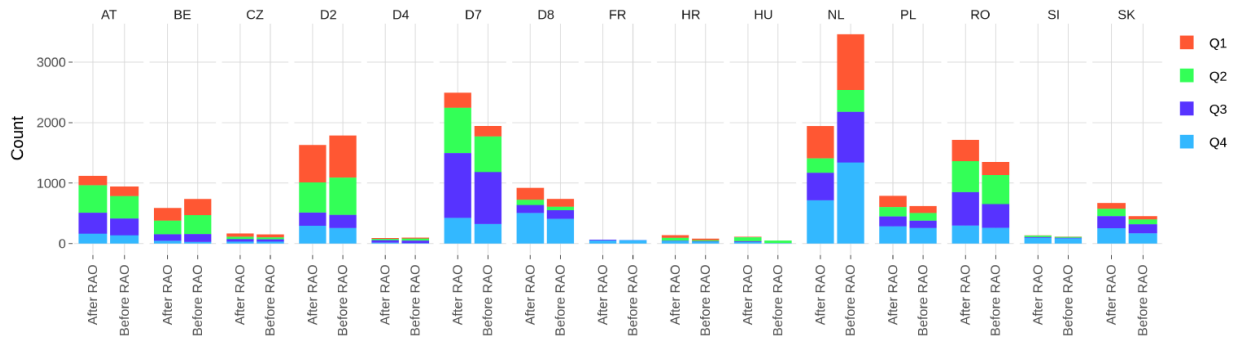
- KPI 7: Relative time share of topological RAs in curative mode (Quarter 4)





- KPI 8: 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



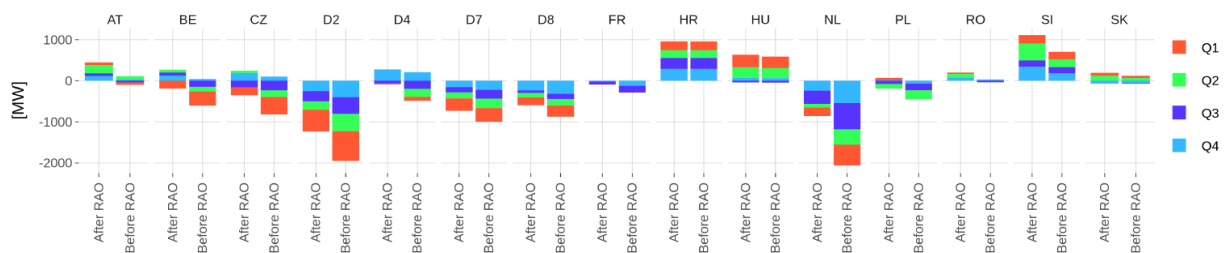
As expected, there is redistributing of the most limiting CNECs. This is because the application of Remedial Actions does not eliminate flows but re-routes, reducing the flows on some limiting CNECs and increasing the load on others, which at the end impacts also the RAM values.

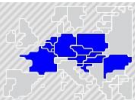
- KPI 9: Average variation of relative RAM before and after NRAO

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

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





Market Impact Assessment

- KPI 10: Most often pre-solved CNECs (top 20 in quarter 1)

CNE	Distinct hours CNE was presolved	Count of hours CNEC was presolved	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max z2zPTDF	Max sum z2zPTDF
[HU-HU] Gonyu - Gyor [DIR]	2157	4019	73.60%	47.36%	110.25%	0.3202	1.4196
[SI-HU] Cirkovce - Heviz [OPP] [HU]	2157	2176	72.49%	50.36%	105.23%	0.2295	1.1615
[SK-SK] Gabčíkovo - P.Biskupice [DIR]	2152	2152	88.28%	67.22%	112.91%	0.3214	1.1992
[SI-HU] Cirkovce - Heviz [DIR] [HU]	2146	2193	105.13%	68.95%	148.47%	0.2295	1.1615
[RO-RO] TR Rosiori 400/220 1 [DIR]	2140	2140	42.99%	5.75%	98.25%	0.1205	0.2293
[SK-HU] Gabčíkovo - Gonyu [DIR] [HU]	2136	2201	86.68%	63.25%	114.66%	0.3201	1.0944
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	2118	2904	109.38%	74.33%	181.02%	0.2314	0.5783
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	2118	2126	65.39%	21.39%	100.27%	0.2314	0.5783
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	2104	3075	70.34%	20.83%	150.67%	0.2182	0.6092
[CZ-SK] Sokolnice - Stupava [DIR] [SK]	2102	2102	81.60%	65.44%	106.57%	0.3096	1.2524
[HU-HU] Gonyu - Gyor [OPP]	2095	2146	108.53%	69.82%	145.56%	0.3202	1.4196
[FR-D7] Vigy - Ensordorf VIGY2 S [DIR] [D7]	2078	2161	68.16%	19.90%	115.39%	0.2192	0.597
[CZ-D2] Hradec - Etzenricht 441 [DIR] [D2]	2063	2090	53.38%	0.14%	104.69%	0.2184	0.9411
[SK-SK] V.Dur - Levice 1 [DIR]	2053	2053	47.31%	12.91%	81.10%	0.2089	0.9298
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	2037	2341	81.26%	0.00%	158.97%	0.1627	0.6093
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	2036	3382	102.30%	0.00%	168.80%	0.2182	0.6092
[SK-HU] R.Sobota - Sajoivanka [DIR] [HU]	2019	2019	78.07%	53.57%	120.29%	0.3111	1.0277
[HR-HU] 400kV Ernestinovo - Pecs 1 [OPP] [HR]	1991	1991	71.18%	40.30%	114.51%	0.2629	0.8475
[CZ-SK] Nosovice - Varin [OPP] [SK]	1987	3619	96.75%	61.90%	137.45%	0.331	1.2586
[SK-HU] Gabčíkovo - Gonyu [OPP] [HU]	1971	3204	87.16%	64.26%	118.27%	0.3201	1.0944

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.

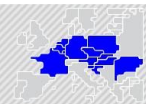
Note 2: RAM for Core exchanges can be higher than 100% due to the relieving effect of Fuaf: $RAM_Core = CEP_target - Fuaf$. So if Fuaf is very negative you can get above 100%.

- KPI 10: Most often pre-solved CNECs (top 20 in quarter 2)

CNE	Distinct hours CNE was presolved	Count of hours CNEC was presolved	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max z2zPTDF	Max sum z2zPTDF
[SK-SK] Gabčíkovo - P.Biskupice [DIR]	2174	2174	88.18%	70.13%	124.30%	0.3736	1.4377
[CZ-SK] Nosovice - Varin [OPP] [SK]	2169	5801	103.77%	66.36%	162.08%	0.4644	1.6801
[FR-D7] Vigy - Ensordorf VIGY2 S [DIR] [D7]	2158	2502	52.56%	17.89%	111.57%	0.2792	0.7469
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	2136	2145	69.79%	31.28%	106.15%	0.2271	0.5761
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	2125	3149	104.45%	62.57%	169.52%	0.2271	0.5761
[CZ-SK] Nosovice - Varin [DIR] [SK]	2091	4560	75.95%	36.91%	116.61%	0.4644	1.6801
[CZ-SK] Sokolnice - Stupava [DIR] [SK]	2062	2191	75.99%	59.60%	108.15%	0.3876	1.5905
[SK-HU] Gabčíkovo - Gonyu [OPP] [HU]	2035	4402	86.40%	64.62%	144.69%	0.4246	1.6421
[RO-RO] TR Rosiori 400/220 1 [DIR]	2034	2072	60.96%	19.25%	118.00%	0.1484	0.3114
[SK-UA] V.Kapusany - Mukachevo (WPS) [DIR] [SK]	2031	2059	88.89%	57.22%	137.41%	0.2513	0.9201
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	2018	2554	62.04%	28.64%	94.30%	0.3855	1.4355
[SK-HU] Gabčíkovo - Gonyu [DIR] [HU]	1986	2801	91.72%	56.46%	137.98%	0.4246	1.6421
[SK-UA] V.Kapusany - Mukachevo (WPS) [OPP] [SK]	1978	3038	87.98%	51.01%	122.06%	0.2513	0.9201
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	1969	4489	61.01%	20.94%	168.16%	0.2606	0.9001
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	1959	2054	67.34%	28.06%	92.35%	0.3937	1.6022
[HU-HU] Gonyu - Gyor [DIR]	1932	4090	73.84%	56.25%	107.00%	0.4417	1.7439
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	1924	4367	113.65%	37.20%	224.03%	0.2606	0.9001
[HU-HU] Gonyu - Gyor [OPP]	1892	2565	113.01%	68.59%	157.18%	0.4417	1.7439
[D8-PL] Mikulowa PST1 [OPP] [PL]	1889	1889	51.88%	23.33%	100.61%	0.4382	1.6078
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	1837	5266	93.73%	8.91%	138.05%	0.362	0.7687

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 10: Most often pre-solved CNECs (top 20 in quarter 3)

CNE	Distinct hours CNE was presolved	Count of hours CNEC was presolved	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max z2zPTDF	Max sum z2zPTDF
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	2208	3207	104.32%	61.23%	209.89%	0.2382	0.5862
[SK-CZ] Krizovany - Sokolnice [OPP] [SK]	2206	2354	93.58%	69.41%	116.45%	0.4234	1.8518
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	2206	2218	71.17%	13.64%	119.52%	0.2382	0.5862
[CZ-SK] Sokolnice - Stupava [DIR] [SK]	2182	2182	78.43%	64.57%	95.02%	0.4215	1.8167
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	2145	5723	57.62%	19.78%	145.73%	0.2615	0.9523
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	2089	4352	118.27%	15.70%	198.62%	0.2615	0.9523
[SK-UA] V.Kapusany - Mukachevo (WPS) [OPP] [SK]	2071	2082	97.70%	50.55%	149.82%	0.2953	1.0608
[SK-SK] V.Dur - Levice 1 [DIR]	2067	2112	45.13%	5.27%	72.73%	0.2847	1.1941
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	2058	2058	58.21%	31.66%	94.56%	0.3815	1.3223
[SI-HU] Cirkovce - Heviz [OPP] [HU]	2055	2055	75.64%	46.75%	108.01%	0.3064	1.269
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	2052	7908	75.72%	19.83%	151.43%	0.3437	0.7526
[SK-SK] Gabčíkovo - P.Biskupice [DIR]	2018	2098	87.04%	64.87%	113.73%	0.3369	1.3696
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	1986	4014	56.96%	19.80%	157.60%	0.292	1.2573
[CZ-SK] Liskovec - P. Bystrica [OPP] [CZ]	1976	1976	101.81%	62.93%	139.77%	0.0891	0.3164
[D8-PL] Mikulowa PST1 [OPP] [PL]	1967	1967	50.93%	19.62%	91.74%	0.4676	1.695
[SK-HU] Gabčíkovo - Gonyu [OPP] [HU]	1941	3987	87.43%	56.68%	148.59%	0.389	1.3162
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	1941	2056	46.31%	19.94%	158.59%	0.2911	0.6879
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	1922	2046	57.90%	27.32%	83.36%	0.3353	1.1366
[PL-PL] Mikulowa AT1 [OPP]	1919	1919	79.30%	50.36%	126.00%	0.1812	0.616
[AT-HU] Neusied - Gyoe 246B [OPP] [AT]	1916	1916	98.10%	20.94%	133.33%	0.0931	0.3633

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.

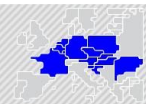
Note 2: RAM for Core exchanges can be higher than 100% due to the relieving effect of Fuaf: $RAM_Core = CEP_target - Fuaf$. So if Fuaf is very negative you can get above 100%.

- KPI 10: Most often pre-solved CNECs (top 20 in quarter 4)

CNE	Distinct hours CNE was presolved	Count of hours CNEC was presolved	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max z2zPTDF	Max sum z2zPTDF
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	2181	3710	113.27%	69.79%	180.75%	0.2123	0.5046
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	2181	2181	56.63%	1.60%	99.73%	0.2123	0.5046
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	2157	3980	58.43%	19.11%	142.18%	0.2335	0.7901
[SK-SK] H.Zdana - Sucany [DIR]	2153	2686	75.23%	65.87%	104.55%	0.274	0.9185
[HU-HU] Gonyu - Gyor [DIR]	2122	3988	72.10%	35.16%	101.81%	0.3077	1.5141
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	2098	2483	115.20%	31.18%	237.87%	0.2335	0.7901
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	2090	4733	88.55%	34.46%	134.81%	0.3833	0.9099
[CZ-SK] Sokolnice - Krizovany [OPP] [CZ]	2086	2126	94.55%	70.27%	111.04%	0.3938	1.6354
[SK-SK] V.Dur - Krizovany [DIR]	2085	2552	82.09%	54.64%	108.04%	0.2665	1.0792
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	2063	2065	50.77%	33.84%	77.42%	0.3233	1.1197
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	2044	3095	59.07%	19.90%	136.20%	0.289	1.2456
[NL-BE] PST Van Eyck 2 [OPP] [BE]	2040	4585	80.20%	33.78%	124.23%	0.593	1.3832
[CZ-SK] Nosovice - Varin [OPP] [SK]	2027	7327	110.18%	69.88%	149.83%	0.4731	1.684
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	2019	2053	39.90%	19.94%	148.72%	0.2768	0.6187
[D8-PL] Mikulowa PST1 [OPP] [PL]	2015	2015	45.05%	23.71%	92.05%	0.3893	1.436
[SI-HU] 400 kV Cirkovce - Heviz [OPP] [SI]	2009	3718	75.14%	42.38%	111.00%	0.2451	0.9132
[CZ-SK] Sokolnice - Stupava [DIR] [CZ]	1995	1995	79.46%	63.71%	103.54%	0.3703	1.4181
[SI-HU] 400 kV Cirkovce - Heviz [DIR] [SI]	1982	3673	103.05%	63.30%	135.17%	0.2451	0.9132
[CZ-SK] Nosovice - Varin [DIR] [SK]	1979	6642	72.89%	50.67%	112.00%	0.4731	1.684
[HR-HU] 400kV Ernestinovo - Pecs 1 [OPP] [HR]	1978	1978	71.83%	44.36%	106.24%	0.2758	0.8874

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 11: Most limiting CNECs (top 20 in quarter 1)

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
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	433	433	1246.47	76.25%	21.59%	113.56%	0.1317
[NL-BE] PST Zandvliet 1 [DIR] [BE]	295	295	378.26	56.61%	11.15%	103.59%	0.4062
[D8-PL] Krajnik - Vierraden 2 [OPP] [PL]	283	283	1513.57	19.69%	0.00%	41.77%	0.3417
[NL-NL] Diemen-Lelystad 380 W [OPP]	279	279	564.94	21.37%	19.97%	47.35%	0.3336
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	276	276	1459.62	27.44%	19.94%	105.13%	0.3036
[CZ-D8] Hradec - Rohrsdorf 446 [OPP] [D8]	262	262	426.24	37.86%	21.88%	61.80%	0.2981
[D7-D7] Buerstadt - Lambsheim BUERST W [DIR]	257	257	907.7	43.03%	29.93%	63.66%	0.1802
[BE-BE] Achene - Gramme 380.10 [OPP]	229	229	477.93	69.58%	33.68%	113.05%	0.3217
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	191	191	1132.58	56.53%	21.39%	94.65%	0.1911
[RO-RO] Resita - Timisoara c1 [DIR]	188	188	2191.34	24.62%	6.15%	54.81%	0.1063
[BE-FR] Achene - Lonny 380.19 [DIR] [BE]	174	174	741.91	61.48%	0.00%	116.65%	0.3214
[RO-RO] TR Rosiori 400/220 1 [DIR]	142	142	1299.05	31.38%	7.75%	63.25%	0.1159
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	140	140	559.96	44.15%	5.47%	65.68%	0.3963
[BE-BE] Doel - Zandvliet 380.25 [OPP]	139	140	434.48	39.88%	20.04%	61.89%	0.4515
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	128	128	688.82	43.95%	22.51%	68.47%	0.3226
[D8-PL] Mikulowa PST1 [OPP] [PL]	126	126	484.47	49.07%	27.35%	75.08%	0.5036
[D7-D7] Y Paffendorf - Oberzier SECHTM S [DIR]	123	123	349.36	63.25%	26.08%	98.85%	0.5457
[SK-SK] V.Dur - Levice 1 [DIR]	121	121	1184.26	38.50%	12.91%	53.32%	0.1935
[D8-D8] Neuenhagen - Vierraden 304 [DIR] [D8]	119	119	911.23	23.91%	19.66%	45.08%	0.0905
[PL-CZ] Kopanina - Liskovec [DIR] [PL]	118	118	1211.43	45.09%	0.00%	77.02%	0.1346

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 MW*0.4 = 1250MW

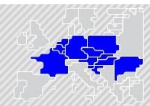
- KPI 11: Most limiting CNECs (top 20 in quarter 2)

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 - Ensordorf VIGY2 S [DIR] [D7]	521	521	421.86	36.81%	17.89%	83.55%	0.2498
[D8-PL] Mikulowa PST1 [OPP] [PL]	254	254	291.34	42.48%	23.33%	87.50%	0.4382
[NL-BE] PST Zandvliet 2 [DIR] [BE]	176	189	897.7	61.59%	27.12%	89.99%	0.4644
[RO-RO] Resita - Timisoara c1 [DIR]	167	167	1996.53	24.60%	0.00%	53.69%	0.1693
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	153	155	1005.64	43.11%	20.94%	88.95%	0.2545
[NL-D2] Meeden-Diele 380 Z [DIR] [NL]	137	137	239.15	66.98%	20.42%	132.29%	0.276
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	137	137	528.54	29.36%	19.85%	87.46%	0.3026
[NL-BE] PST Zandvliet 1 [DIR] [BE]	120	120	304.5	51.53%	17.90%	97.15%	0.4198
[AT-HU] Wien Suedost - Gyoer 245 [DIR] [AT]	90	90	1644.14	61.76%	36.32%	89.32%	0.0743
[RO-RO] TR Portile de Fier 400/220 1 [OPP]	81	81	554.55	24.88%	0.00%	91.20%	0.1974
[D7-D7] Gronau - Gronau TR 441 E [DIR]	66	66	235.4	44.56%	23.07%	75.13%	0.2065
[RO-RO] TR Rosiori 400/220 1 [DIR]	66	66	448.62	49.30%	25.00%	76.50%	0.1481
[NL-NL] Diemen-Lelystad 380 W [OPP]	61	61	595.06	21.50%	19.97%	33.01%	0.2989
[CZ-SK] Nosovice - Varin [DIR] [SK]	61	61	71.42	58.26%	36.91%	72.48%	0.453
[RO-RO] Paroseni - Targu Jiu Nord [OPP]	59	61	2123.3	20.61%	0.00%	37.75%	0.1102
[D8-PL] Mikulowa PST3 [OPP] [PL]	58	58	118.49	32.56%	2.95%	49.32%	0.4406
[CZ-D8] Hradec - Rohrsdorf 446 [OPP] [D8]	55	55	664.27	38.10%	22.45%	62.66%	0.3305
[AT-D2] St. Peter 2 - Pleinting 258 [DIR] [AT]	52	52	134.86	45.78%	19.82%	74.16%	0.1837
[RO-RO] Portile de Fier - Resita c1 [DIR]	48	48	1346.14	26.35%	0.00%	50.74%	0.1049
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	43	43	207.43	42.09%	31.10%	59.88%	0.3848

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 MW*0.4 = 1250MW



- KPI 11: Most limiting CNECs (top 20 in quarter 3)

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]	765	765	785.31	29.89%	19.80%	83.33%	0.2574
[D8-PL] Mikulowa PST1 [OPP] [PL]	279	279	355.4	38.03%	19.62%	74.39%	0.445
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	256	268	588.78	41.65%	19.78%	99.17%	0.2612
[SK-SK] V.Dur - Levice 1 [DIR]	247	247	1526.99	37.07%	5.27%	59.96%	0.2847
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	232	276	206.31	55.45%	19.87%	101.23%	0.2787
[RO-RO] TR Rosiori 400/220 1 [DIR]	206	206	5428.4	32.10%	19.00%	72.75%	0.1248
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	170	190	207.09	49.51%	19.98%	83.20%	0.3361
[NL-D7] Maasbracht - Siersdorf SELFK SW [DIR] [D7]	132	136	332.83	56.53%	29.16%	87.41%	0.3034
[D8-D8] Pasewalk - Vierraden 306 [DIR]	128	128	1654.49	28.69%	19.66%	44.12%	0.1292
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	120	120	629.82	24.22%	19.94%	53.37%	0.291
[BE-BE] Achene - Gramme 380.10 [OPP]	113	113	305.74	74.84%	19.94%	149.23%	0.3004
[NL-D2] Meeden-Diele 380 Z [DIR] [NL]	107	107	488.35	58.88%	19.85%	125.07%	0.2545
[AT-D2] St. Peter 2 - Pleinting 258 [DIR] [AT]	87	94	509.24	54.31%	19.63%	107.89%	0.165
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	80	81	296.75	42.04%	19.80%	96.50%	0.292
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	78	78	408.55	68.71%	19.74%	120.60%	0.1663
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	74	74	273.45	50.72%	20.27%	73.74%	0.3305
[RO-RO] Resita - Timisoara c1 [DIR]	73	75	1164.36	29.90%	20.21%	58.41%	0.1449
[CZ-D8] Hradec - Rohrsdorf 445 [OPP] [D8]	70	70	20548.64	33.18%	18.90%	51.95%	0.3232
[NL-BE] Rilland-Zandvliet 380 W [DIR] [NL]	68	69	259.57	53.21%	20.03%	114.95%	0.5927
[AT-AT] Lienz 2 - Lienz 1 LIRHU43 [OPP]	57	57	24.75	67.01%	20.00%	116.40%	0.1685

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 MW/h/0.4 = 1250MW

- KPI 11: Most limiting CNECs (top 20 in quarter 4)

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
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	522	522	859.77	27.31%	19.94%	85.09%	0.2634
[D8-PL] Mikulowa PST1 [OPP] [PL]	453	453	610.1	39.73%	23.71%	68.03%	0.3893
[RO-RO] TR Rosiori 400/220 1 [DIR]	339	339	1450.8	31.78%	18.75%	63.75%	0.155
[FR-D7] Vigy - Enseldorf VIGY2 S [DIR] [D7]	315	315	482.28	47.69%	19.85%	87.05%	0.2369
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	218	227	393.93	42.39%	19.11%	103.27%	0.2214
[FR-D7] Vigy - Enseldorf VIGY1 N [DIR] [D7]	202	202	315.33	52.33%	19.96%	83.55%	0.24
[SK-SK] V.Dur - Levice 1 [DIR]	199	199	878.05	42.49%	36.35%	51.29%	0.2152
[D8-D8] Neuenhagen - Vierraden 304 [DIR] [D8]	164	164	905.41	34.51%	20.86%	51.80%	0.1006
[BE-FR] Achene - Lonny 380.19 [OPP] [BE]	142	142	152.1	89.24%	48.21%	134.03%	0.3512
[CZ-D8] Hradec - Rohrsdorf 445 [OPP] [D8]	140	140	386.34	37.15%	28.52%	59.79%	0.2906
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	126	126	858.96	63.65%	19.83%	141.93%	0.1618
[SK-HU] Levice - God [DIR] [HU]	112	112	952.97	49.54%	33.57%	71.70%	0.3184
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	104	104	688.18	51.29%	32.31%	74.24%	0.3815
[D8-D8] Pasewalk - Vierraden 306 [DIR]	95	95	1060.92	31.68%	19.90%	45.08%	0.1098
[RO-RO] Resita - Timisoara c1 [DIR]	85	85	1245.8	25.45%	19.79%	51.07%	0.1378
[D2-D2] Altheim - Sittling 219 [OPP]	80	80	1406.15	57.31%	26.37%	93.52%	0.0824
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	80	80	268.45	45.09%	35.93%	59.26%	0.3127
[PL-PL] Krosno Iskrzynia - Tarnow [OPP]	72	72	338.64	44.68%	32.68%	73.88%	0.43
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	50	50	566.39	68.28%	33.42%	91.98%	0.2065
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [OPP]	49	49	105.33	44.86%	20.00%	104.10%	0.2483

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 MW/h/0.4 = 1250MW

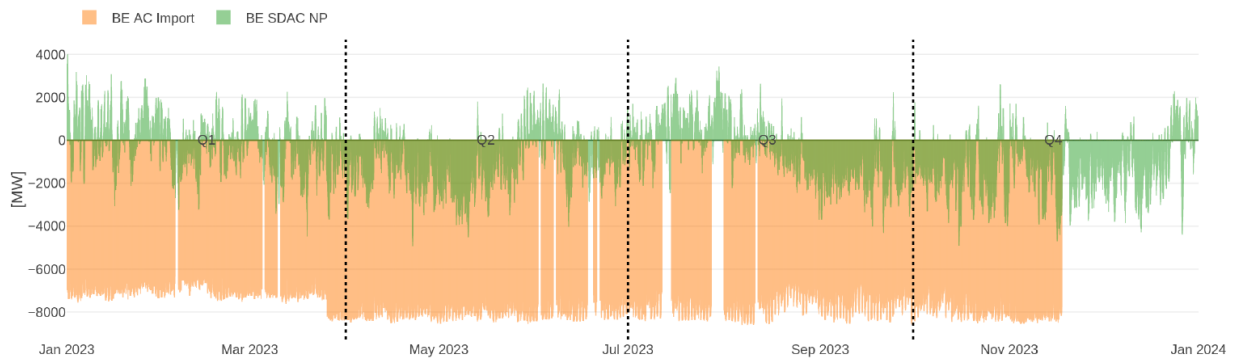


- KPI 12a: Allocation constraints (Belgium)

# MTUs	
AC was Limiting MC	0

BE AC Import [MW]	
Avg.	-6616.13
Min.	-8579.00
Max.	0.00

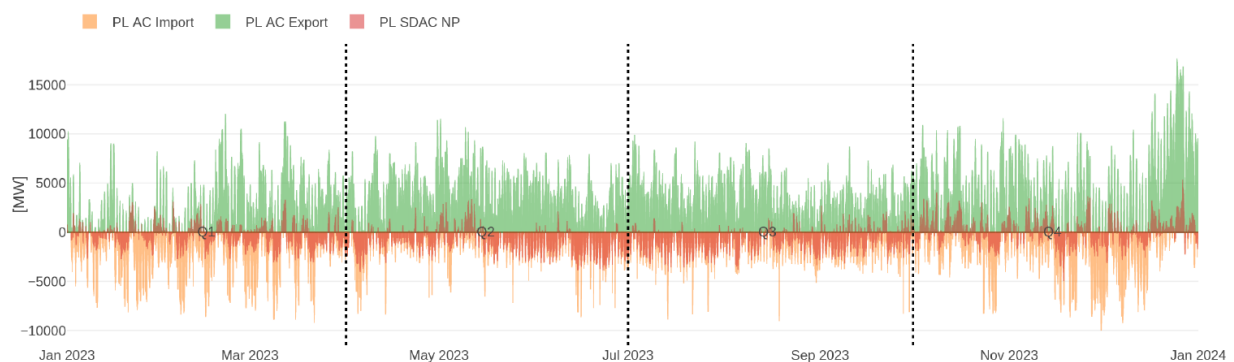
Belgium only uses import allocation constraints

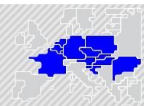


- KPI 12b: Allocation constraints (Poland)

# MTUs	
AC was limiting MC	3956
AC < 0 MW	1580
AC = 0 MW	2200
AC > 0 MW	176

PL AC Import [MW]	PL AC Export [MW]
Avg.	-1502.51 2951.92
Min.	-9960.00 0.00
Max.	0.00 17629.00





Annex 1: Effectiveness of Allocation Constraints and Alternative Solutions to address the underlying operational security limits

Introduction

According to Article 7(3)(b)(i) and (ii) of the DA CCM, as well as the agreement with Core NRAs in Core IG call 20200415, the Core TSOs that use external or allocation constraints need to provide to the CCC as an annex in the annual report the following information:

Expected inputs to be provided by concerned Core TSOs	Condition on which input is expected from concerned Core TSOs
Effectiveness of the allocation constraint in preventing the violation of the underlying operational security limits	Concerned Core TSO uses external- or allocation constraints
Alternative solutions to address the underlying operational security limits	External- or allocation constraint of concerned Core TSO had a non-zero shadow price in more than 0.1% of hours in any of the quarters of the analysed year

This annex contains the required information described above for each concerned Core TSO for which the respective conditions for input provision for the analysed year are met.

Elia

Effectiveness of allocation constraint

During the Core DA CC process, the static voltage and dynamic security issues are not considered during the calculations of capacities, nor in the individual validation of Elia. In order to satisfy static voltage and dynamic security criteria (the BE stability limit), Elia made use of an external constraint in CWE. After the introduction of the ALEGrO cable in the DA CC, the use of an external constraint was replaced by an allocation constraint. For the Core DA CC, this allocation constraint is also used by Elia. The need for such a constraint has been subject of a dedicated study, executed by Elia in 2019. This study has resulted in a path forward on the values of this constraint, starting from 5500MW and going up to 7500MW once the necessary assets for reactive power management are commissioned. The study document [2019_06_13_Scientific foundation 7500MW limit.pdf](#) (provided separately) is adzQAded for extra information. Starting the year 2024, the allocation constraint was removed.

PSE

Effectiveness of allocation constraint

PSE may use an external constraint to limit the import and export of the Polish bidding zone.

Technical and legal justification

Implementation of external constraints as applied by PSE is related to integrated scheduling process applied in Poland (also called central dispatching model) and the way how reserve capacity is being procured by PSE. In a central dispatching model, in order to balance generation and demand and ensure secure energy delivery, the TSO dispatches generating units taking into account their operational constraints, transmission constraints and reserve capacity requirements. This is realised in an integrated scheduling process as a single optimisation problem called security constrained unit commitment (SCUC) and economic dispatch (SCED).

The integrated scheduling process starts after the day-ahead capacity calculation and SDAC and continues until real-time. This means that reserve capacity is not blocked by TSO in advance of SDAC and in effect not removed from the wholesale market and SDAC. However, if balancing service providers (generating units) would already sell too much energy in the day-ahead market because of high exports, they may not be able to provide sufficient upward reserve capacity within the integrated scheduling process.² Therefore, one way to ensure sufficient reserve capacity within integrated scheduling process is to set a limit to how much electricity can be imported or exported in the SDAC.

The objective to limit balancing service providers to sell too much energy in the day-ahead market in order to be able to provide sufficient reserve capacity in the integrated scheduling process cannot be efficiently met by translating this limit into capacities of critical network elements offered to the market. If this limit was to be reflected in cross-zonal capacities offered by PSE in the form of an appropriate adjustment of cross-zonal capacities, this would imply that PSE would need to guess the most likely market direction (imports and/or exports on particular interconnectors) and accordingly reduce the cross-zonal capacities in these directions. In the flow-based approach, this would need to be done on each CNEC in a form of reductions of the RAM. However, from the point of view of market participants, due to the inherent uncertainties of market results, such an approach is burdened with the risk of suboptimal splitting of allocation constraints onto individual interconnections – overestimated on one interconnection and underestimated on the other, or vice versa. Also, such reductions of the RAM would limit cross-zonal exchanges for all bidding zone borders having impact on Polish CNECs, whereas the allocation constraint has an impact only on the import or export of the Polish bidding zone, whereas the trading of other bidding zones is unaffected.

External constraints are determined for the whole Polish power system, meaning that they are applicable simultaneously for all CCRs in which PSE has at least one bidding zone border (i.e. Core, Baltic and Hansa). This solution is the most efficient application of external constraints. Considering allocation constraints separately in each CCR would require PSE to split global external constraints into CCR-related sub-values, which would be less efficient than maintaining the global value. Moreover, in the hours when Poland is unable to absorb any more power from outside due to violated minimal downward reserve

² This conclusion equally applies for the case of lack of downward balancing capacity, which would be endangered if balancing service providers (generating units) sell too little energy in the day-ahead market, because of too high imports.



capacity requirements, or when Poland is unable to export any more power due to insufficient upward reserve capacity requirements, Polish transmission infrastructure is still available for cross-border trading between other bidding zones and between different CCRs.

Methodology to calculate the value of external constraints

When determining the external constraints, PSE takes into account the most recent information on the technical characteristics of generation units, forecasted power system load as well as minimum reserve margins required in the whole Polish power system to ensure secure operation and forward import/export contracts that need to be respected from previous capacity allocation time frames.

External constraints are bidirectional, with independent values for each DA CC MTU, and separately for directions of import to Poland and export from Poland.

For each hour, the constraints are calculated according to the below equations:

$$EXPORT_{constraint} = P_{CD} - (P_{NA} + P_{ER}) + P_{NCD} - (P_L + P_{UPres}) \quad (1)$$

$$IMPORT_{constraint} = P_L - P_{DOWNres} - P_{CDmin} - P_{NCD} \quad (2)$$

Where:

P_{CD}	Sum of available generating capacities of centrally dispatched units as declared by generators ³
P_{CDmin}	Sum of technical minima of available centrally dispatched generating units
P_{NCD}	Sum of schedules of generating units that are not centrally dispatched, as provided by generators (for wind farms: forecasted by PSE)
P_{NA}	Generation not available due to grid constraints (both planned outage and/or anticipated congestions)
P_{ER}	Generation unavailability's adjustment resulting from issues not declared by generators, forecasted by PSE due to exceptional circumstances (e.g. cooling conditions or prolonged overhauls)
P_L	Demand forecasted by PSE
P_{UPres}	Minimum reserve for upward regulation
$P_{DOWNres}$	Minimum reserve for downward regulation

For illustrative purposes, the process of practical determination of external constraints in the framework of the day-ahead capacity calculation is illustrated below in Figures 1 and 2. The figures illustrate how a forecast of the Polish power balance for each hour of the delivery day is developed by PSE in the morning of D-1 in order to determine reserves in generating capacities available for potential exports and imports, respectively, for the day-ahead market.

External constraint in export direction is applicable if $\Delta Export$ is lower than the sum of cross-zonal capacities on all Polish interconnections in export direction. External constraint in import direction is applicable if $\Delta Import$ is lower than the sum of cross-zonal capacities on all Polish interconnections in import direction.

³ Note that generating units which are kept out of the market on the basis of strategic reserve contracts with the TSO are not taken into account in this calculation.

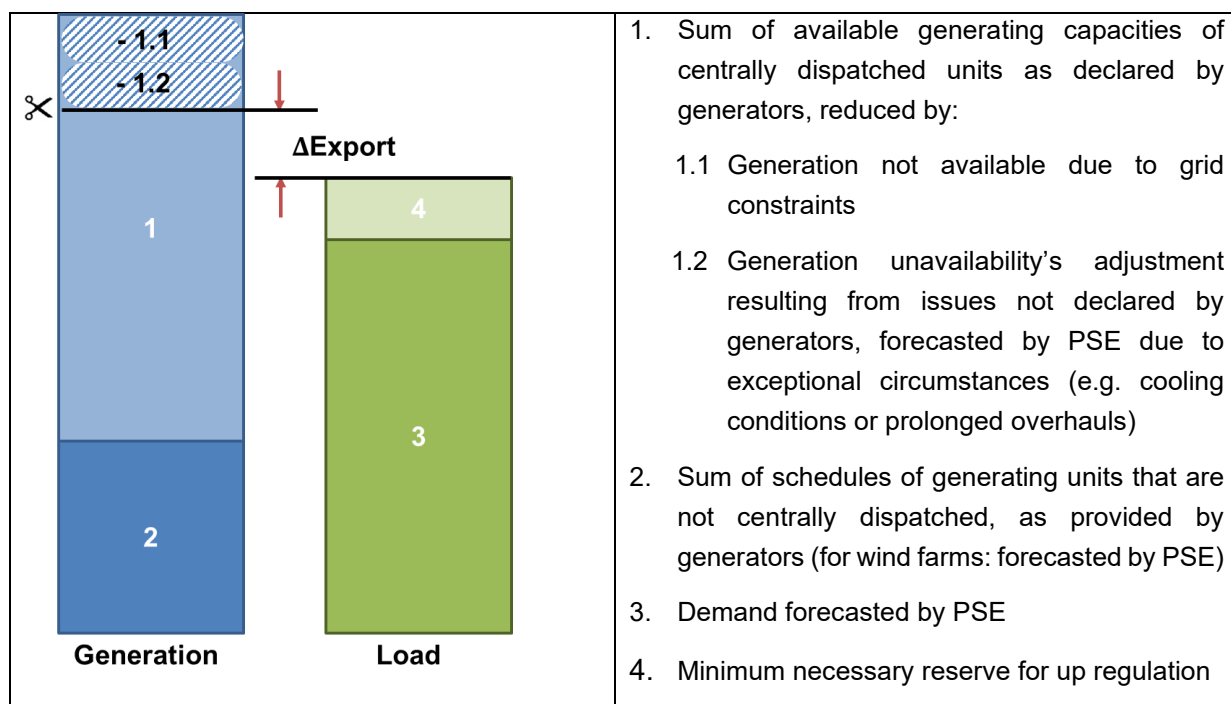


Figure 1: Determination of external constraints in export direction (generating capacities available for potential exports) in the framework of the day-ahead capacity calculation.

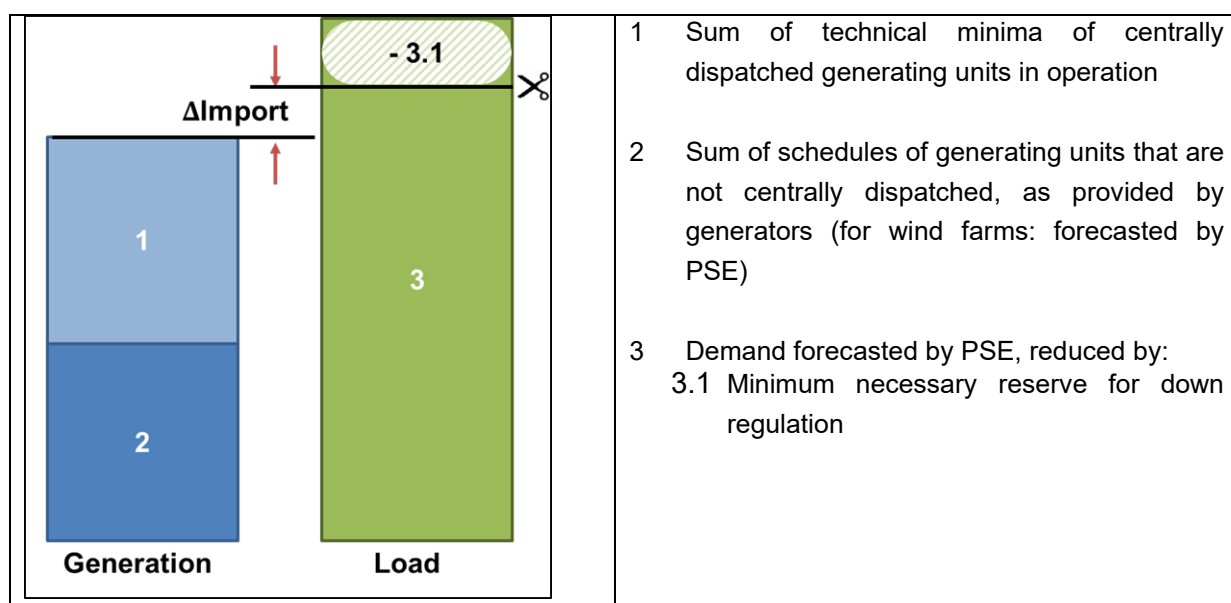


Figure 2: Determination of external constraints in import direction (reserves in generating capacities available for potential imports) in the framework of the day-ahead capacity calculation.

Frequency of re-assessment

External constraints are determined in a continuous process based on the most recent information, for each capacity allocation time frame, from forward till day-ahead and intra-day. In case of day-ahead process, these are calculated in the morning of D-1, resulting in independent values for each DA CC MTU, and separately for directions of import to Poland and export from Poland.



Time periods for which external constraints are applied

As described above, external constraints are determined in a continuous process for each capacity allocation timeframe, so they are applicable for all DA CC MTUs of the respective allocation day.

Alternative solutions to address the underlying operational security limits

Please find more information separately in the file [Impact of Polish Allocation Constraints in 2023 - PSE ES.pdf](#), which contains an analysis of Polish Allocation Constraints prepared by PSE (comparison of historical data and simulations with no Allocation Constraint).



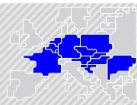
Annex 2: Detailed reasons for Data Quality Indicators Breaches and Action Plans

Introduction

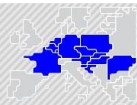
According to Article 26(d) of the DA CCM, the Core TSOs that did not fulfil the ambition levels of the defined Data Quality Indicators (DQI) need to provide to the CCC the detailed reasons for the failure as well as action plans to correct past failures and prevent future failures. This information shall be included in the annual report.

Data quality Indicators breaches for 2023 and action plans overview

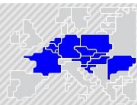
Party	BD	DQI breach category	MTUs with DQI breach	Cause	Mitigation	Corrective Action	Corrective action live since
TSCNET	03/02/2023	NRAO results were not applied	1, 24	The GROM tasks for dedicated TS failed due to insufficient resources	N/A	Environment reconfiguration with Increase of RAM capacity	17/05/2024
Coreso	03/02/2023	NRAO results were not applied	1 to 24	Castor faile due to IT infrastructure issue. The RAO step was skipped per request	N/A	Software patched	28/03/2024
Coreso	11/02/2023	NRAO results were not applied	1 to 24	RAO requests not acknowledged. The RAO step was skipped per request	N/A	Software patched	28/03/2024
TSCNET	18/02/2023	NRAO results were not applied	1	The GROM tasks for dedicated TS failed due to insufficient resources	N/A	Environment reconfiguration with Increase of RAM capacity	17/05/2024
TSCNET	20/02/2023	NRAO results were not applied	1 to 24	TSCNET NRAO tool worked correctly sending NRAO results, communication issues identified on Core ECP endpoint side	N/A	Configuration adjustments on network load balancer	28/07/2024
Coreso	20/02/2023	NRAO results were not applied	1 to 24	Castor faile due to IT infrastructure issue. The RAO step was skipped per request	N/A	Software patched	28/03/2024



TENNET NL	08/05/2023	IGM Replacement	1 to 24	Tool failure	Restart	Root cause of failure was adressed	22/05/20230
TENNET NL	09/05/2023	IGM Replacement	1	Tool failure	Restart	Root cause of failure was adressed	22/05/20230
TENNET NL	10/05/2023	IGM Replacement	1 to 24	Tool failure	Restart	Root cause of failure was adressed	22/05/20230
TENNET NL	12/05/2023	IGM Replacement	1 to 24	Tool failure	Restart	Root cause of failure was adressed	22/05/20230
TENNET NL	20/05/2023	IGM Replacement	1 to 24	Tool failure	Restart	Root cause of failure was adressed	22/05/20230
TENNET NL	21/05/2023	IGM Replacement	1 to 24	Tool failure	Restart	Root cause of failure was adressed	22/05/20230



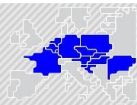
Creos	07/08/2023	IGM Replacement	1 to 24	Xchange server; transmission problem ; root cause not tangible	restart of Server	N/A	07/08/2023
Creos	08/08/2023	IGM Replacement	1 to 24	Xchange server ; transmission mproblem root cause not tangible	restart of Server	N/A	07/08/2023
TENNET NL	19/09/2023	IGM Replacement	1 to 24	Tool failure	Restart	Root cause of failure was adressed	19/09/2023
MAVIR	19/09/2023	IGM Replacement	1 to 24	Tool failure	Restart	N/A	19/09/2023
MAVIR	22/09/2023	IGM Replacement	24 to 24	Tool failure	Restart	N/A	22/09/2023
MAVIR	22/09/2023	IGM Replacement	1 to 24	Tool failure	Restart	N/A	23/09/2023



TENNET NL	25/09/2023	IGM Replacement	1 to 24	Tool failure	Restart	Root cause of failure was addressed	25/09/2023
Coreso as CCCt operator	22/10/2023	DFP	24	Pre-Final FB Computation “Empty FB domain detected”. Root cause ECP connection issue The condition for application of is that spanning computation can be computed only in case one or two consecutive timestamps fail in normal computation and there are surrounding timestamps with success in normal computation. This condition cannot be satisfied for the first or last timestamp because there is at most one surrounding successful timestamp computation. Hence, the 24th timestamp defaulted to regular computation due to this limitation.	The issue was solved by maintenance support	N/A	23/10/2023
Creos	08/12/2023	IGM Replacement	1 to 24	The setting of allowable difference between the market schedules and system calculation was exceeded , thus leading to a blockage of file (DACF,D2CF) generation	Re-Adjustement of parameter needed	The problem was solved by increasing this (Delta) parameter	15/12/2023
Creos	09/12/2023	IGM Replacement	1 to 24	The setting of allowable difference between the market schedules and system calculation was exceeded , thus leading to a blockage of file (DACF,D2CF) generation	Re-Adjustement of parameter needed	The problem was solved by increasing this (Delta) parameter	15/12/2023
Creos	12/12/2023	IGM Replacement	1 to 24	The setting of allowable difference between the market schedules and system calculation was exceeded ,	Re-Adjustement	The problem was solved by increasing this (Delta) parameter	15/12/2023



				thus leading to a blockage of file (DACF,D2CF) generation	of parameter needed		
Creos	13/12/2023	IGM Replacement	1 to 24	The setting of allowable difference between the market schedules and system calculation was exceeded , thus leading to a blockage of file (DACF,D2CF) generation	Re-Adjustement of parameter needed	The problem was solved by increasing this (Delta) parameter	15/12/2023
Creos	14/12/2023	IGM Replacement	1 to 24	The setting of allowable difference between the market schedules and system calculation was exceeded , thus leading to a blockage of file (DACF,D2CF) generation	Re-Adjustement of parameter needed	The problem was solved by increasing this (Delta) parameter	15/12/2023



Annex 3: Quality of data published - Raw survey results

Survey Question	Answer #1	Answer #2	Answer #3	Answer #4
Which category of stakeholders do you belong to? - category of stakeholder	Regulator	TSO	Industry	Energy Trader
If in the previous question you indicated "Other", please specify - Views				
I want my answer to remain anonymous. If you tick this box, we will publish your comments but we will not publish your name and organisation. - Anonymity	No	Yes	No	No
I want my answer to remain confidential - If you tick this box, we will not publish your answer to this consultation - Confidentiality	No	No	No	No
Publication Tool Handbook: How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	5	1	5	5
Monitoring Tool: How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	5		5	5
Core Market View - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	3	2	5	5
Core Market Graphs - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	2	5	5



Core Map - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	2	5	5
Border Data Overview - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	2	5	5
Max Net Positions - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	5	3	5	5
Max Exchanges (MaxBex) - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	5	3	5	5
Initial Comp.(VirginDomain) - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	2	5	5
Remedial Actions Preventive - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	1	5	5



Remedial Actions Curative - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	1	5	5
Validation Reductions - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	5	1	5	5
Pre-Final (EarlyPub) - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	3	5	5
LTN - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	2	5	5
Final Computation - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	5	4	5	5
LTA - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	3	5	5



Final Bilateral Exchange Restrictions - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	2	1	5	5
Allocation Constraints - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	3	5	5
D2CF - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	4	5	5
Refprog - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	1	5	5
Reference Net Position - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	1	5	5
ATCs on CORE external borders - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	1	5	4



ShadowAuction ATC - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	1	5	5
ShadowPrices - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	1	5	5
Congestion Income - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	3	5	4
Scheduled Exchanges - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	5	4	5	5
Net Position - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	5	2	5	5
Intraday ATC - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	3	5	5



Intraday NTC - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	3	5	5
Price Spread - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	4	5	5
Spanning/DFP - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	4	5	5
Publication Tool Handbook: How would you rate the clarity and completeness of the information included in the Publication Tool Handbook, with 1 being not clear at all and 5 being very clear? - rate the clarity and completeness	4	2	3	3
Monitoring Tool: How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	4		3	3
Core Market View - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	3	2	5	4



Core Market Graphs - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	2	5	3
Core Map - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	2	5	5
Border Data Overview - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	2	4	3
Max Net Positions - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	5	5	4
Max Exchanges (MaxBex) - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	5	5	5



Initial Comp.(VirginDomain) - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		3	3
Remedial Actions Preventive - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	2		4	3
Remedial Actions Curative - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	2		4	4
Validation Reductions - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	4		3	3
Pre-Final (EarlyPub) - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		4	4



LTN - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	3	5	5	5
Final Computation - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		4	4
LTA - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	3	5	5	5
Final Bilateral Exchange Restrictions - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	2		5	3
Allocation Constraints - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		5	5



D2CF - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	3	5	4
Refprog - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		4	4
Reference Net Position - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		5	5
ATCs on CORE external borders - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		4	5
ShadowAuction ATC - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		4	5



ShadowPrices - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	2	5	5
Congestion Income - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	4	4	3
Scheduled Exchanges - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5		5	5
Net Position - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	5	5	5
Intraday ATC - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	4		4	5



Intraday NTC - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	4		4	5
Price Spread - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	5	5	5
Spanning/DFP - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	5	2	4	5



Your feedback on the tools and pages - Any feedback on highlighting good practices or examples?

EDF welcomes this annual survey about the quality of the provided data and the easy-of-use of data retrieval on the JAO platform.

EDF would like to share some observations regarding the data available on the JAO platform:

- Sometime data are indicated as published but the corresponding fields are empty. A recent example is the publication of the flow-based domains on day-ahead on Monday the 24th of June for delivery the 25th of June. Initially, the fields were empty.
- EDF observes differences

The Monitoring tool serves as a useful means to efficiently monitor the available data. The clarity is ok, but on some business days the output were wrong and mislead market participants. We need to be able to rely on this published data.

Core market graphs: the option to zoom (located in the top right corner) and select zones of interest is a useful feature.

Pre-Final (EarlyPub): timeline of publication should be respected as it is not always the case. Also there is a strong need for communication when the process is late (current communication missing).

Final computation: timeline of publication should be respected as it is not always the case. Also there is a strong need for communication when the process is late (current communication missing).



			between data published on the different publication tools of JAO and the same data published on ENTSO-E platform. Differences has been detected regarding final ATC for SIDC and the ATC for IDA2 from ENTSO-E.	
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<p>Your feedback on the tools and pages - Any comments or suggestions for improvement?</p>		<p>sometimes it's hard to find answers why you are published 'exactly those' data. Publication Handbook doesn't provide enough information on how certain groups of data interact with other groups of data.</p>	<p>EDF would like to share some suggestions regarding:</p> <ul style="list-style-type: none"> • Publication tool handbook: the inclusion of long-term allocation should be clarified. Indeed, the definition of the proposed indicators could be more described. • Regarding data that are input for calculation processes: these data are published as soon as the result of the calculation process is available. EDF regrets that the input data are not published sooner. • The warning regarding the final bilateral exchanges could be more visible on the dedicated 	<p>Monitoring tool: It appears that there are still some issues with the monitoring tool, such as cases where the status remains "Expected" even though the data is already present, or where the status shows "Received" but part of data is missing .</p> <p>Proposed improvements:</p> <ul style="list-style-type: none"> • Report (as in the handbook) the expected time of publication for each item. • Moreover, adding more information in the "Follow up action initiated" column would be helpful to understand the actions taken on the reported issues. For instance, including details about the type of issue (simple delay, IT failure,...) and whether there is active work ongoing to solve the issue. These improvements would enhance the usability of the monitoring tool and help users to effectively track the status of the items. <p>Core market view: it would be useful to give a short description of what the "tests" do directly on the</p>
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			<p>JAO page.</p> <ul style="list-style-type: none">• LTA section: a publication of the LTA after each monthly auction results is needed.• Curtailments: a dedicated section for curtailments, including the non-CORE borders is needed.	<p>page (currently users must refer to the handbook)</p> <p>Core market graphs: An interactive graph would be a valuable addition to the current display format. Users could benefit from features such as the ability (directly from the graph) to select or deselect borders, zoom in and out, and dynamically view values by hovering the mouse over the lines. Being able to directly save the charts would also be welcomed.</p> <p>Max net positions: the explanation of how Max Net Positions are obtained could be improved, particularly in terms of providing a high-level overview of the calculation.</p> <p>MaxBex: The explanation of how these are obtained could be improved, particularly in terms of providing a high-level overview of the calculation.</p> <p>Initial Comp.(VirginDomain): we understand that the Initial Comp. is based on the F_{ref_init} and that F_{ref} does not exist at this point</p>
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				<p>because it is a product of the NRAO phase performed later in the process. However, a column F-ref is shown in the publication tool (values=f_ref_init) but this is not reported in the handbook under section 5.7. Would be useful to clarify this aspect.</p> <p>Remedial Actions Preventive: replace the term "Parameters" in the right-hand side section by a term that reflects more adequately what the numerical values "baseline" & "after NRAO" refer to.</p> <p>Remedial Actions Curative: as of today, it seems only the CNEC & cRA#1 names are given, both baseline & NRAO columns remain empty. Difficult to find any useability of this page with the limited amount of information available.</p> <p>Validation Reductions: TSOs seem not to use all the fields in a standardized way, sometimes the information is all contained in the justification column, sometimes in the extra NP</p>
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				<p>columns . The handbook is also not up to date and does not include a description of all the columns of this page.</p> <p>Pre-Final (EarlyPub): the calculation of minRAM_target_Core% is difficult to comprehend, and the values displayed still haven't been fixed. A clearer explanation is needed, particularly regarding the relationship between R_amr and minRAM_target_Core. Furthermore, the labeling "R_amr" and "minRAM for Core target" is confusing, and a better naming structure would be preferable.</p> <p>LTN: the explanation of LTN could be clearer. It is our understanding that LTN refers to long-term capacity that has been physically nominated, and this is currently only applicable to HR-SI: it may be useful to detail further the fact that only borders with PTRs are shown.</p> <p>Final computation: we propose two modifications</p>
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				<p>to the PTDF Final Computation:</p> <ul style="list-style-type: none">• Add a new column indicating if the CNEC (Critical Network Element Constraint) meets the maxz2z threshold of 5% (boolean or checkmark). This provides better transparency to MPs and NRAs and helps understand which CNECs has been retained despite not meeting the threshold.• Introduce another column to classify whether the element is a CNEC (Critical Network Element Constraint) and MNEC (Monitored Network Element Constraint) elements. This will facilitate the filtering by MPs. <p>LTA: it could be very useful to add a graph view</p> <p>Final Bilateral Exchange Restrictions: as indicated in the publication handbook, if the DA CC fails, the default FB parameters are utilized. In such a case, the description suggests the values may not always correspond to the standard LTN-adjusted LTAs of</p>
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				<p>normal operation days. It would be advantageous to include a message stating whether DFP is in force directly on this page, and add a description of modifications applied on the standard domain. It would be very important to add a “curtailment” section.</p> <p>ATCs on CORE external borders: it could be very useful to add a graph view.</p> <p>Shadow prices: we would welcome adding in the handbook a description of the precise formula used to compute the maxZ2Zptdf displayed on this page (since the official CCM formula has been amended a few times it is not always clear to use whether the actual formula behind this column has also evolved over time).</p> <p>Scheduled exchanges: it could be very useful to add a graph view.</p> <p>Net position: it could be very useful to add a graph view.</p>
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				<p>Intraday NTC: on some days, the Intraday NTC was not published, which then implied the need for market participants to perform manual calculation from Intraday ATC and Scheduled exchanges. . It could be very useful to add a graph view.</p> <p>Price spread: it could be very useful to add a graph view.</p> <p>Spanning/DFP: It would be helpful to include additional information in the publication handbook about what the Default FB Parameters actually entail (or a link to the associated documentation). In addition, when DFP is applied, the “synthetic” PTDFs based on OMW max import/export are not reported for all computations (initial/pre-final/final). One such example is on BD 2024-06-25. All 3 publications are described as DFP, but the Pre-Final does not contain the data (it is empty).</p> <p>Two items, namely Active</p>
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				FB Constraints and Active LTA Constraints are referenced in the Handbook but are not (yet?) published on the API.
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Navigation, Downloading of data (on ease-of-use of data retrieval - manual, Art. 26(3)(b)): How often do you use the navigation and downloading functionalities from JAO Publication Tool on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	5	3	5	5
API (on ease-of-use of data retrieval - automated, Art. 26(3)(b)): How often do you use the API from JAO Publication Tool on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	3	1	5	5
Navigation, Downloading of data (on ease-of-use of data retrieval - manual, Art. 26(3)(b)): How would you rate the ease-of-use of navigation among the different pages from the JAO Publication Tool and downloading of data on a scale from 1 to 5, with 1 being not clear at all and 5 being very clear? - Views	4	3	5	3
API (on ease-of-use of data retrieval - automated, Art. 26(3)(b)): How would you rate the ease-of-use of the API on a scale from 1 to 5, with 1 being not clear at all and 5 being very clear? - Views	4		5	5



Your Feedback - Any feedback on highlighting good practices or examples for the navigation, downloading of data or the API?

EDF would like to mention that in general the API works well, and the handbook gives enough information about it. However, there are few things that we would like to add:

1. A notification about any change in the API could be published and informed to the users in advance. As an example, the threshold on the number of API calls per second was implemented without prior information.
2. The API guide could be kept up to date with such information that could impact data extraction or causes any

The addition of filters for in-page navigation & data download is also appreciated.

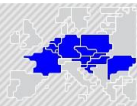
The option to test the API queries directly on the webpage is a very useful feature.

We would like to add:

1. A notification about any change in the API in advance. E.g. the threshold on the #of API calls per second was implemented without prior information.
2. The API guide could be kept up to date with such information that could impact data extraction or causes any changes in the way data is delivered. E.g. the threshold on #of calls
3. The response from API could contain PublishTime value to help the users know at what time the data got updated/published on the API



			<p>changes in the way data is delivered (example: the threshold on number of calls).</p> <p>3. The response from API could contain PublishTime value to help the users know at what time the data got updated/published on the API.</p>	
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<p>Your Feedback - Any comments or suggestions for improvement of the navigation, downloading of data or the API?</p>	<p>I would be very valuable to be able to download data from the publication tool with filtered parameters (for instance to be able to download only pre-solved CNECs or a specific TSO CNECs).</p>		<p>EDF would like to stress the following points:</p> <ul style="list-style-type: none">• The need for visibility on the future development of the API is essential: call signature, authentication, if necessary, ...• The need for clarity between the operational functions and the ones that are at a development stage (as an example, in parallel run).• On the navigation pages several days can be downloaded but the file is divided per day. A unique file with all data could be useful.	<p>A point of attention also raised to Core TSOs relate to the golive of the IDA and of the new "CoreID CCR" page. On go-live day, users found out that the overall structure, naming and url of the published items had been changed compared to the parallel run endpoint previously communicated. This forced users to apply last-minute fixes to correctly retrieve the data. In the future, we hope such changes are performed ahead of go-live and that a warning is sent.</p> <p>We believe that it would be beneficial to emphasize the "CWE-timezone" even further, despite it already being displayed above the hour selection bar on the left. This is particularly important given that the API operates on UTC.</p> <p>Additionally, a dedicated tab or link towards the relevant parameters/datasets published on the main JAO website (Ramr DA & ID, SGM ...)which are not currently easily accessible, would be beneficial for</p>
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				<p>users.</p> <p>Currently, accessing the API tester at https://publicationtool.jao.eu/core/api requires either manually changing the url or using the link in the publication handbook, which can be inconvenient. It would be helpful to have an additional tab labeled "API" in the publication tool for easy access to these examples.</p>
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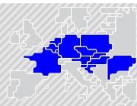
Static Grid Model: How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	1	1	4	5
Operational KPI reports: How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	3	1	1	
Monthly DQI reports: How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	2		1	
Quarterly reports: How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	4	3	1	
How often do you use the following publications a scale from 1 to 5? - m - Annual reports	3	4	1	
Static Grid Model: How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	3		3	1



Operational KPI reports: How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	4		1	3
Monthly DQI reports: How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	3		1	3
Quarterly reports: How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	3	4	1	3
How would you rate the clarity and completeness of the information included in the publication, with 1 being not clear at all and 5 being very clear? - I - Annual reports	3	4	1	3
Your Feedback - Any feedback on highlighting good practices or examples for any of the publications?			EDF regrets that the accurate localisation of the nodes is not available on the JAO platform. These data are essential to simulate the complete network.	Static Grid Model: the addition of the changelog has been very welcomed by market participants.



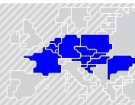
<p>Your Feedback</p> <p>- Any comments or suggestions for improvement for any of the publications?</p>				<p>Static Grid Model: not solely related to this page, but ensuring consistency in element names across publications (SGM, CNE names, KPI reports, intermediate ID domains, etc...) is key to provide optimal traceability.</p> <p>Operational KPIs reports: the page does not seem of use anymore (last ppt from 11/2022), KPIs are rather reported monthly in the DQI reports below. Could be useful to highlight if MPs should follow this page at all.</p> <p>Monthly and Quarterly DQI reports: it would be preferable if the attachments section were located at the top of the page rather than requiring the user to scroll down.</p>
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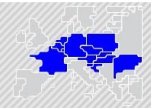
<p>What general feedback or suggestions do you have for improving the data published on JAO webpages? - Views</p>	<p>One suggestion not directly linked to the publication tool: adding the possibility to filter by TSO or borders the message board</p>		<p>Overall, the data published by Jao is of good quality, with some inconsistencies due to the heterogeneity of TSO.</p> <p>Below some suggestions on what is published, and what is not:</p> <p>Data published by Jao:</p> <ul style="list-style-type: none"> Occasionally substation names are wrong (e.g. "Sreys" instead of "Creys", "genissiat instead of "Genissiat Poste") The grid map HTML looks very old and should be upgraded (on the same pattern as the remark on more info on nodes) Filtering on the website could be made more 	<p>Market participants would like to thank JAO & the TSOs for the recent improvements to the publication tool and its handbook, as well as for giving users the opportunity to provide their feedback.</p> <p>Going forward, we would welcome the addition of new tabs/links on the webpage to connect with external documents or pages (SGM, API tester, intraday files, etc) which facilitates the access. For the PTDF, it would also bring clarity to highlight which elements are true CNECs and which are not, and whether the 5% threshold is reached.</p> <p>We also proposed above some minor improvements of the handbook.</p> <p>It is important that all data are published on time and respect public deadlines. Also, before published, all data should be complete.</p>
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			<p>precise</p> <ul style="list-style-type: none">• The explicit names are often not consistent, e.g., the same line is called Wien SudOst – Gyor by Apg but Wien – Gyor by Mavir. <p>Data not published by Jao :</p> <ul style="list-style-type: none">• We need the full grid (including the CNEs that fall below the 5% threshold) every day, at least for the FINAL_PUBLICATION• Before regions Core and Italy-North are merged, the operation of the FR-IT DC cable needs to be clarified• The GSK methodology needs to be revised for a grid with less and less thermal.	
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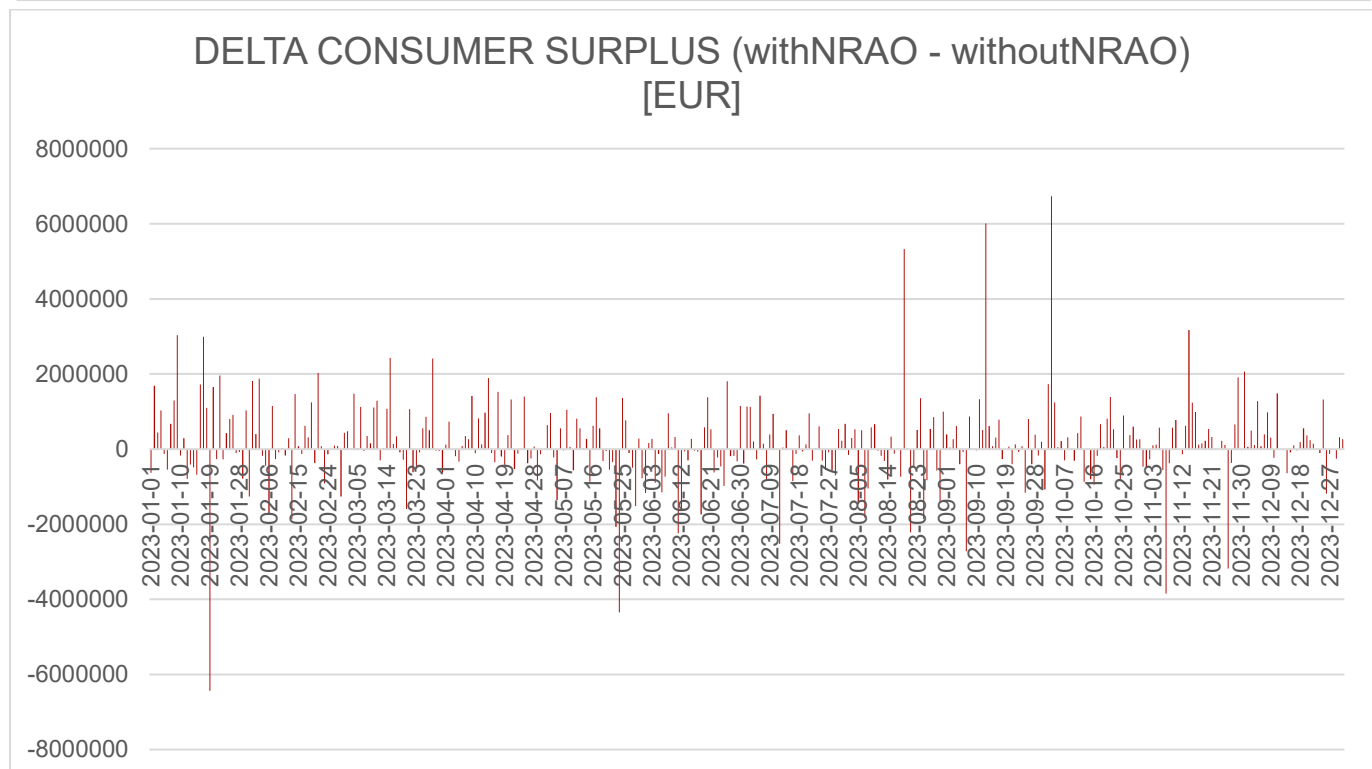
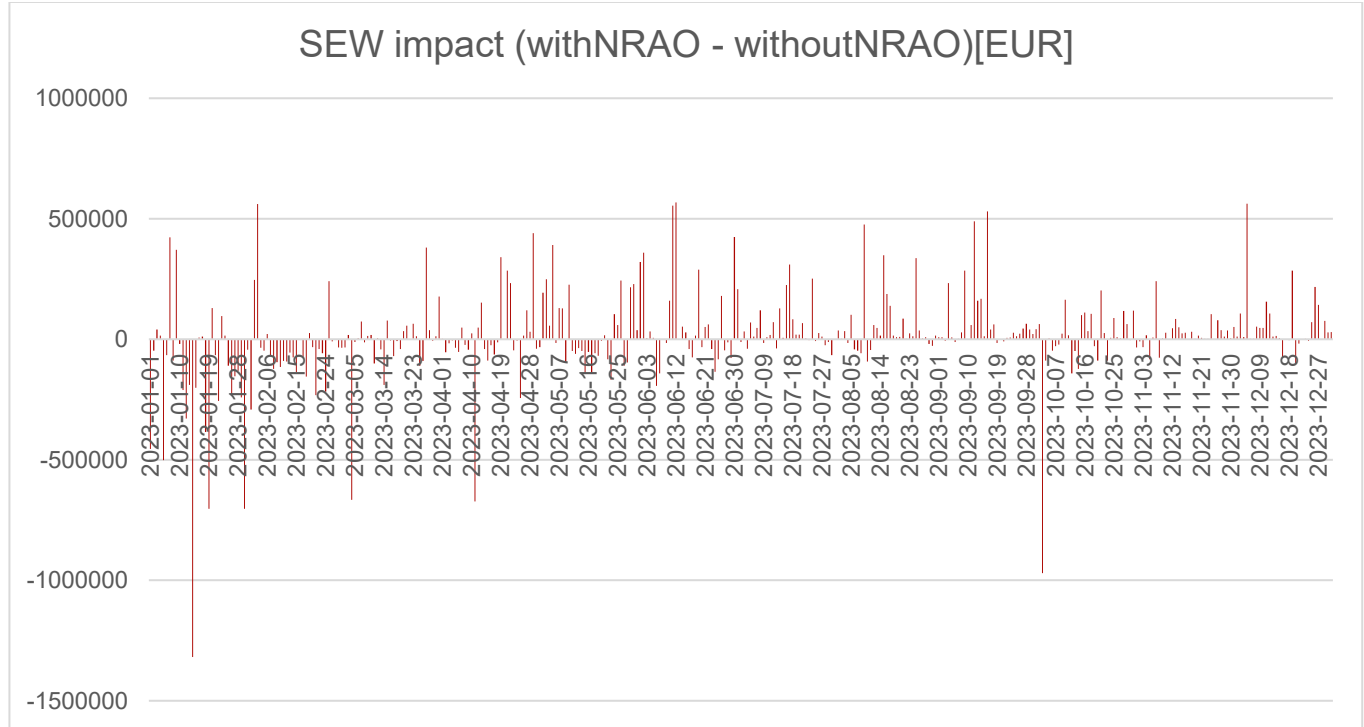


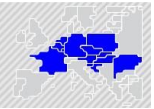
What general feedback or suggestions do you have for improving the format of this survey? - Views				None
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Activity State	open	open	open	open
Citizen Space Version	v7.44.0	v7.44.0	v7.49.0	v7.49.0
Visited Pages - Introduction	Introduction	Introduction	Introduction	Introduction
Visited Pages - Data published on JAO	Data published on JAO	Data published on JAO	Data published on JAO	Data published on JAO
Visited Pages - Ease-of-use of data retrieval	Ease-of-use of data retrieval	Ease-of-use of data retrieval	Ease-of-use of data retrieval	Ease-of-use of data retrieval
Visited Pages - Regular publications or reports	Regular publications or reports	Regular publications or reports	Regular publications or reports	Regular publications or reports
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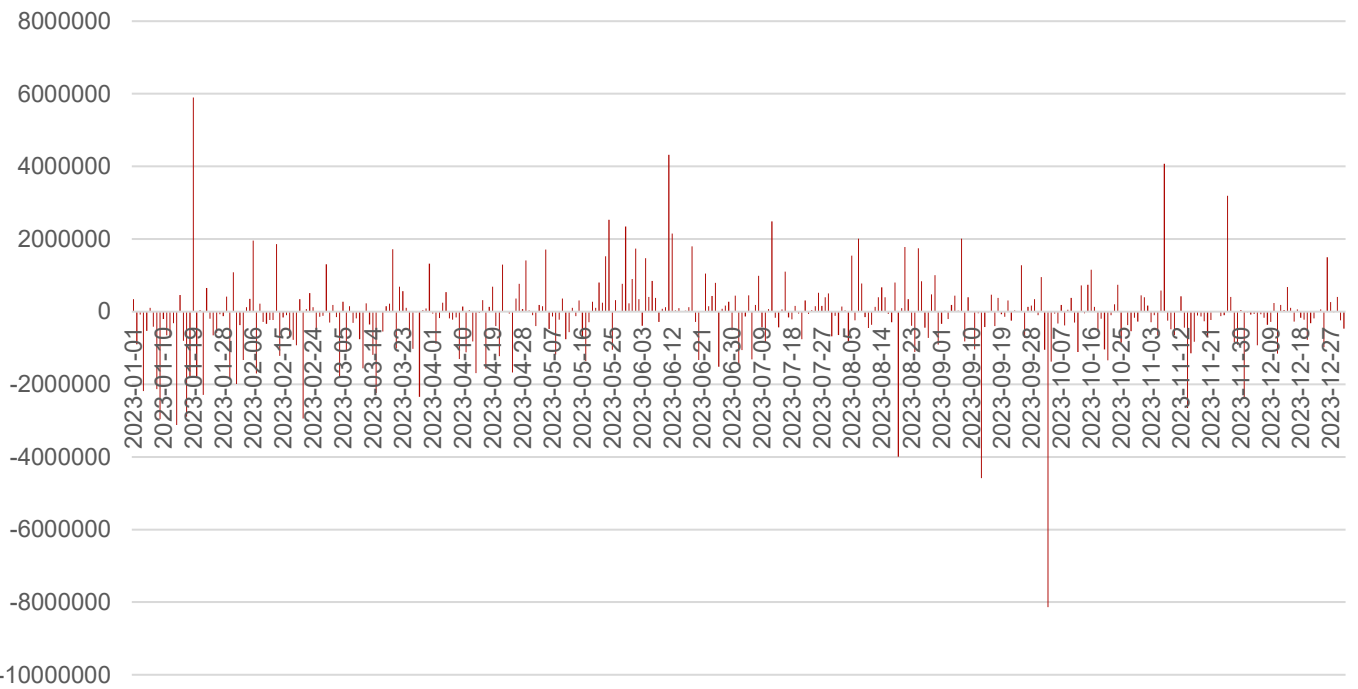
Annex 4: NRAO analysis figures

Sorted by chronological order:



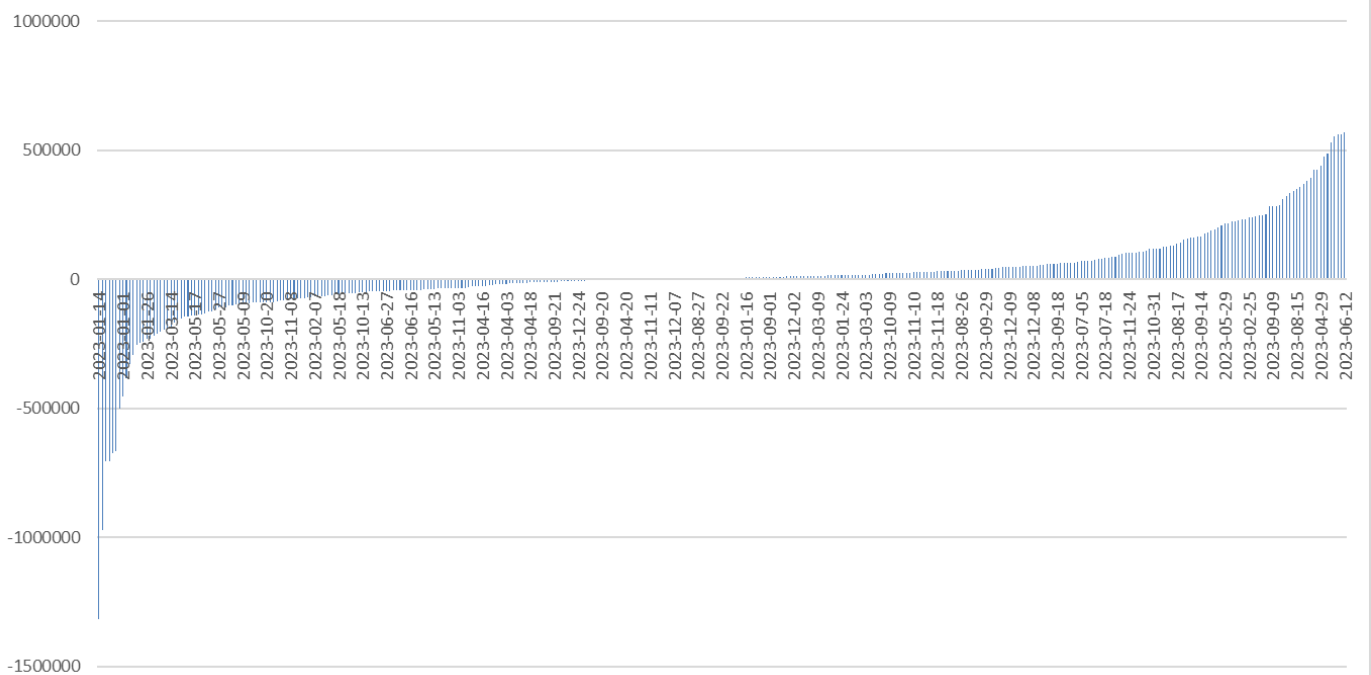


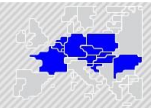
DELTA PRODUCER SURPLUS (withNRAO - withoutNRAO)[EUR]



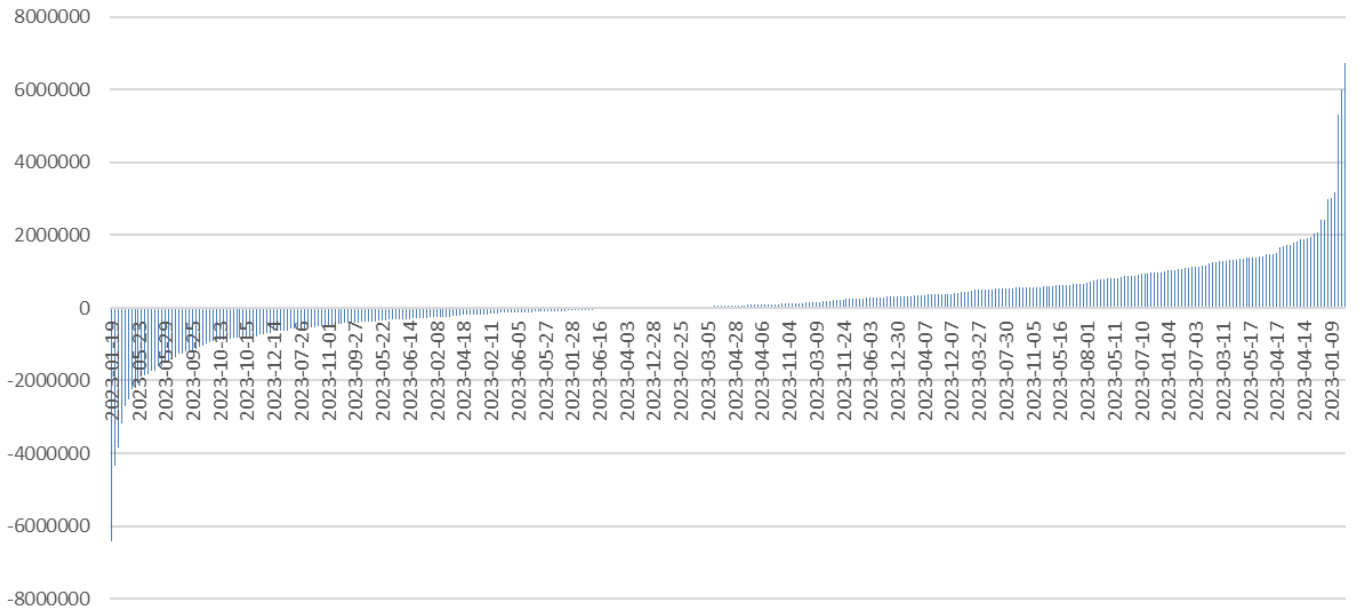
Sorted from lowest to highest SEW impact:

SEW BENEFIT (withNRAO - withoutNRAO)[EUR]





DELTA CONSUMER SURPLUS (withNRAO - withoutNRAO)[EUR]



DELTA PRODUCER SURPLUS (withNRAO - withoutNRAO)[EUR]

