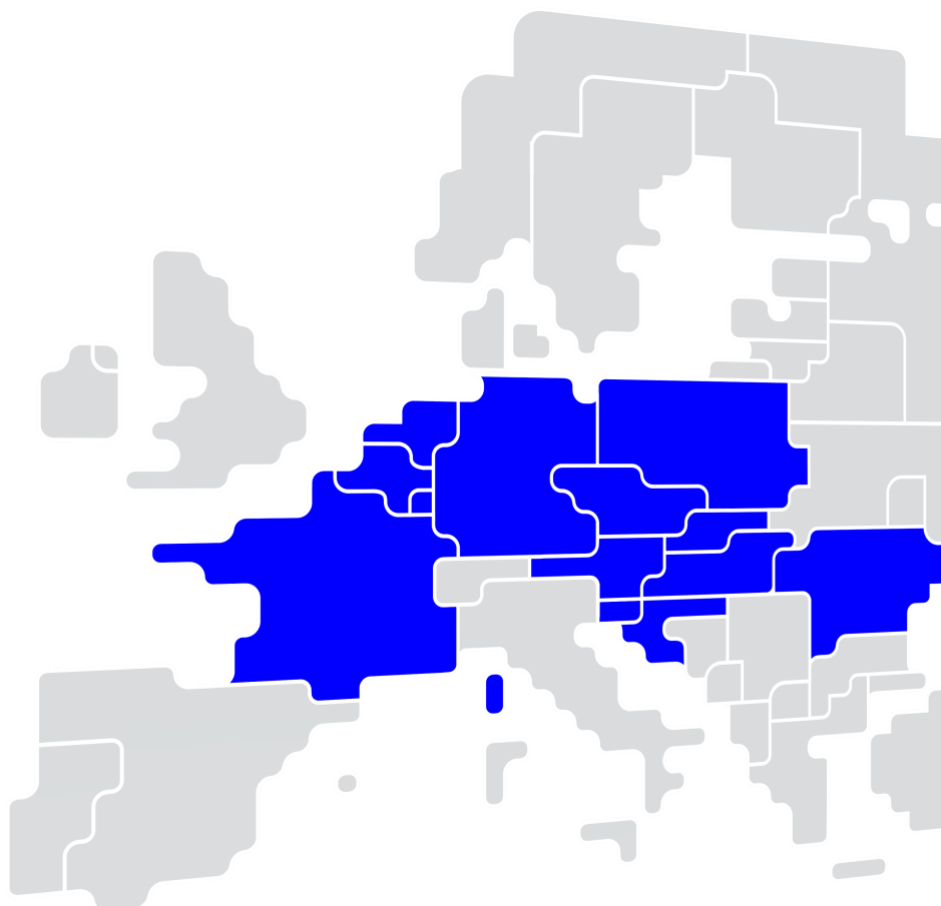




Core DA CC – Annual Report

2022



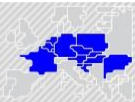
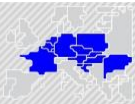


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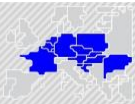
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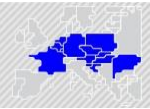
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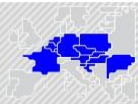


Glossary

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



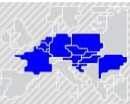
RAM	Remaining Available Margin
RDP	Redispatch Potential
REMIT	The Regulation on Wholesale Energy Market Integrity And Transparency
SDAC	Single Day-Ahead Coupling
SEW	Social Economic Welfare
SGM	Static Grid Model
SO GL	System Operation Guideline on Electricity Transmission
SP	Shadow Price
TF	Task Force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

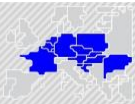
Art. 27(4): “The CCC, with the support of the Core TSOs where relevant, shall draft and publish an annual report satisfying the reporting obligations set in Articles 10, 13, 16, 26 and 28 of this methodology:

- (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**”.*

As the go-live of Core Day-Ahead Capacity Calculation and Market Coupling processes was for Business Day 9th of June 2022, this report exceptionally covers a reporting period covering business days 09.06 – 31.12.2022. The report is structured as follows: 2 general chapters (*Introduction* and *Glossary*), 5 chapters dedicated to reporting obligations, and 2 annexes (one Annex related to Allocation and External Constraints, the other Annex for the yearly overview of the monthly data quality indicator (DQI) breaches).



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:

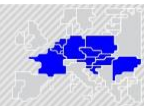
- NRAO: where non-costly (PSTs and topological RAs) RAs are provided
- Simple Coordinated Validation: where non-costly (PSTs and topological RAs) and costly (redispatch potential *RD*) RAs are provided

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).

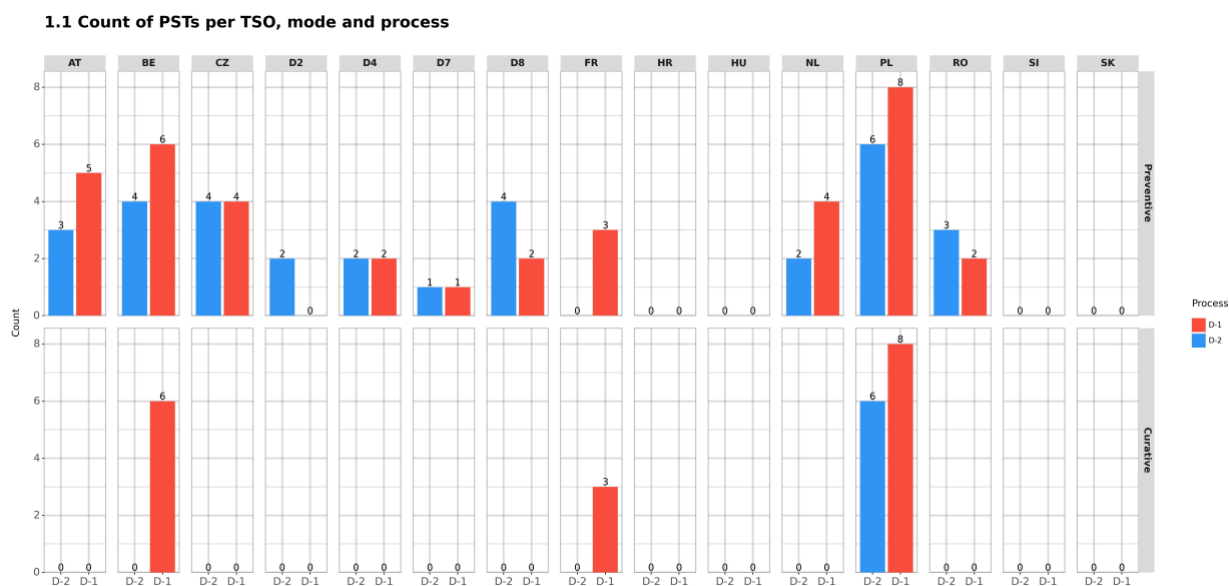
For any RA, a distinction is being made between being in Preventive (RA application can be considered regardless of base-case or considered contingency) or Curative (the RA application is associated only with a certain contingency or contingencies) mode.



RA potential – PSTs

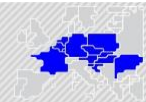
By changing the tap position of a PST, the active power flow on a certain network element or several network elements can be adjusted.

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

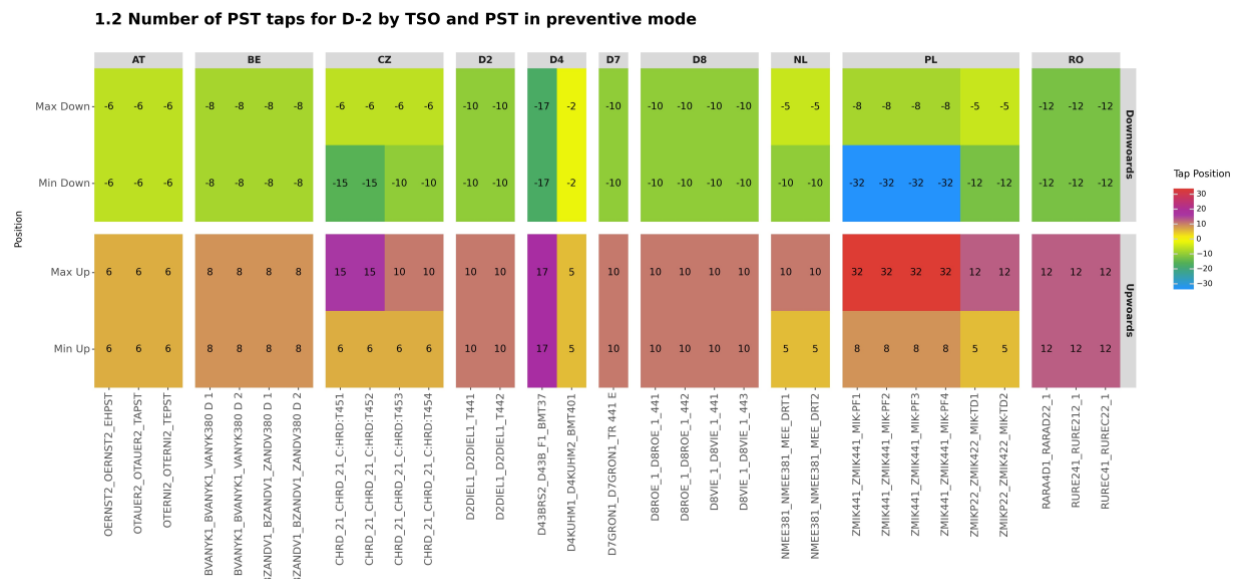


The figure above shows the cumulative number of times PSTs have been applied as RAs per TSO during the D-2 process and during the D-1 process in the reporting period. The top half of the figure shows the count of PSTs applied as preventive RAs and the bottom half shows the count of PSTs applied as curative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

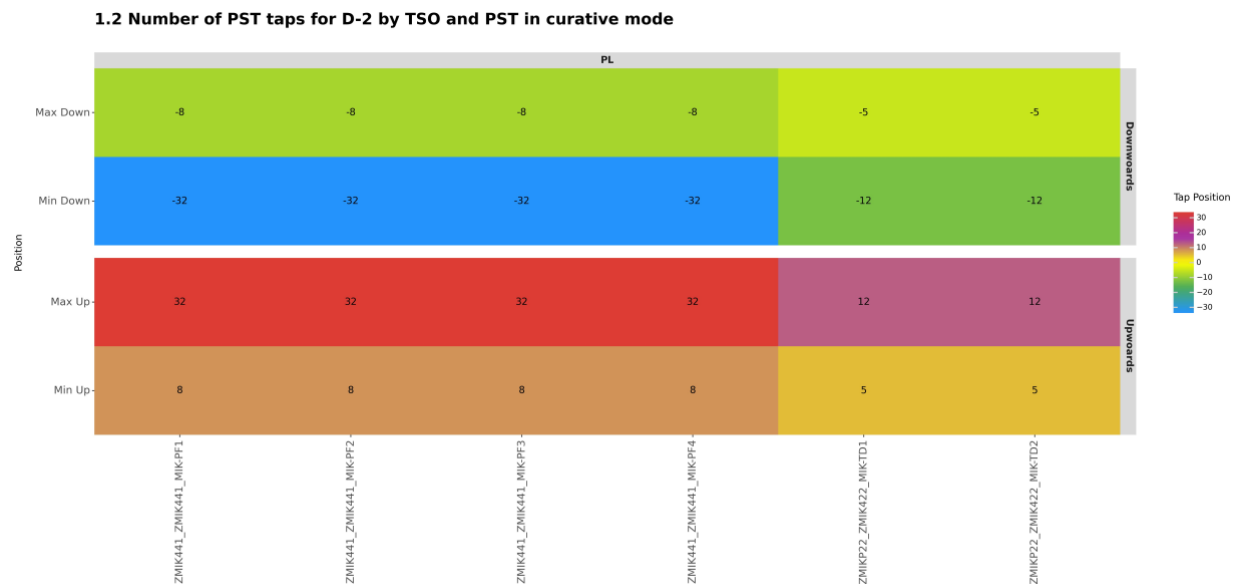
In the case of D-1 and D-2 data, the same PST can be provided for both preventive and curative measures for the same TS. In the figure, a distinct count of PSTs is considered for preventive and curative modes, even if the same PST is provided for both modes.



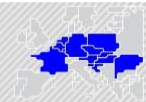
Number of PST taps provided for D-2, by TSO and PST



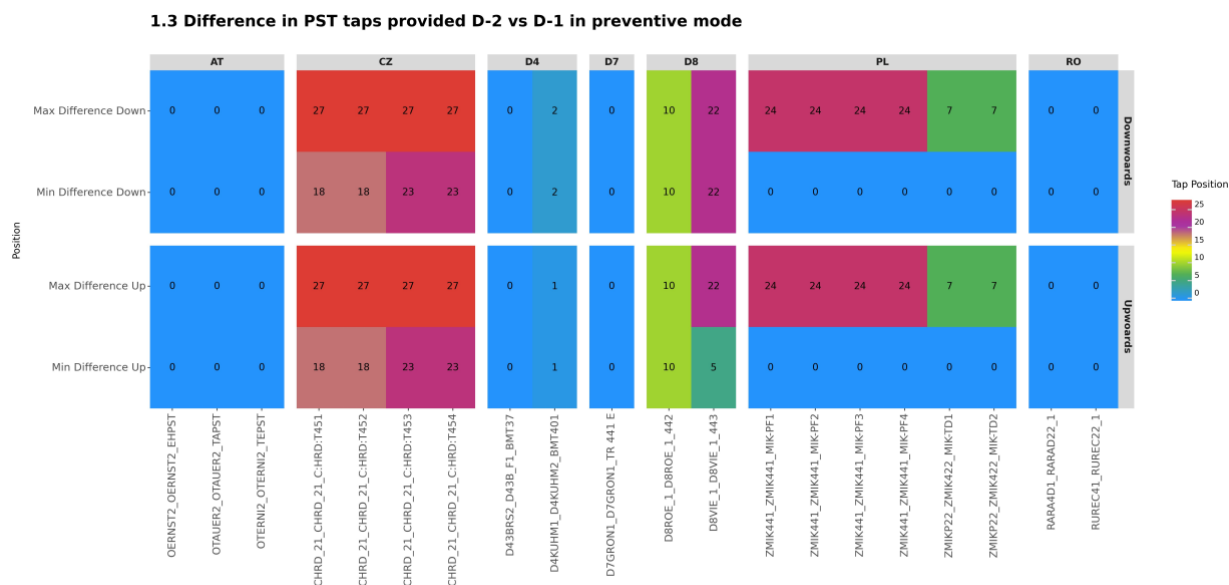
The figure above shows the number of PST taps provided by the TSOs for each PST for the D-2 process in preventive mode.



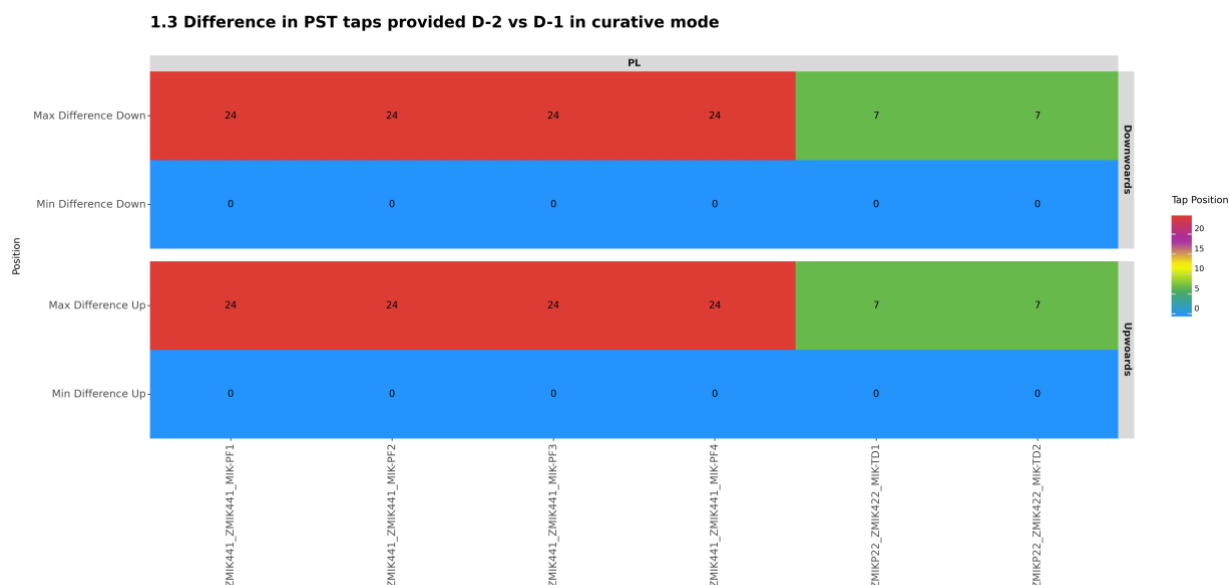
The figure above shows the number of PST taps provided by the TSOs for each PST for the D-2 process in curative mode.



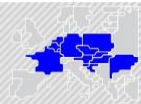
Difference in PST taps provided for D-2 vs D-1, by TSO and PST



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.

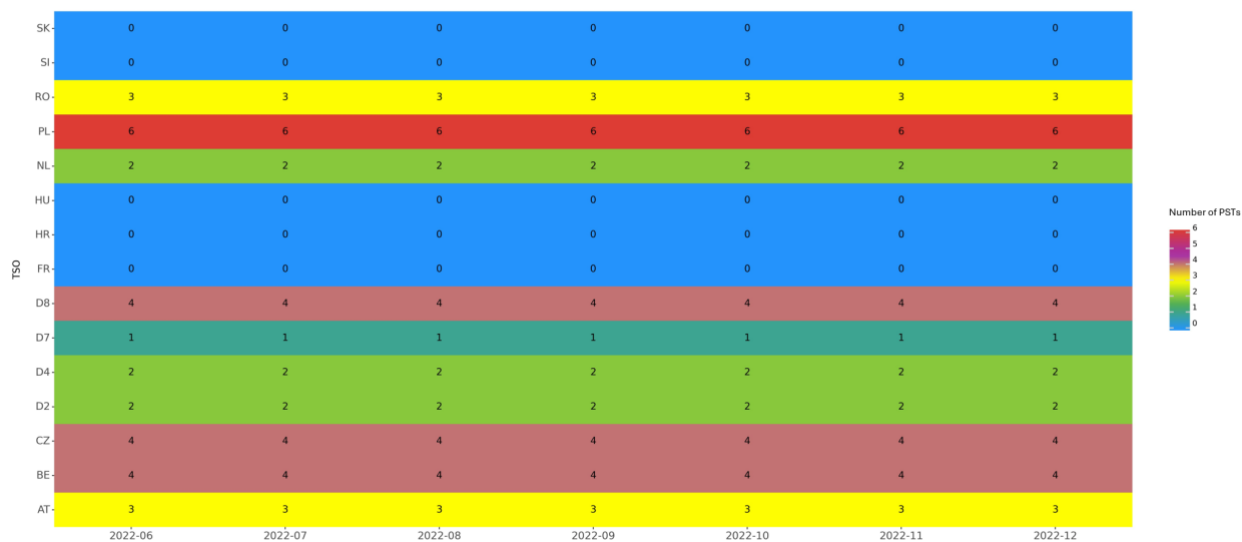


The figure above shows the difference in provided PST taps when comparing the D-2 process to the D-1 process. The figure is showing the number per TSO and the provided PST taps are compared for curative mode.



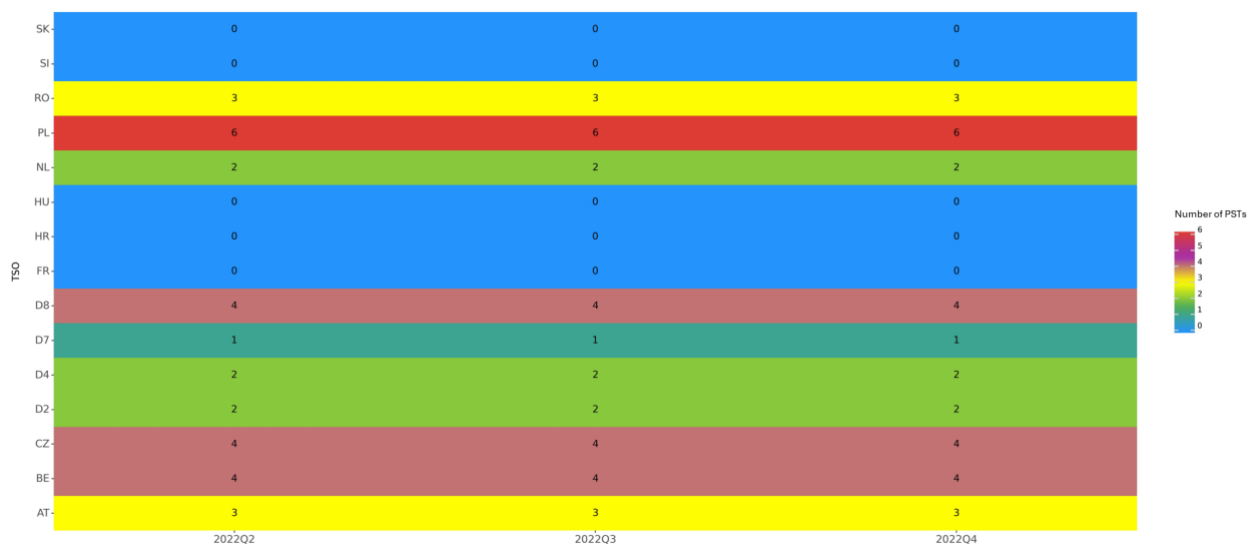
Timeseries indicators for PSTs

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

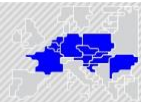


The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each month in the period.

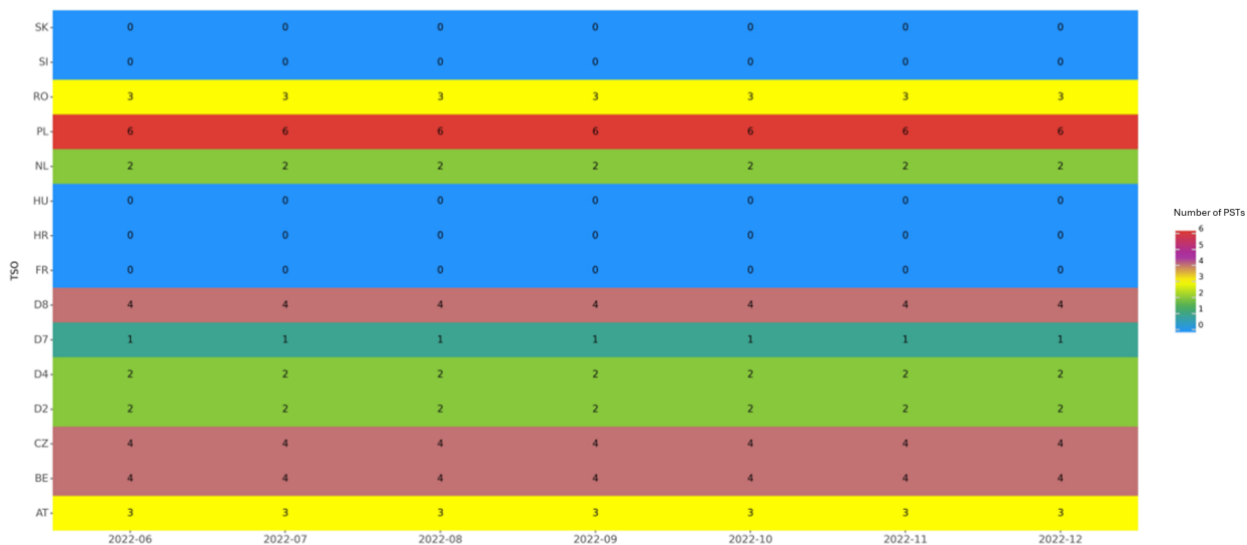
1.4.1 Count of PSTs from D-2 per TSO and quarter



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

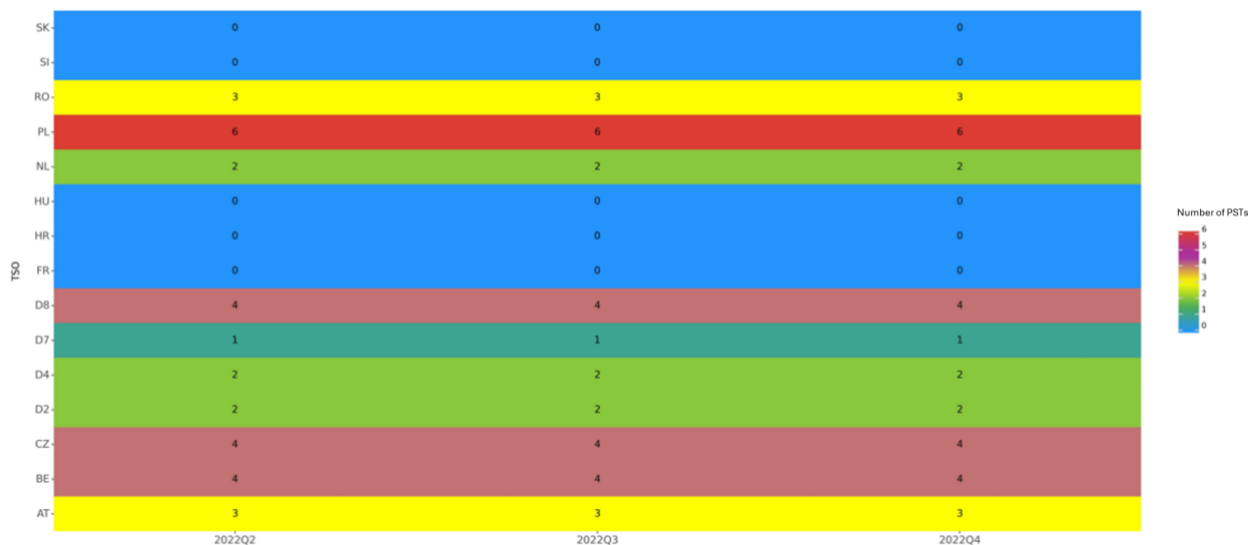


1.4.2 Count of PSTs from D-2 per TSO and month in preventive mode

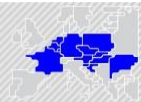


The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each month in the period in preventive mode.

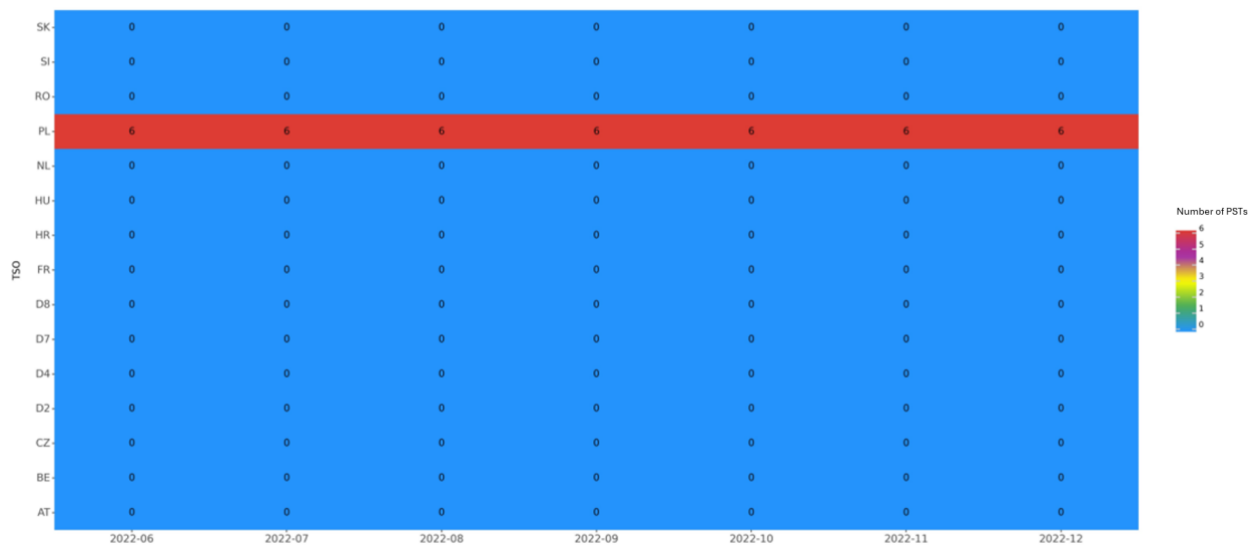
1.4.2 Count of PSTs from D-2 per TSO and quarter in preventive mode



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 preventive mode.

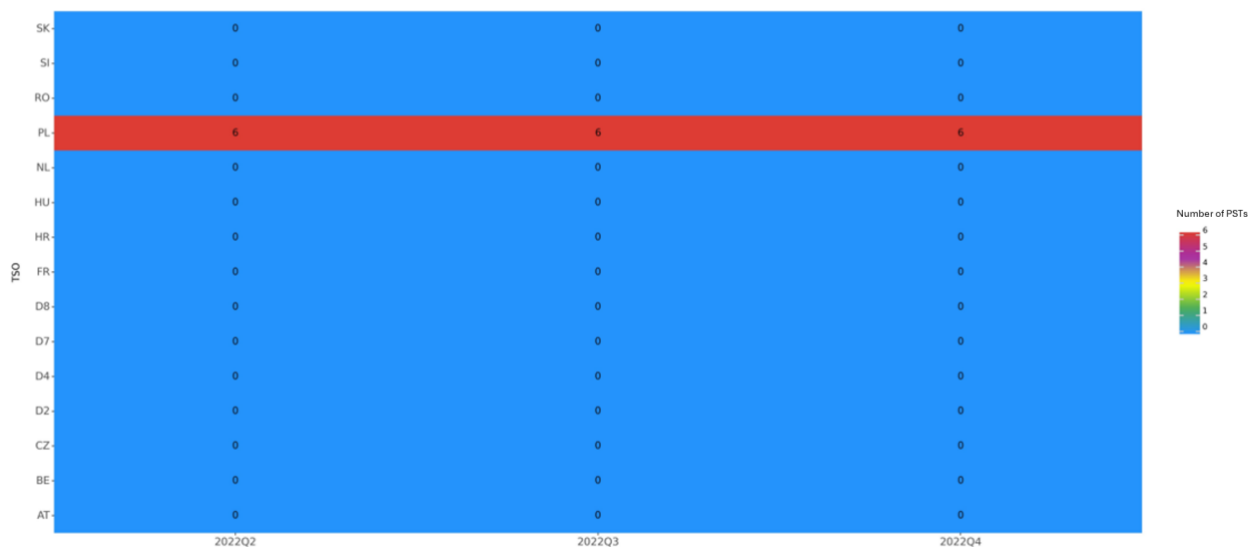


1.4.2 Count of PSTs from D-2 per TSO and month in curative mode

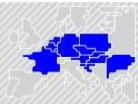


The figure above is showing the number of PSTs offered by each TSO during the D-2 process for each month in the period in curative mode.

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:

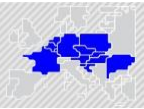
- 2-node operation in a substation voltage level (by opening the busbar coupler)
- Closing/opening of a circuit (line, transformer)
- Moving one line from one busbar to another (in the case of 2-node or 3-node operation)

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.

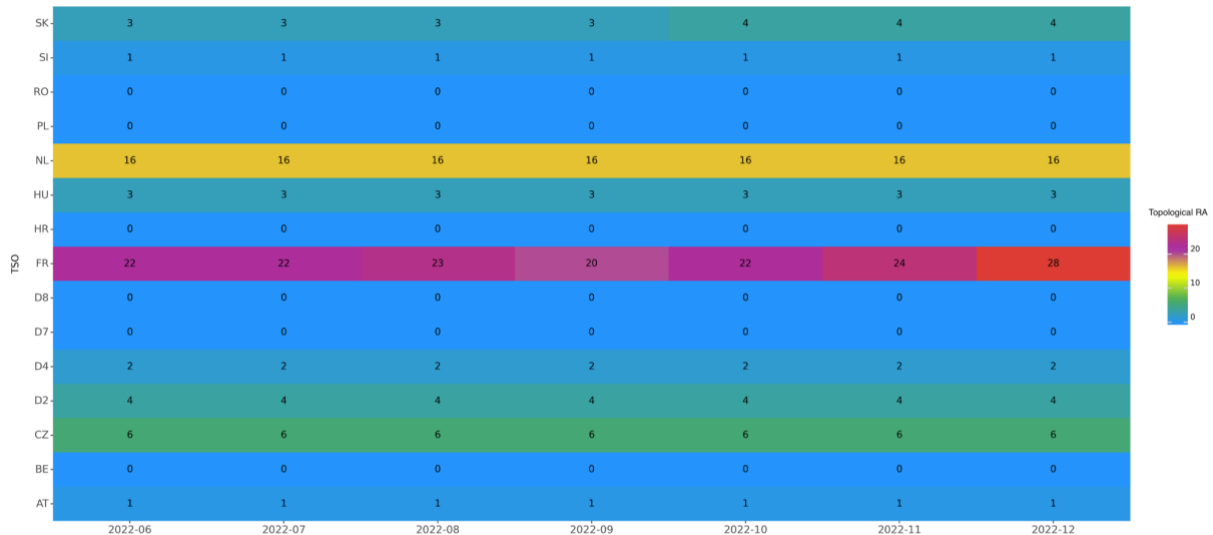
In the case of D-1 and D-2 data, the same topological RA can be provided for both preventive and curative measures for the same TS. In the figure, a distinct count of PSTs is considered for preventive and curative modes, even if the same Topological RA is provided for both modes.



Timeseries indicators for Topological RAs

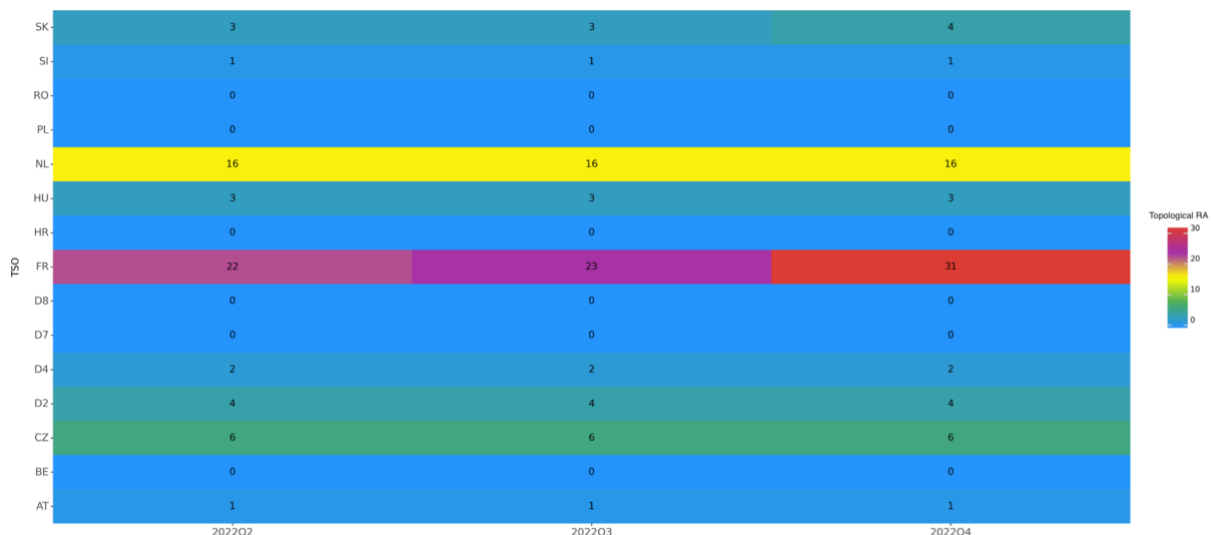
The following figures include both curative and preventive RAs. In case the same RA has been offered as curative and preventive, it is only counted once.

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



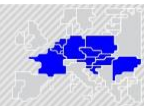
The figure above shows a monthly overview of the number of unique topological RAs provided by each Core TSO for the D-2 process. If the same remedial action is provided for multiple MTUs, it is only counted once.

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.

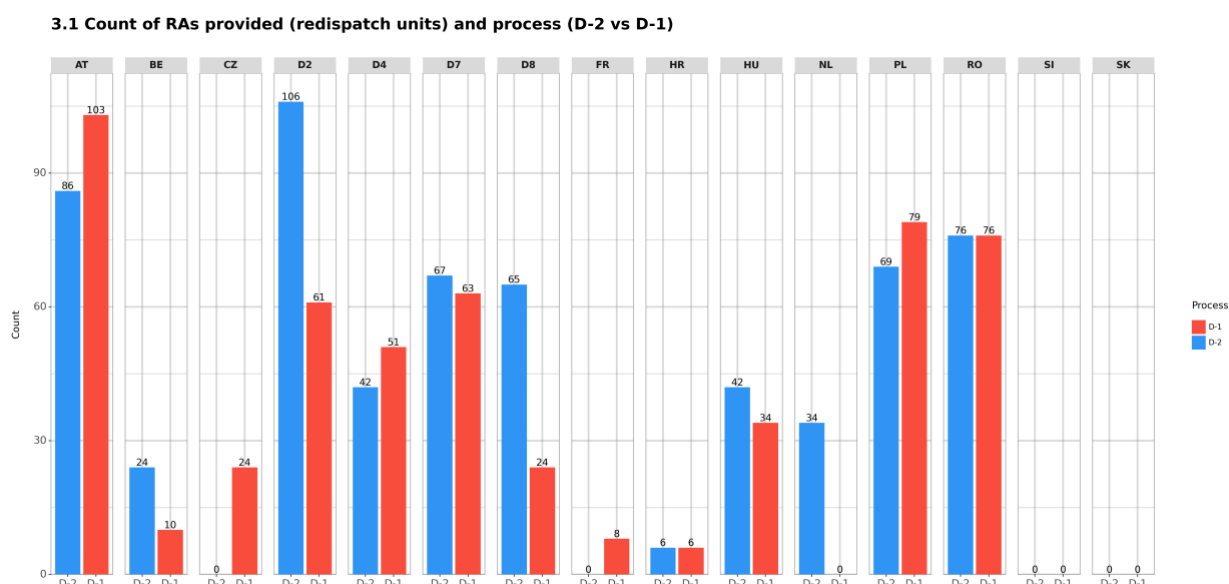


RA potential – Redispatch potential

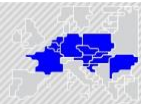
Redispatch is a costly RA which consists of modifying (increasing or decreasing) the generation value of one or several generating or production units, with the aim of relieving an overload on certain network element or several network elements. Countertrading is not in the scope of this report.

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)

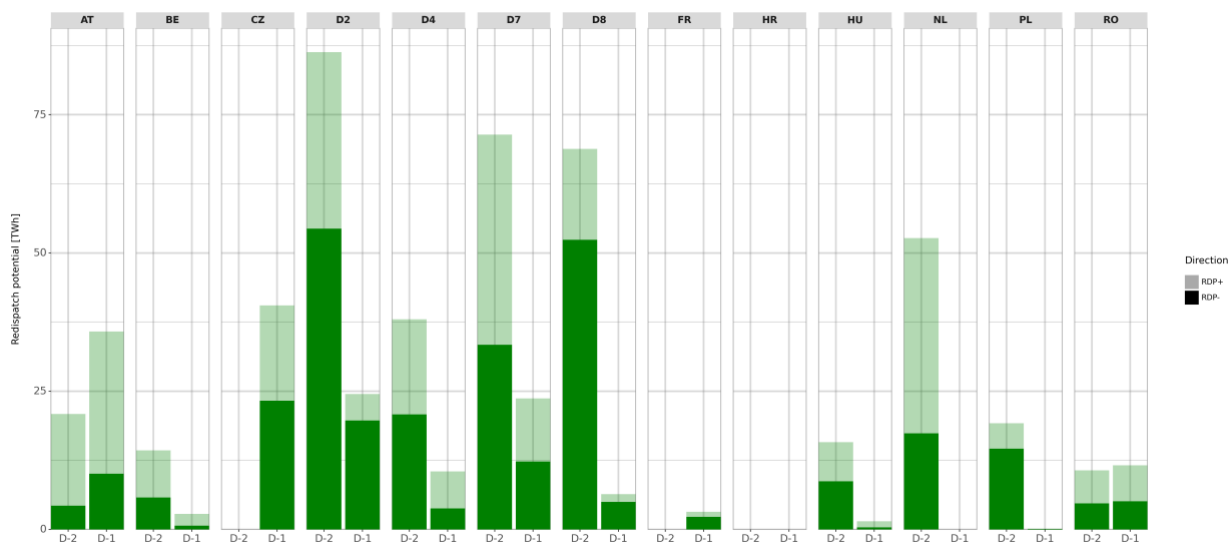


The figure above shows the number of redispatch units provided by each TSO for the D-1 - and the D-2 process.



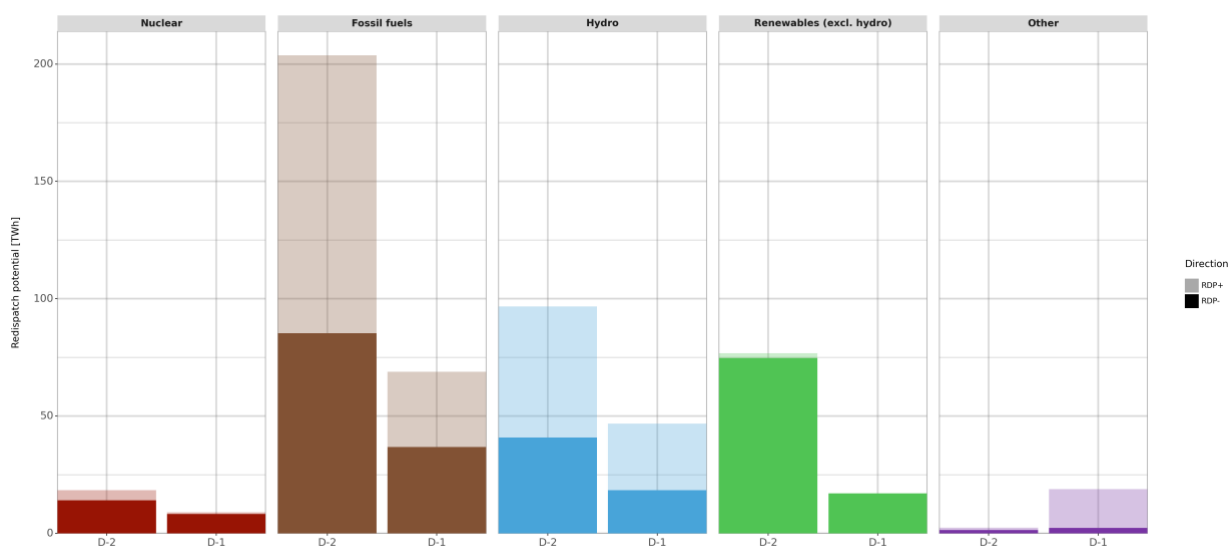
Redispatch volume by TSO, Fuel Type and Process (D-2 vs D-1)

3.2.1 Redispatch potential per TSO and process (D-2 vs D-1)

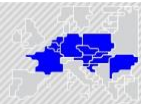


The figure above shows the cumulative redispatch potential per TSO for each process D-1 and D-2 for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the solid colour is showing the downward redispatch potential.

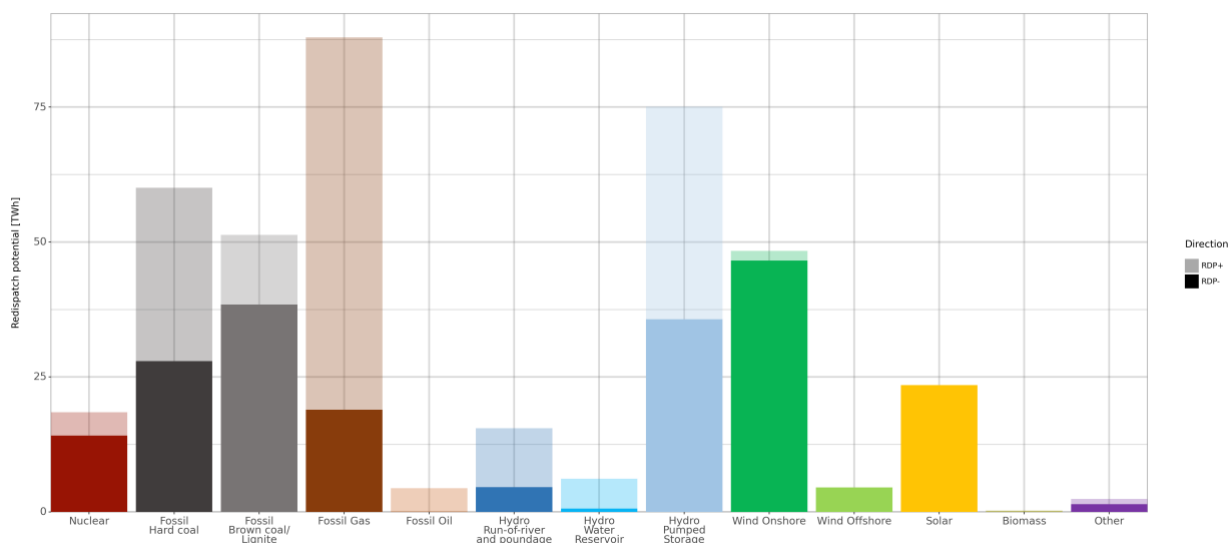
3.2.2 Redispatch potential per fuel type and process (D-2 vs D-1)



The figure above shows the cumulative redispatch potential per fuel type for each process D-1 and D-2 for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

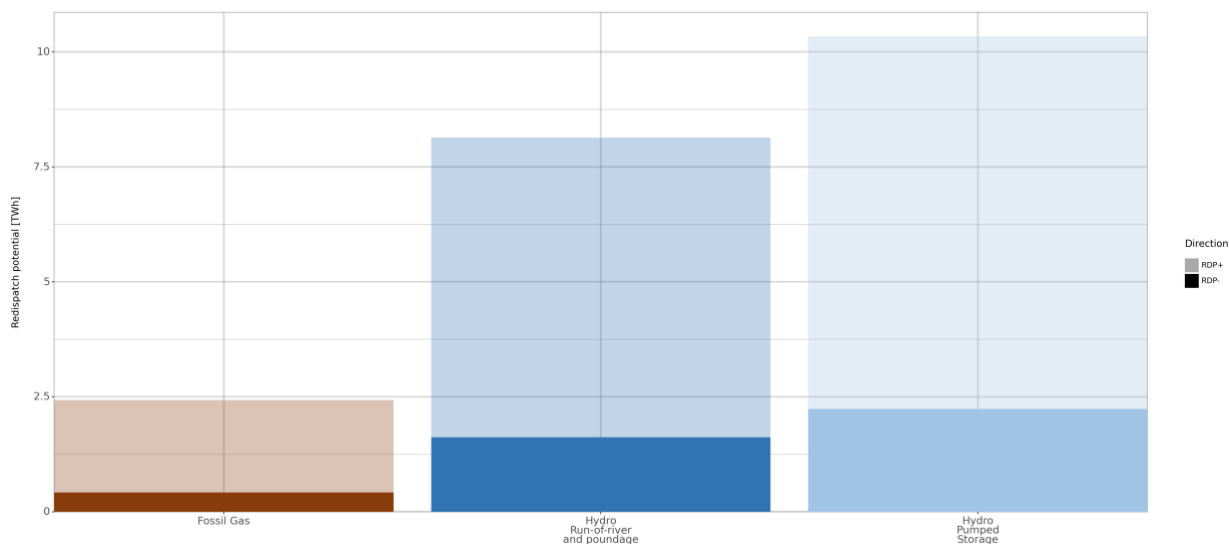


3.2.3 Total Redispatch potential over Core region per fuel type in the D-2 process



The figure above shows the total redispatch potential per fuel type for the D-2 process for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

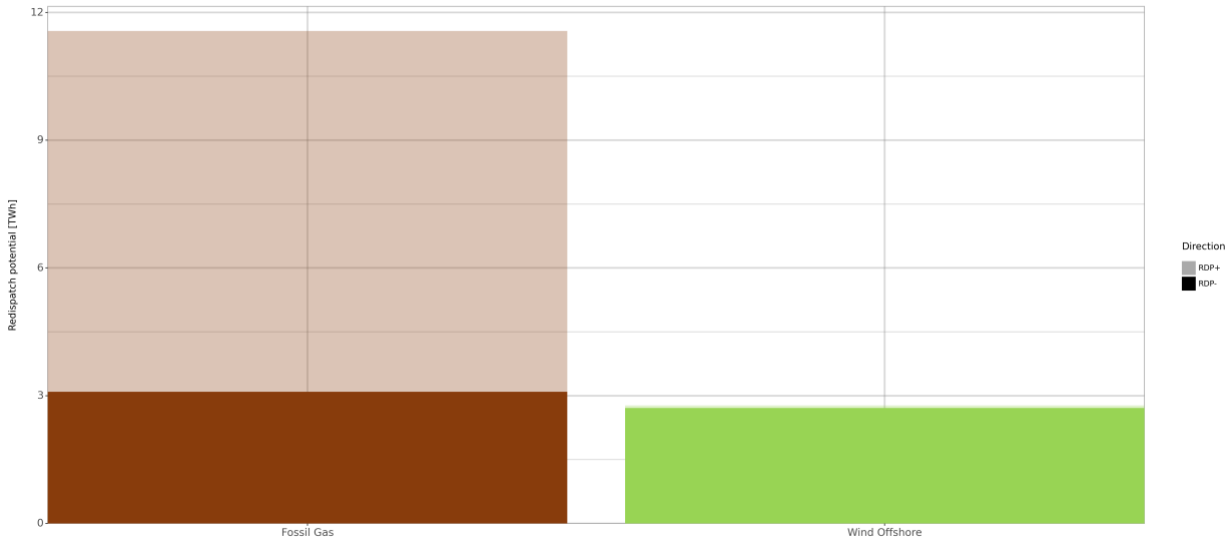
3.2.3 Redispatch potential for AT per fuel type in the D-2 process



The figure above shows the redispatch potential per fuel type for the D-2 process for APG for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

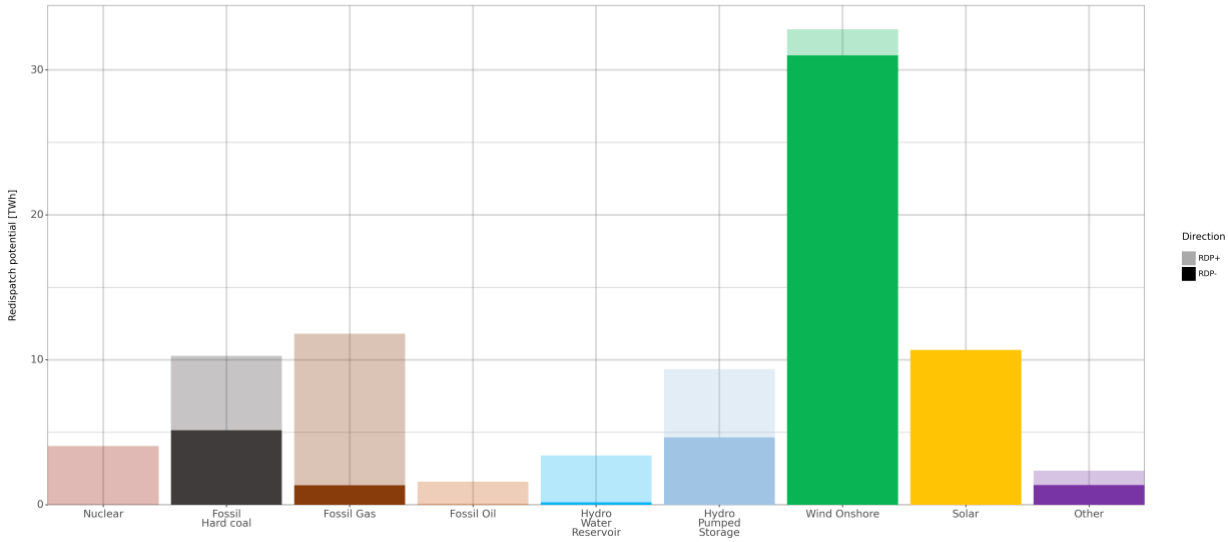


3.2.3 Redispatch potential for BE per fuel type in the D-2 process

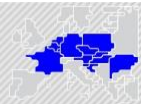


The figure above shows the redispatch potential per fuel type for the D-2 process for Elia for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

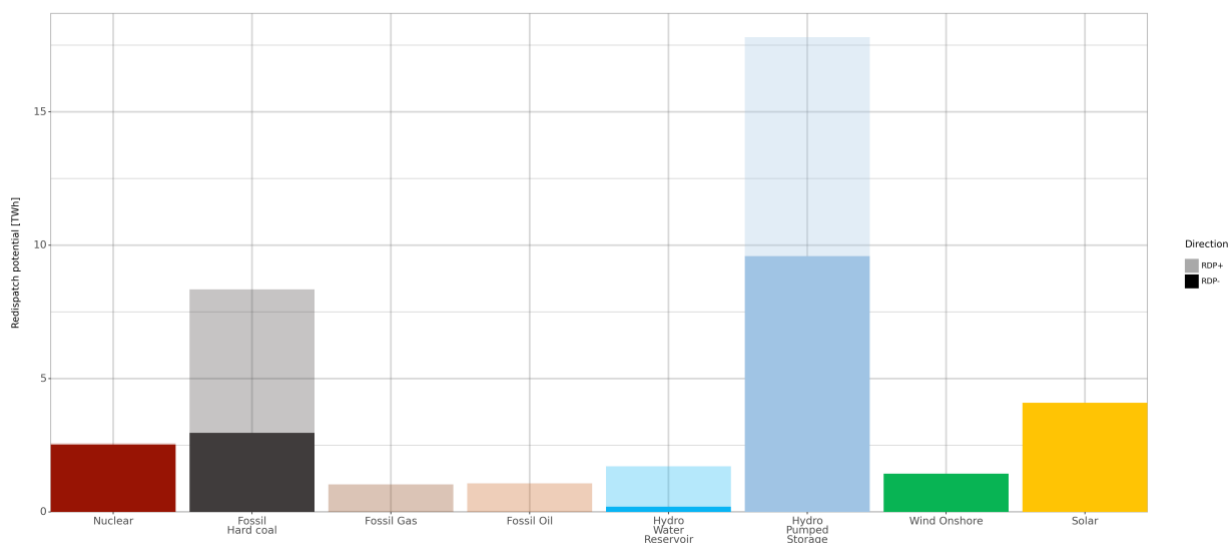
3.2.3 Redispatch potential for D2 per fuel type in the D-2 process



The figure above shows the redispatch potential per fuel type for the D-2 process for TenneT TSO GmbH for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

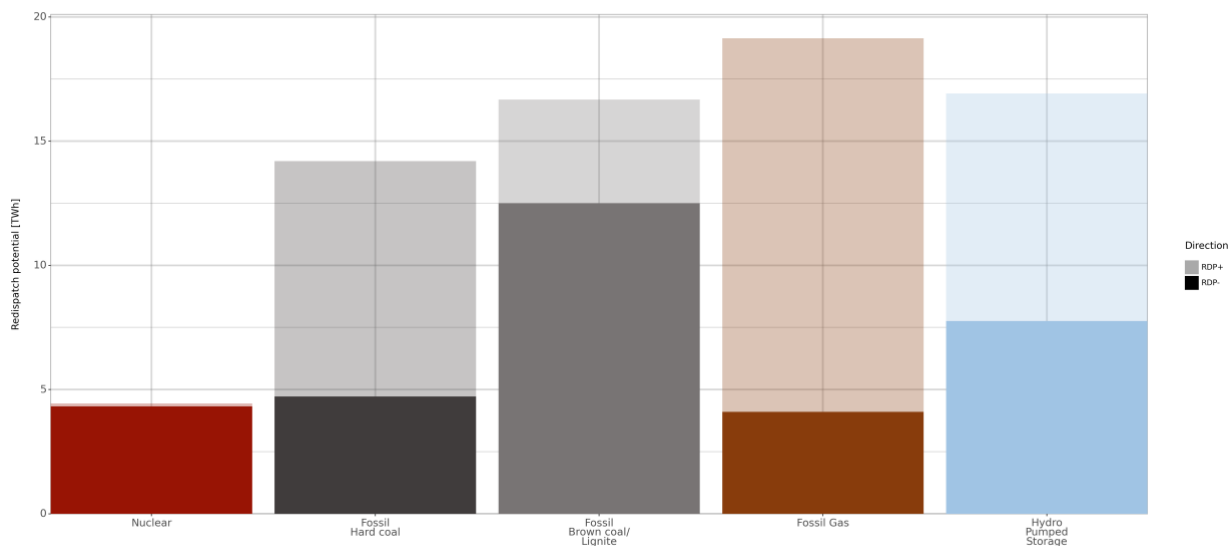


3.2.3 Redispatch potential for D4 per fuel type in the D-2 process

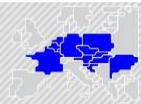


The figure above shows the redispatch potential per fuel type for the D-2 process for TransnetBW for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

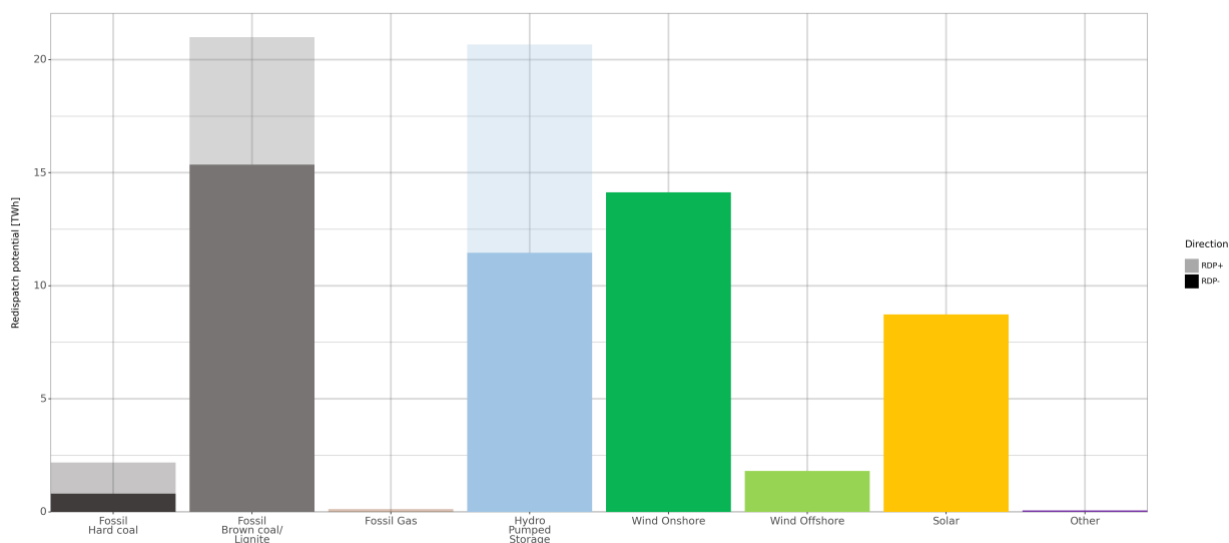
3.2.3 Redispatch potential for D7 per fuel type in the D-2 process



The figure above shows the redispatch potential per fuel type for the D-2 process for Amprion for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

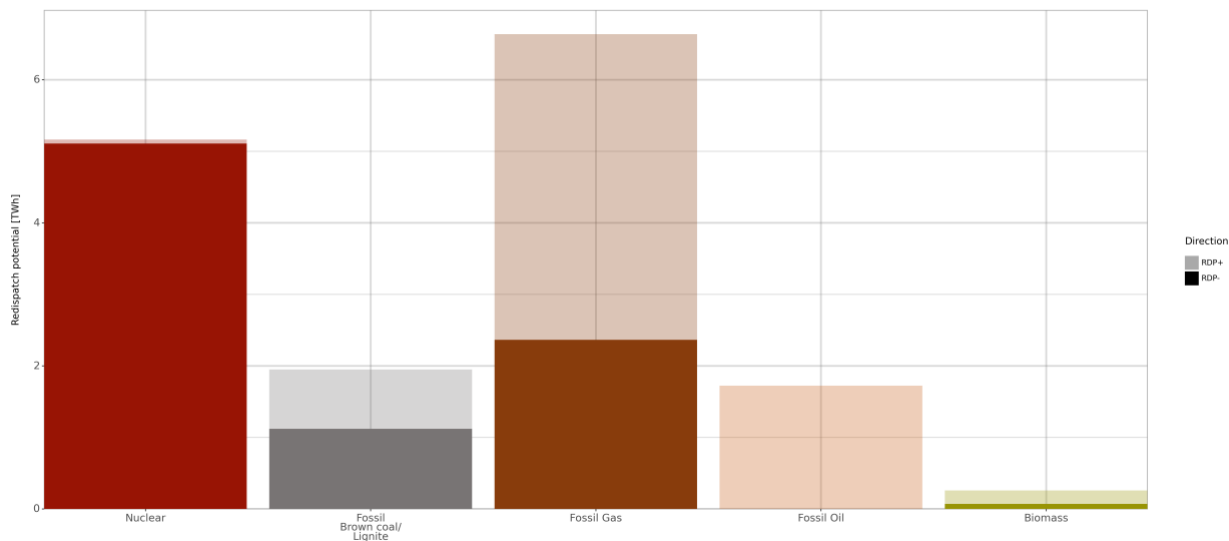


3.2.3 Redispatch potential for D8 per fuel type in the D-2 process

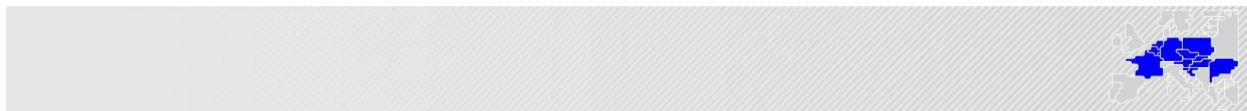


The figure above shows the redispatch potential per fuel type for the D-2 process for 50Hertz for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

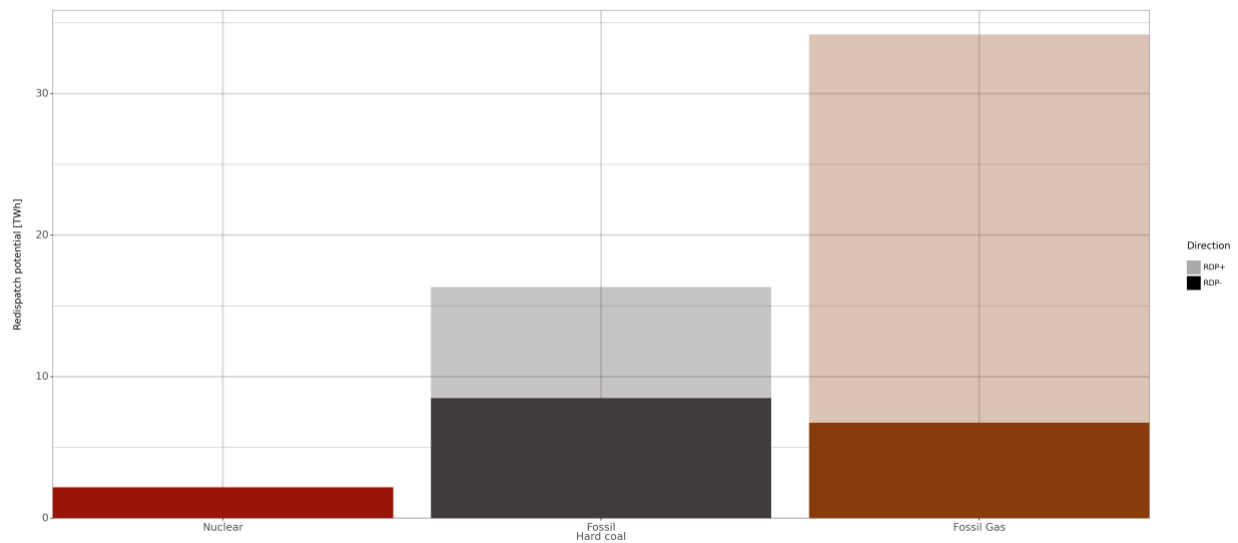
3.2.3 Redispatch potential for HU per fuel type in the D-2 process



The figure above shows the redispatch potential per fuel type for the D-2 process for Mavir for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

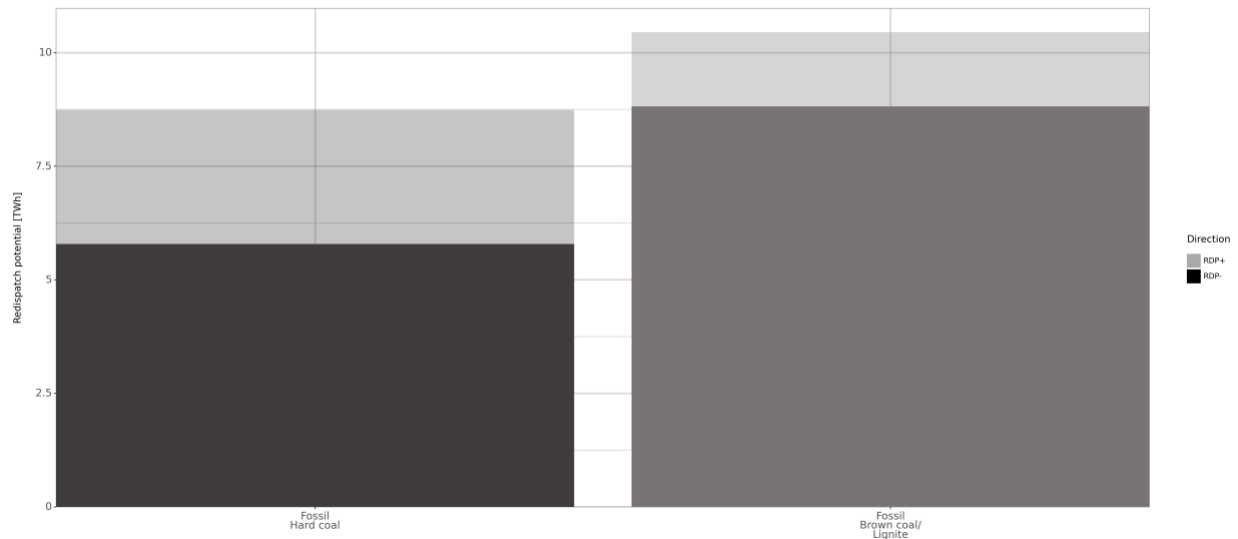


3.2.3 Redispatch potential for NL per fuel type in the D-2 process

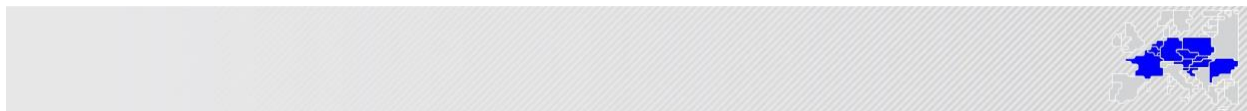


The figure above shows the redispatch potential per fuel type for the D-2 process for TenneT TSO B.V. for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

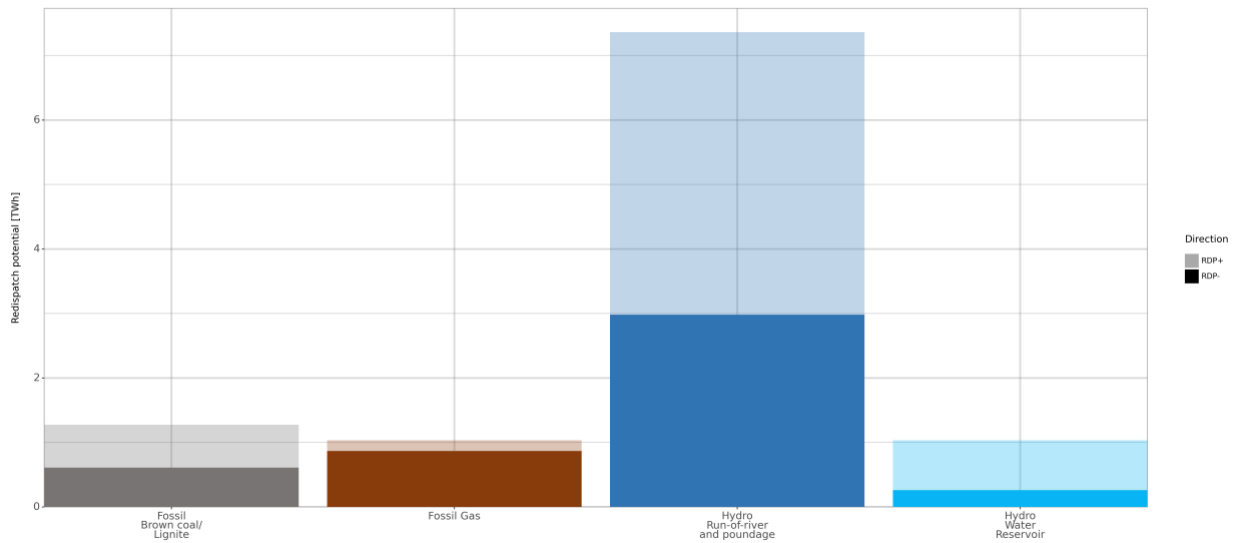
3.2.3 Redispatch potential for PL per fuel type in the D-2 process



The figure above shows the redispatch potential per fuel type for the D-2 process for PSE for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.



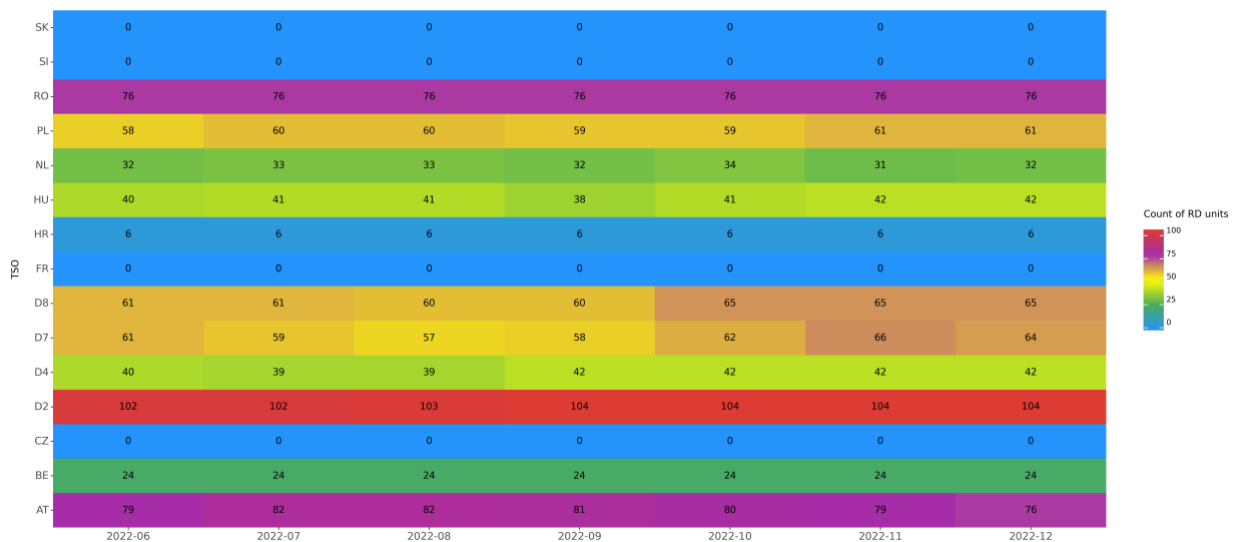
3.2.3 Redispatch potential for RO per fuel type in the D-2 process



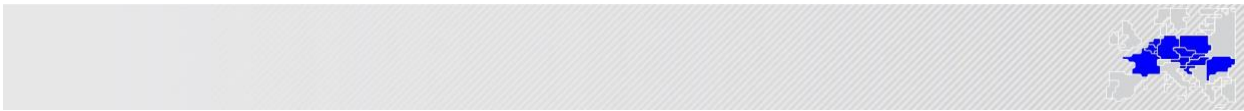
The figure above shows the redispatch potential per fuel type for the D-2 process for Tranelectrica for the 2022 period as of go-live. The transparent colour is showing the upward redispatch potential and the complete colour is showing the downward redispatch potential.

Timeseries indicators for Redispatch potential

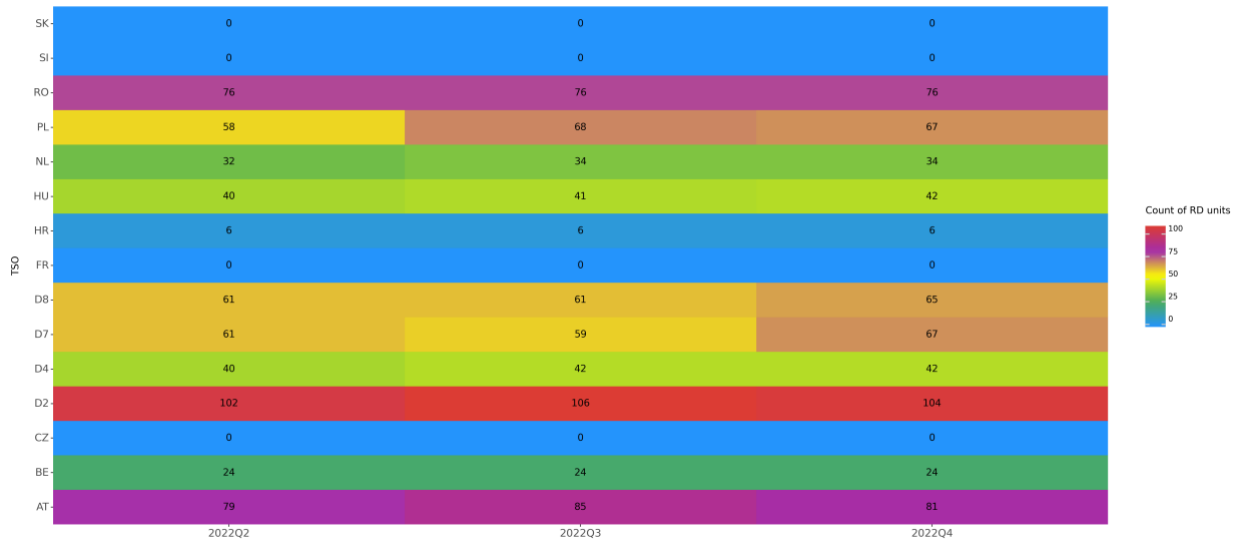
3.3.1 Count of RD units from the D-2 process per TSO per month



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.



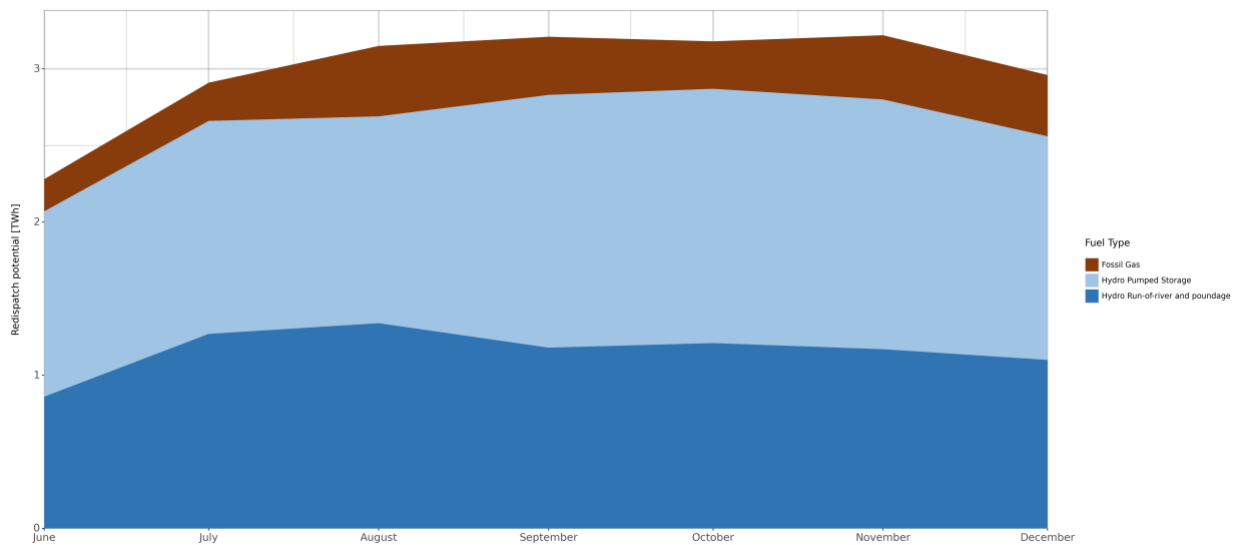
3.3.1 Count of RD units from the D-2 process per TSO per quarter



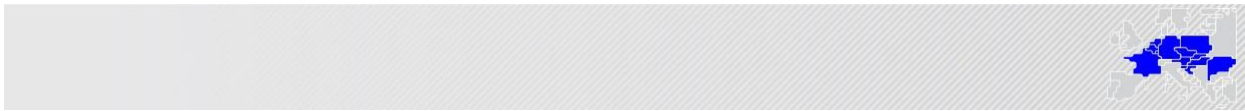
The figure above shows the average number of redispatch units provided by each TSO for the D-2 process per TSO during each quarter of the reporting period. This includes cases for which redispatch units; RD+ and RD- have zero values. The colour coding indicates the range in which the counted number belong.

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.

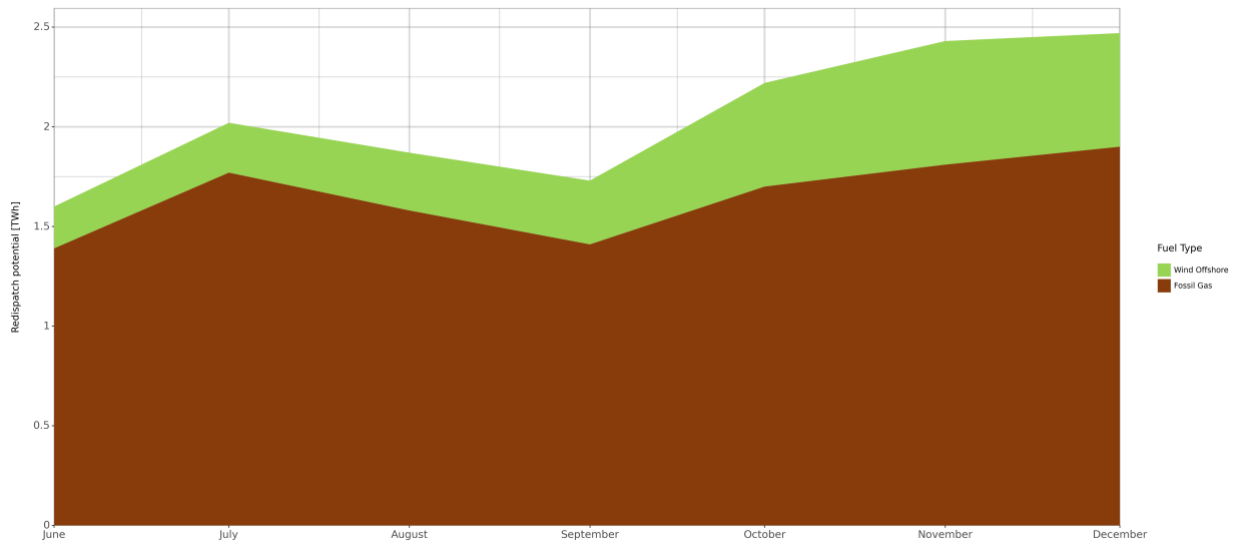
3.3.2 Redispatch potential for AT per month and fuel type in the D-2 process



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

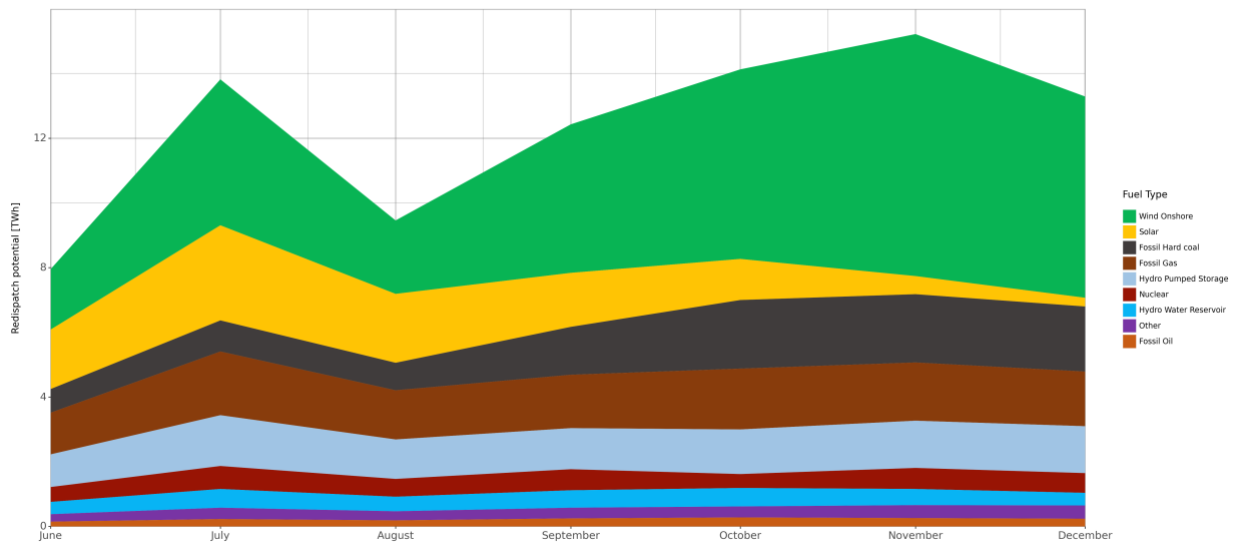


3.3.2 Redispatch potential for BE per month and fuel type in the D-2 process

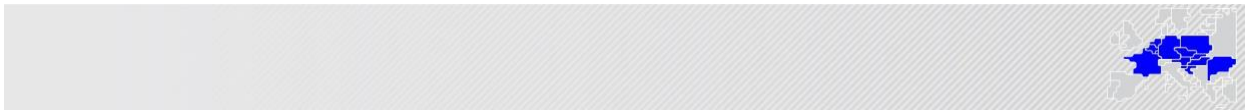


The figure above shows the monthly redispatch potential per fuel type for the D-2 process for Elia.

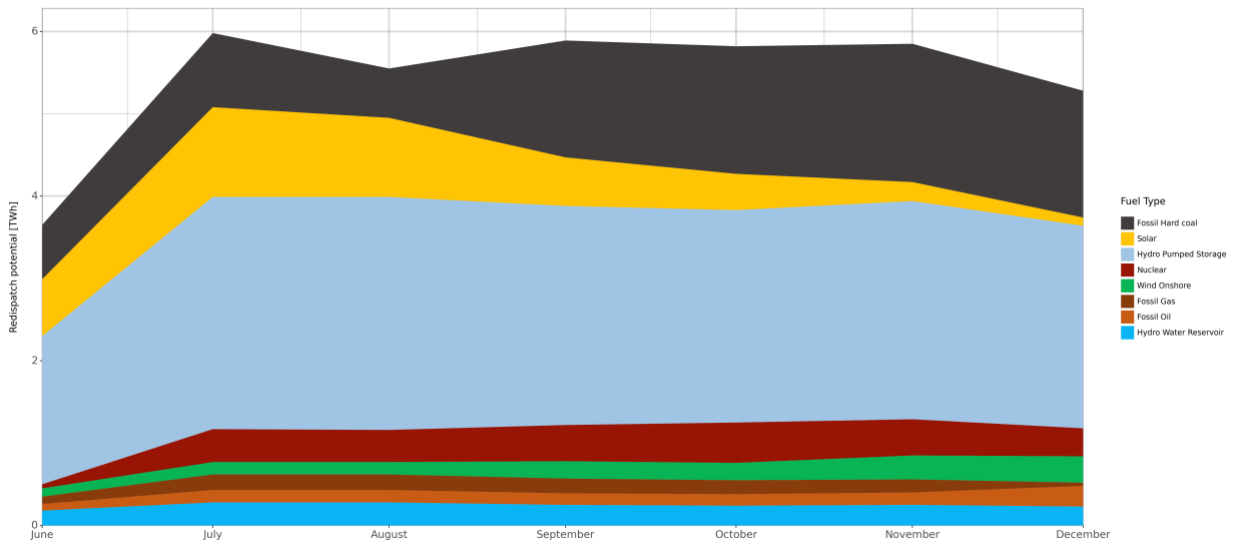
3.3.2 Redispatch potential for D2 per month and fuel type in the D-2 process



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

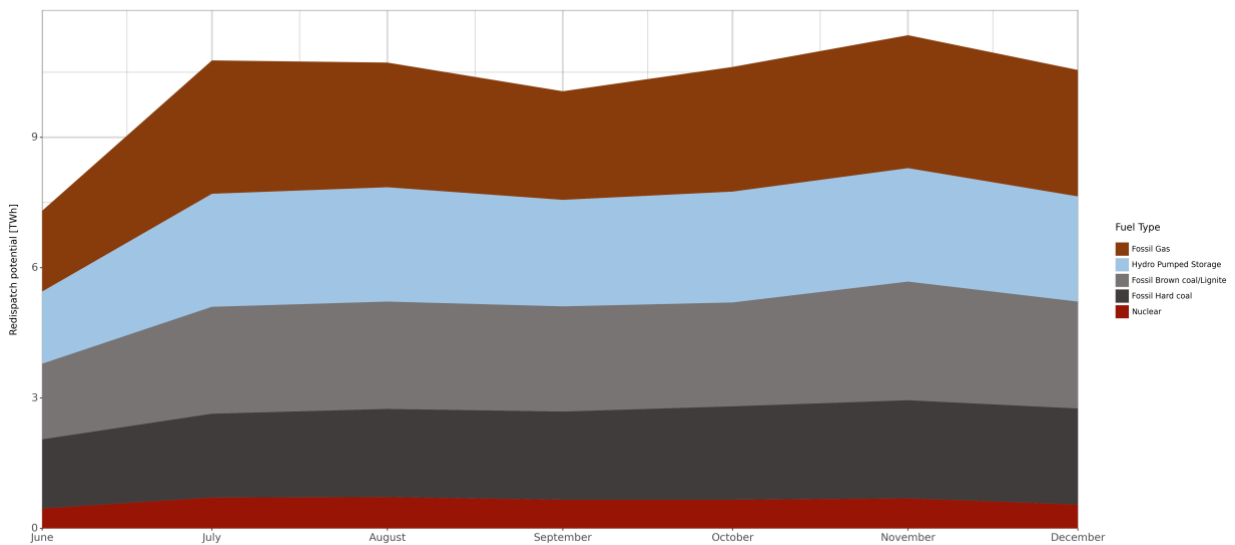


3.3.2 Redispatch potential for D4 per month and fuel type in the D-2 process

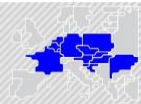


The figure above shows the monthly redispatch potential per fuel type for the D-2 process for TransnetBW.

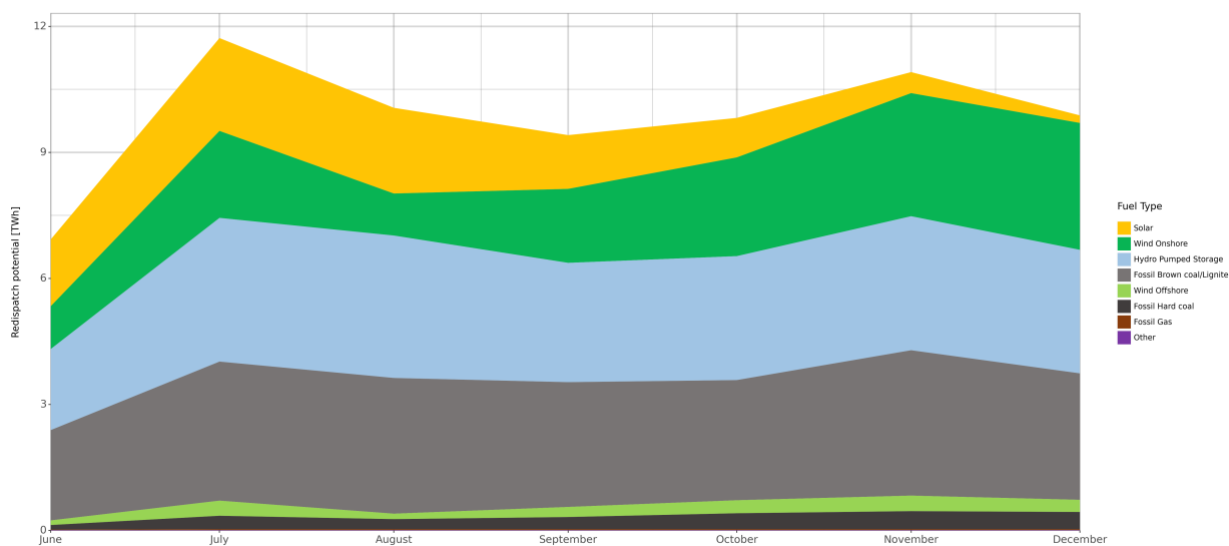
3.3.2 Redispatch potential for D7 per month and fuel type in the D-2 process



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

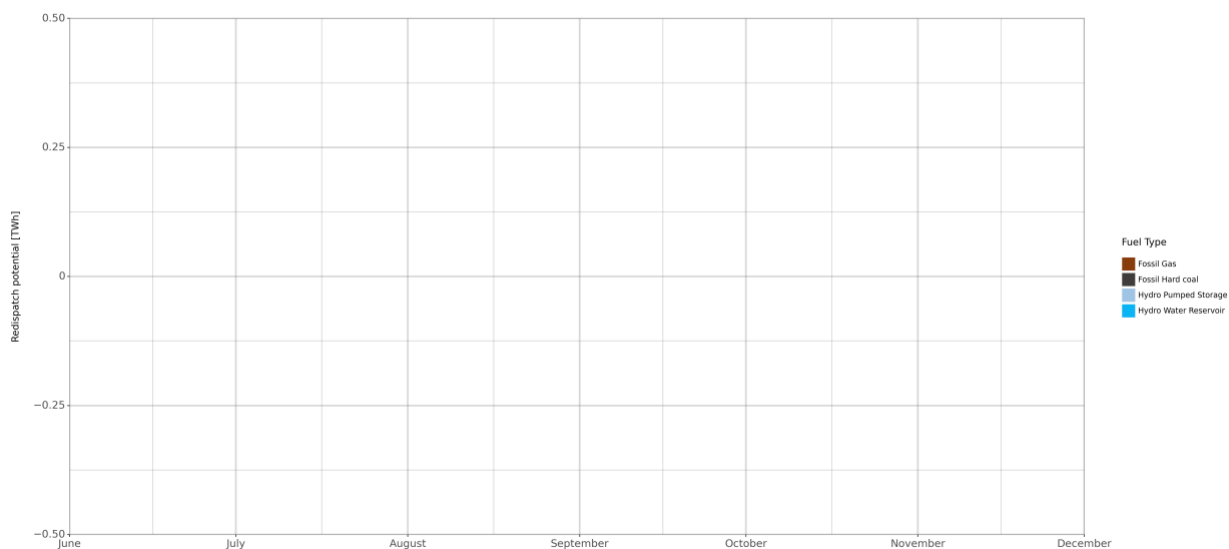


3.3.2 Redispatch potential for D8 per month and fuel type in the D-2 process

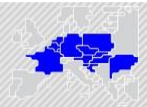


The figure above shows the monthly redispatch potential per fuel type for the D-2 process for 50 Hertz.

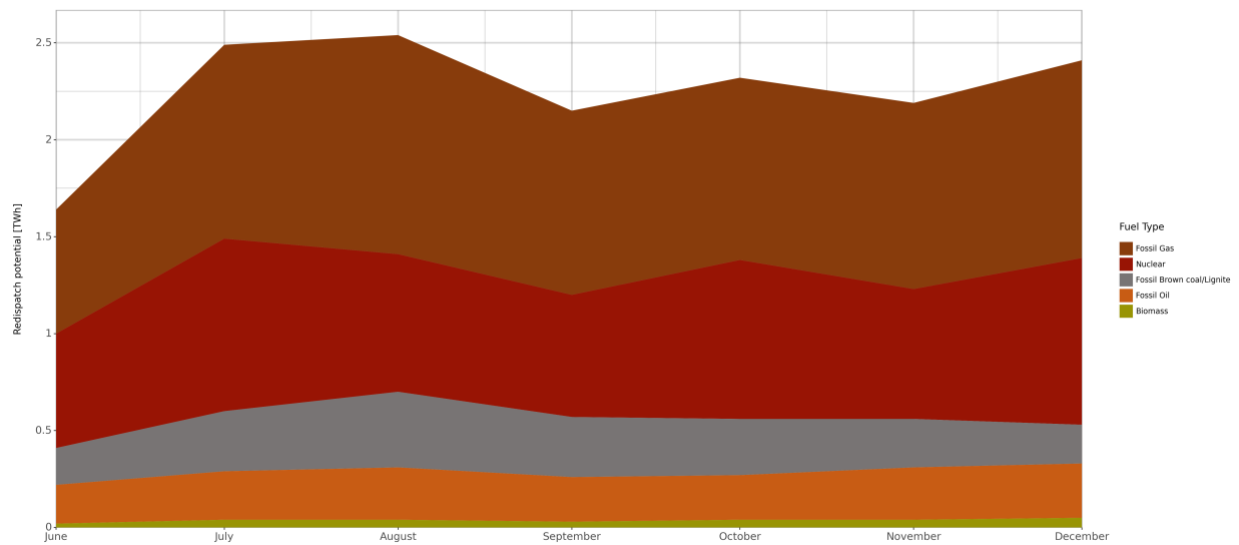
3.3.2 Redispatch potential for HR per month and fuel type in the D-2 process



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.

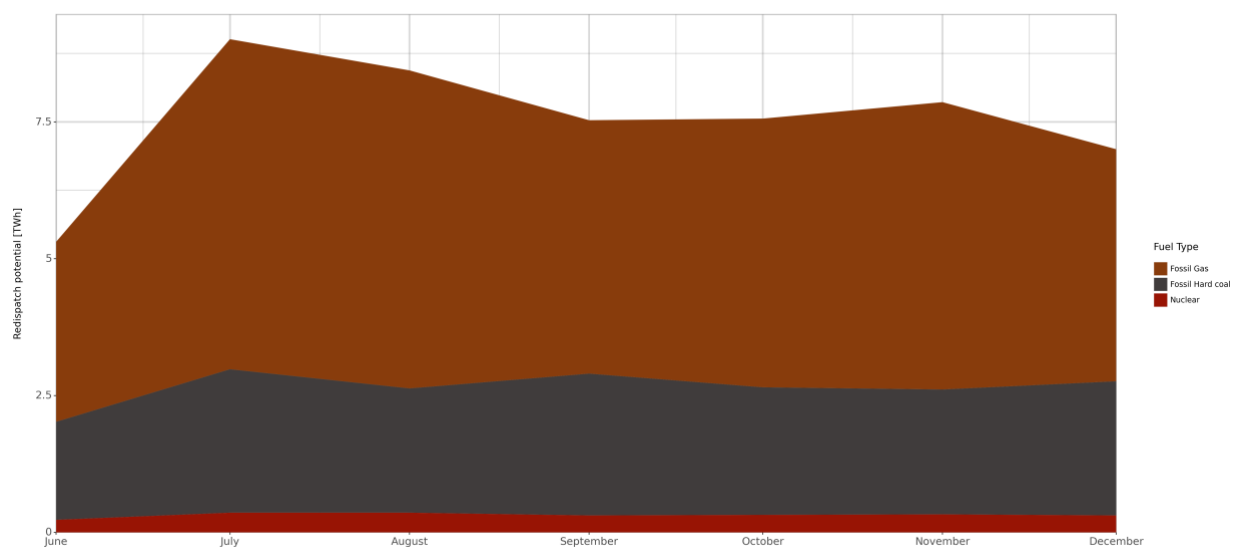


3.3.2 Redispatch potential for HU per month and fuel type in the D-2 process

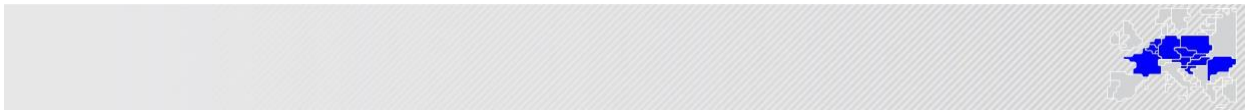


The figure above shows the monthly redispatch potential per fuel type for the D-2 process for Mavir.

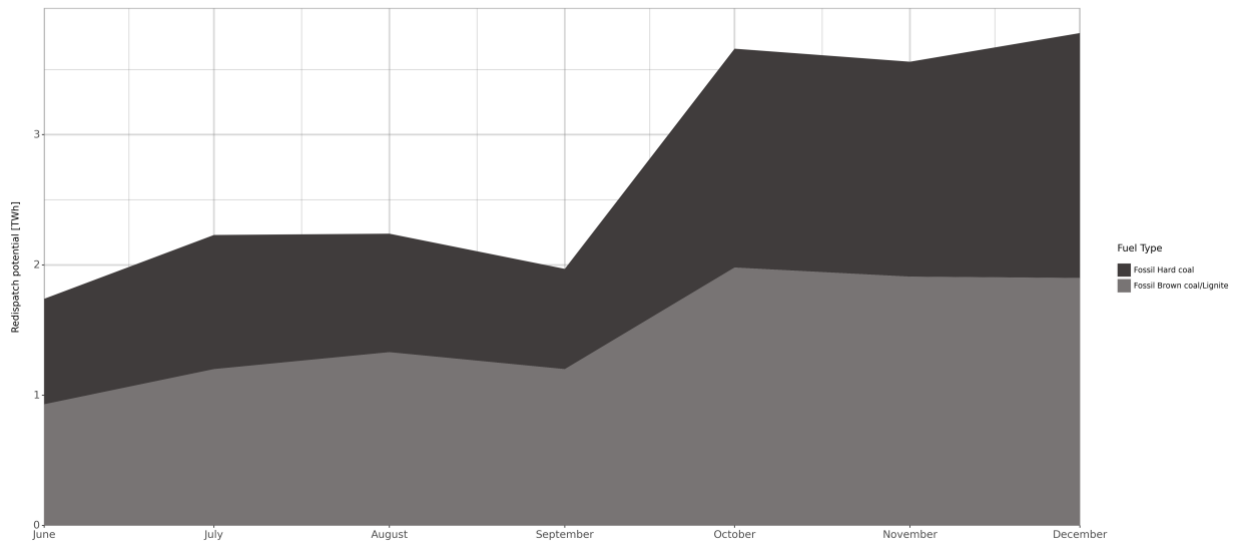
3.3.2 Redispatch potential for NL per month and fuel type in the D-2 process



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

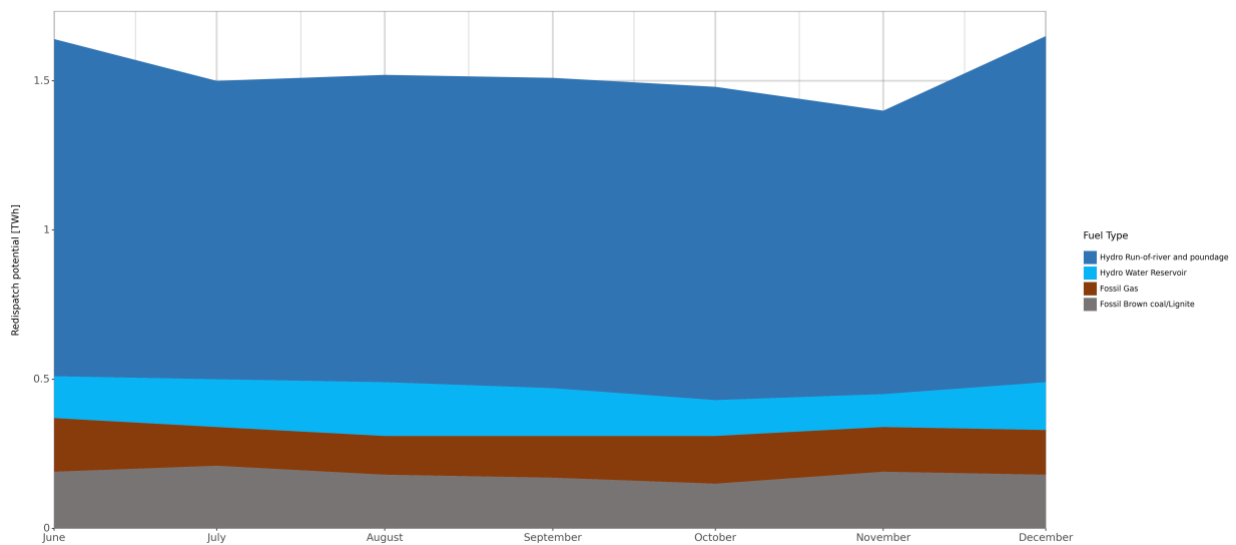


3.3.2 Redispatch potential for PL per month and fuel type in the D-2 process

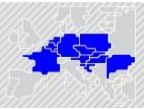


The figure above shows the monthly redispatch potential per fuel type for the D-2 process for PSE.

3.3.2 Redispatch potential for RO 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 Transelectrica.



Accuracy of non-Core Exchanges

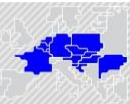
The obligation of Core TSOs to monitor and report on the accuracy of non-Core exchanges is outlined in this chapter, offering an overview of the DA CCM requirements and their fulfilment.

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)”*

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



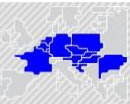
Article 16(7)(a)

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 contain 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	5
CZ	10
D2	6
D4	4
D7	1
D8	4
FR	34
HR	0
HU	5
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:

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

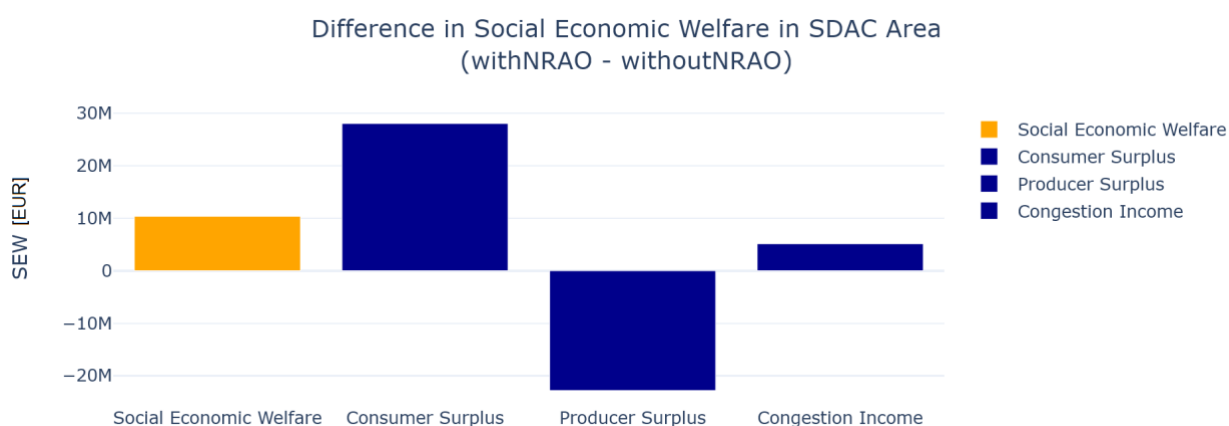
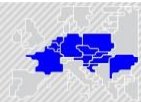
The data is provided separately in the file “2022_CNECs_with_non-zero_shadow_price.xlsx”

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

Simulation results

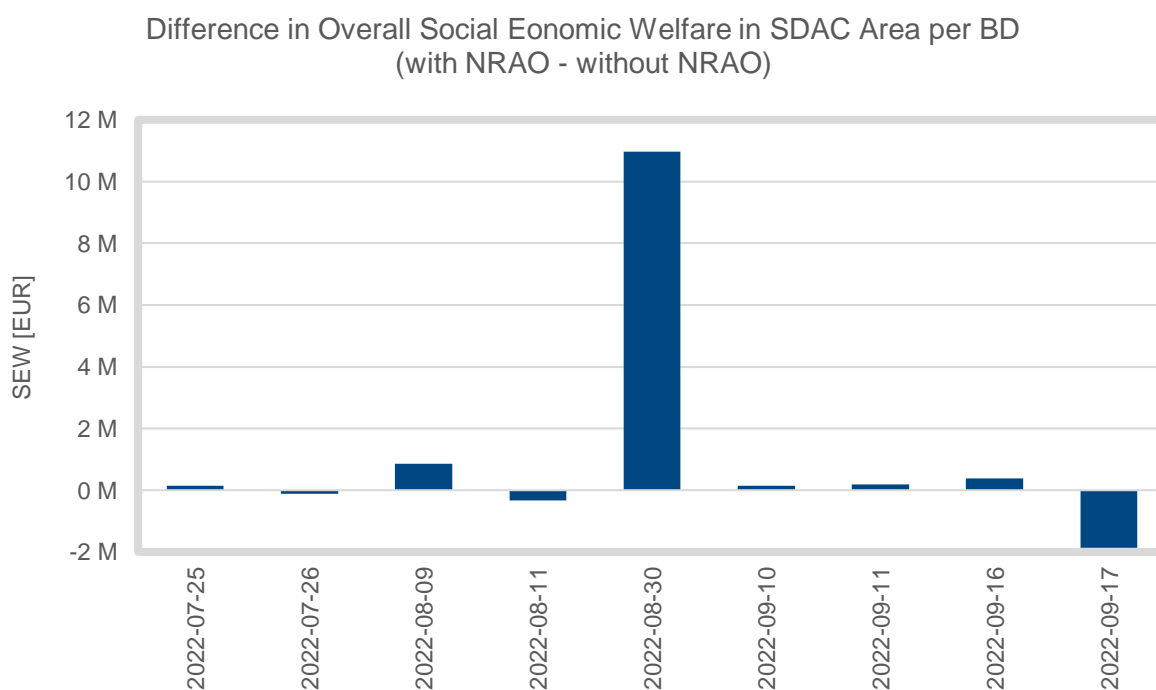
This subchapter provides results of the study to evaluate the effect of implementing the non-costly remedial action optimization (NRAO) on market coupling outcomes, focusing particularly on social welfare. The study involved rerunning the capacity calculation process for a set of nine Business Days (BDs) with NRAO and without NRAO, using the versions of the Core Capacity Calculation tool and the local individual validation as in operations in November 2023. Also, BDs with NRAO were rerun in order to ensure that observed differences between market coupling results are solely attributable to the application of NRAO and not due to any tool changes between 2022 and November 2023.

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 4.25.0 and Euphemia 11.2 fix 3, replicating the 17-minute runtime of Euphemia as in SDAC operations.

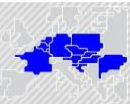


The graph above shows the added value of the NRAO step for nine Business Days (BD) in 2022. A positive value indicates a positive impact of NRAO. The yellow column “Social Economic Welfare” is the sum of the blue bars “Consumer Surplus”, “Producer Surplus”, and “Congestion Income”.

The selection of BDs subject for analysis was based on MTUs with the highest and lowest price differences/spreads for which the whole business day was selected for re-computation.



The graph above shows the benefit of NRAO per simulated business day by displaying the difference between the market coupling simulation results from the process with NRAO included and the results the market coupling from the process without including NRAO.

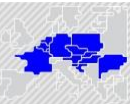


The following table gives an overview on the observed differences between the average day-ahead market prices and SDAC net positions for the 9 BDs for all Core bidding zones.

Bidding Zone	Market Price (with NRAO) [EUR/MWh]	Market Price (without NRAO) [EUR/MWh]	Market Price Difference [EUR/MWh]	SDAC Net Position (with NRAO) [MWh]	SDAC Net Position (without NRAO) [MWh]	SDAC Net Position Difference [MWh]
AT	416	417	-1	-1320	-1312	-8
BE	346	343	3	1091	1074	17
CZ	375	378	-3	1326	1328	-2
DE/LU	341	342	-1	1667	1729	-62
FR	419	422	-3	-3264	-3309	45
HR	432	433	-1	-37	-37	0
HU	434	434	0	-1676	-1676	0
NL	338	335	3	1112	1059	53
PL	203	203	0	24	23	1
RO	437	438	-1	-332	-331	-1
SI	431	432	-1	-346	-345	-1
SK	429	430	-1	-6	-5	-1

The conducted analysis relies on data from 9 business days in 2022. By systematically altering the mean SEW for eight business days at a time, while excluding one business day each time to mitigate potential bias, the observed SEW benefit varies within a range of -37K EUR to 1.5M EUR.

When comparing the results of the reruns with production data, several inconsistencies have been identified. These inconsistencies are caused by tool evolutions from the time when the production process was executed to until when the simulations were computed. When examining the estimates of social economic welfare provided in this section, these considerations should be taken into account.



Observations from Operational Process

This subsection contains key observations from the operational process during 2022.

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 2022.

Month	Number of timestamps with RAs applied	Share of timestamps with RAs applied [%]
Jun	372	70
Jul	551	74
Aug	592	80
Sep	573	80
Oct	661	89
Nov	597	83
Dec	583	78

The chapter “Aggregated operational KPIs” contain several KPIs that provides insights to the performance of NRAO including KPI 9 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.

Individual Validation Adjustment Applied as Fallback

Following RAO during 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 2022 in which IVA was applied as fallback.

Month	Number of timestamps with IVA applied as fallback	Share of timestamps with IVA applied as fallback [%]
Jun	45	9
Jul	175	24
Aug	36	5
Sep	27	4
Oct	24	3
Nov	6	1
Dec	48	6



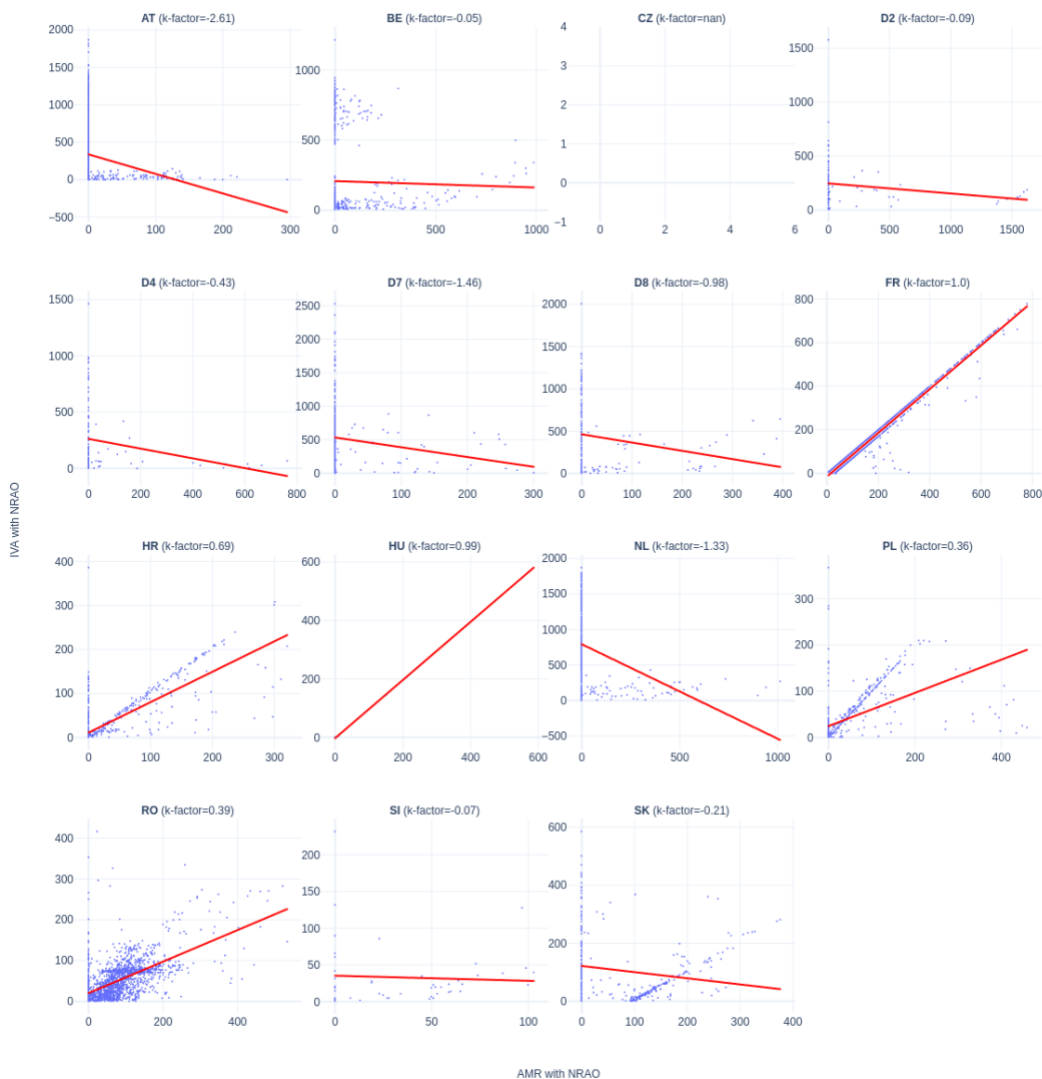
Estimated IVA values

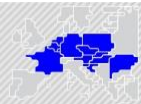
In order to assess how NRAO affects the IVA values, a comparison between IVA with and without NRAO is conducted.

The IVA values with NRAO can be directly obtained from the Capacity Calculation production process. On the other hand, recomputing all the IVA values for a scenario without NRAO would be very time and resource consuming. Therefore, an estimated value is computed based on the assumption that there is a correlation between IVA and AMR values, using the following formula:

$$IVA_{\text{without NRAO}} = \max((AMR_{\text{without NRAO}} - AMR_{\text{with NRAO}}) * k + IVA_{\text{with NRAO}}; 0)$$

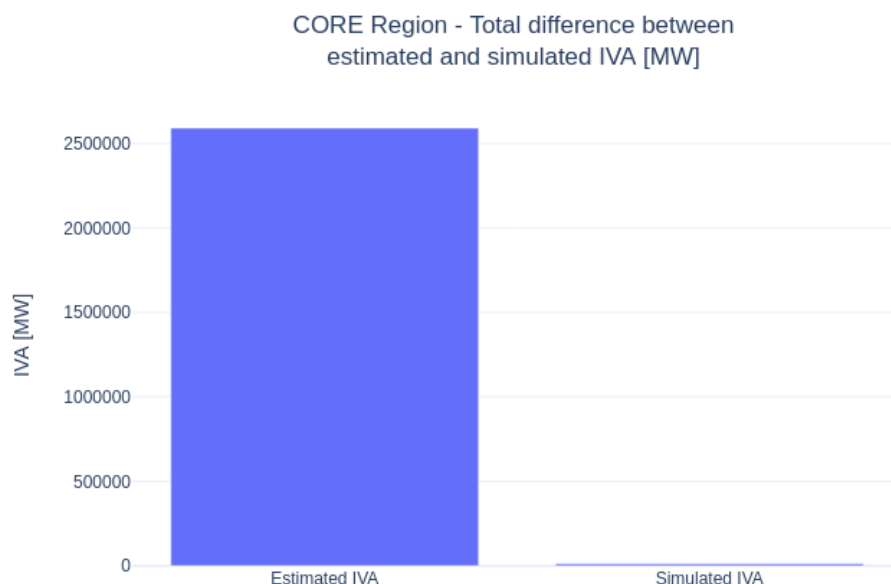
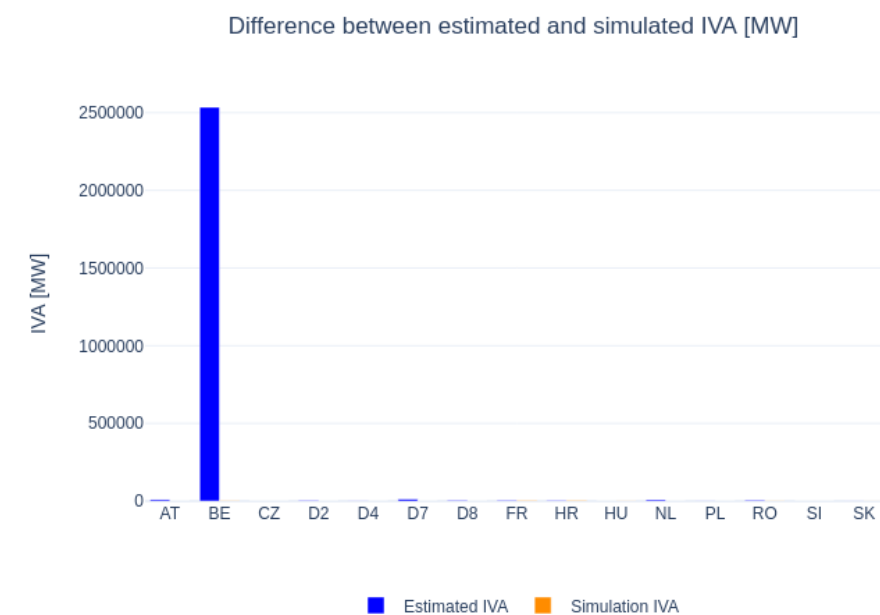
The correction factor k is derived separately for each Core TSO. It is calculated by creating a scatterplot of AMR values (X-axis) and IVA values (Y-axis) applied by the respective TSO. The k value results from the slope of the regression line. (If k value is negative, then it is set to 0) In the figure below, the k values for each TSO can be seen.



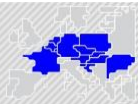


Looking at the graphs above, it can be seen that the initial assumption is not correct, since there is no correlation (with the exception of FR) between the IVA and the AMR values. Hence, the results derived from this IVA estimation, are expected to be incorrect.

Additionally, for the set of re-run BDs, the differences between IVA values from the re-run process and the estimated IVA values are compared; and a visualization of total differences in IVA per TSO is generated.



All results computed with these estimated IVA values can be found in [Annex 4](#).



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:

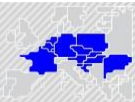
- (a) the summary of the quality of the data provided by each data provider*
- (b) the assessment of the ease-of-use of data retrieval (both manual and automated)*
- (c) the results of the satisfaction survey performed annually with stakeholders and all Core regulatory authorities*
- (d) suggestions 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.
 - Annual overview (monthly granularity) of total number of occurrences for which follow up actions were initiated

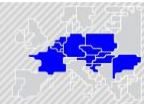


IGM replacement heatmap

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	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AT	2	0	7	1	3	0	0
BE	0	23	0	0	0	0	0
CZ	2	0	0	0	0	0	0
D2	0	0	0	0	0	9	6
D4	0	0	0	0	0	0	0
D6	18	96	0	0	0	0	0
D7	0	0	24	0	0	0	0
D8	0	0	0	0	0	0	0
FR	0	0	0	0	0	1	1
HR	0	0	0	0	0	0	0
HU	0	0	0	0	24	0	0
NL	24	24	3	0	10	1	1
PL	0	2	1	0	0	0	0
RO	0	1	0	0	0	2	0
SI	0	16	0	1	92	0	0
SK	2	0	0	0	0	0	0

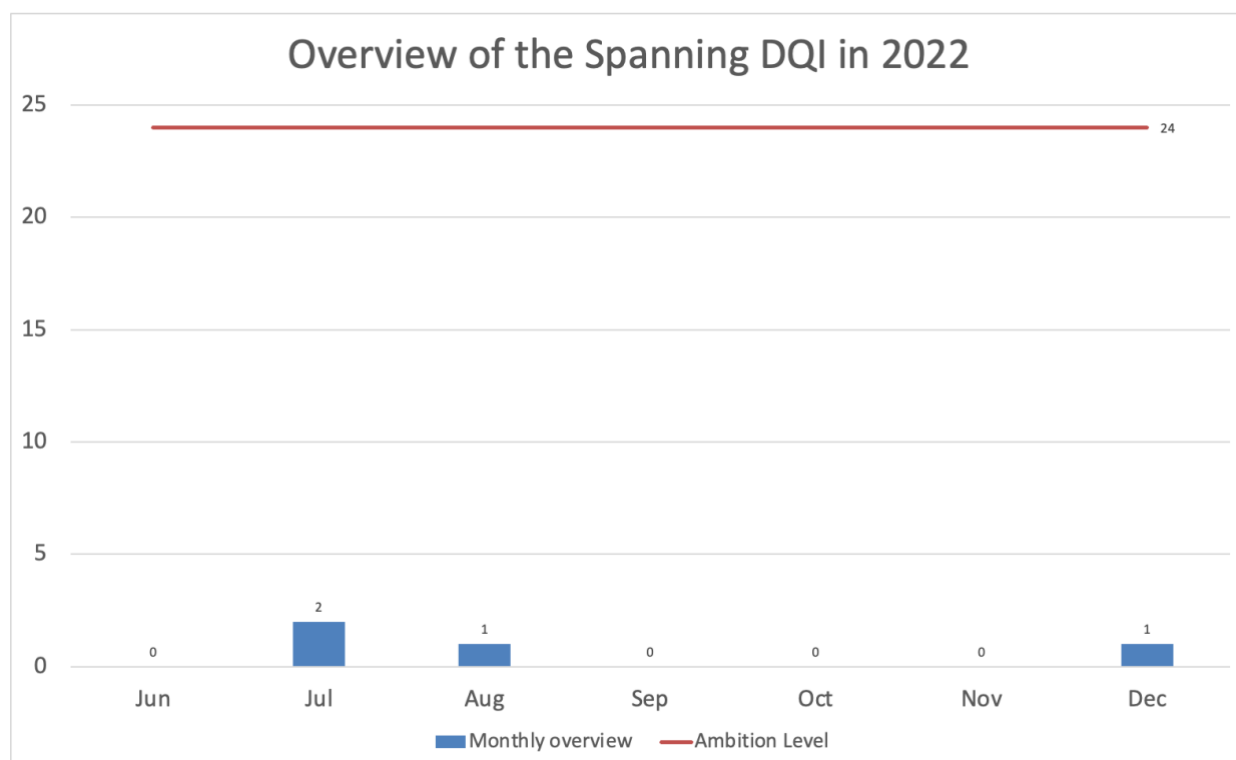


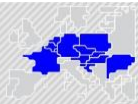
Spanning

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](#)



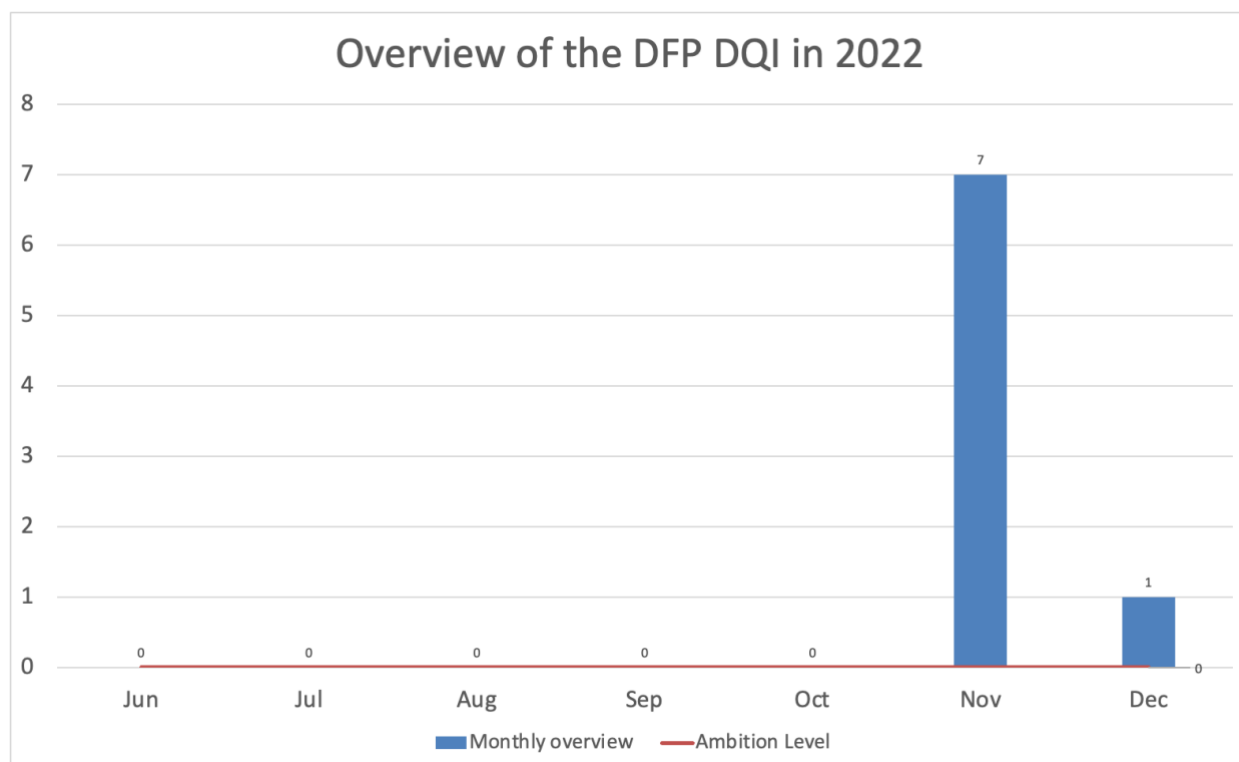


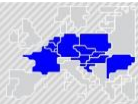
DFP

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](#)

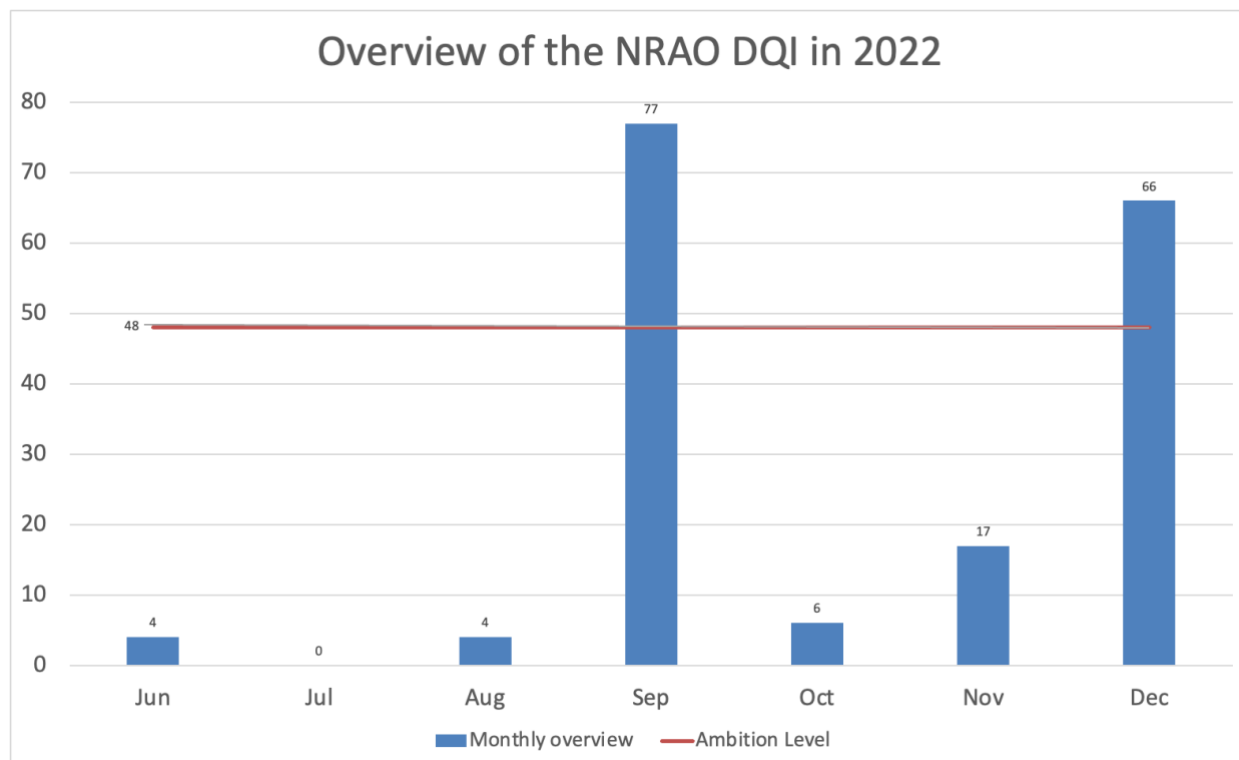


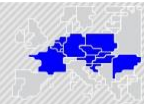


NRAO was not applied

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 (TSCNET NRAO or CASTOR) 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](#)

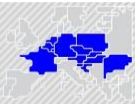




JAO Monitoring Tool Completeness and Timely Data Publication

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	4	10	6	16	8	6	15
Allocation Constraints	2	5	4	2	4	3	5
Border Data Overview	1	1	0	0	2	1	0
Congestion Income	1	0	0	0	0	0	0
Core MarketGraphs	1	0	2	2	2	2	1
Core MarketView	2	1	3	2	4	3	5
Core max net positions and bilateral exchanges	1	0	2	2	2	2	1
D2CF	2	0	1	0	1	0	0
Final Bilateral Exchange Restrictions	2	0	2	1	2	2	1
Final Computation	1	1	2	1	3	2	5
Initial Computation (Virgin Domain)	2	0	4	2	2	3	1
Intraday ATC	2	0	0	0	1	0	0
Intraday NTC	1	0	0	0	1	0	0
LTA	1	0	0	0	0	0	0
LTN	1	1	0	0	1	1	0
Max Exchanges (MaxBex)	1	0	1	1	1	1	1
Max Net Positions	1	0	1	2	2	2	1
Net Position	2	0	0	0	0	0	0
Pre-Final Computation (Early Publication)	1	1	4	2	2	4	1
Price Spread	1	0	0	0	0	2	0
Reference Net Position	1	0	1	0	1	0	0
Refprog	2	0	0	0	0	0	0
Remedial Action Curative	2	1	2	0	1	0	1
Remedial Action Preventive	2	1	2	0	1	0	1
Scheduled Exchanges	3	0	1	0	3	1	0
Shadow Auction ATC	5	11	8	16	8	6	15
Shadow Prices	11	0	2	0	3	1	1
Spanning / DFP	4	1	2	1	2	2	1
Validation Reductions	1	5	3	2	5	3	4
	Jun	Jul	Aug	Sep	Oct	Nov	Dec



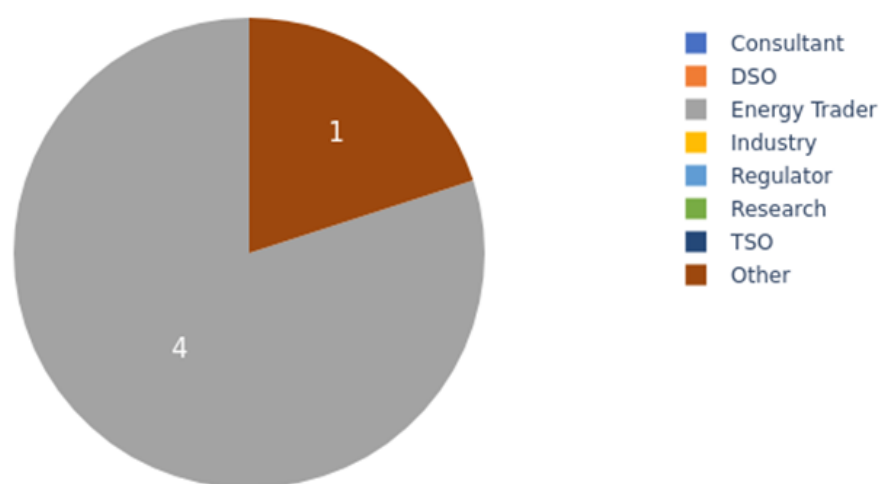
Article 26(3)(b)-(d)

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 2022. The survey ran for 1 month on the ENTSO-E and the feedback received was processed by the Reporting TF.

5 survey responses were obtained:

- 2/5 responses were confidential
- 4/5 responses were from “Energy Trader” stakeholder category

BREAKDOWN OF SURVEY RESPONSES, PER STAKEHOLDER CATEGORY



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

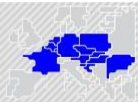
Frequency of use – functionality with highest rating	Frequency of use – functionality with lowest rating
API (4.7/5)	Monitoring Tool (3.0/5)
Clarity and completeness of information – functionality with highest rating	Clarity and completeness of information – functionality with lowest rating
Navigation, downloading the data (via GUI) (4.3/5)	Monitoring tool and all the regular publications/reports (3.0/5)
	<i>*Most polarized views seem to be on the Static Grid Model</i>

The most frequently used pages have an overall good average rating (>4.0/5)

The lowest average rating for clarity and completeness was 3.0/5 for 3 pages:

The pages “Intraday ATC” and “Intraday NTC” are among the least frequently used

The page “Validation Reductions” would be more important, and an improvement was already introduced for the page in the form of more structured reporting information



Some improvements were flagged to increase the readability and definition of the data. These improvements will be implemented:

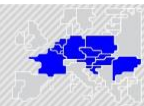
- Replace the term “Parameters” in the right-hand side section by a more adequate term: For PSTs, this should be "PST tap before NRAO" and "PST tap after NRAO"
- Rename the "baseline" and "after NRAO" - "PST tap before NRAO" and "PST tap after NRAO" for PSTs. Nothing expected for topo RAs
- Better naming of the labelling “R_{amr}” and “minRAM for Core target”

In the FB domain pages the MNECs will be filtered out. This is in line with the CCM requesting to publish only the CNECs.

Clarification how to access the API: Add /API in the URL.

Requests to add more features to the PuTo are not pursued:

- Changing download functionality compromises performance
- Adding graphs/visualization is considered a nice to have and not a key priority for Core TSOs



Aggregated operational KPIs

Reporting obligations from DA CCM

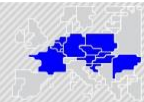
As per Article 28(4) of the Core DA CCM:

*“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:

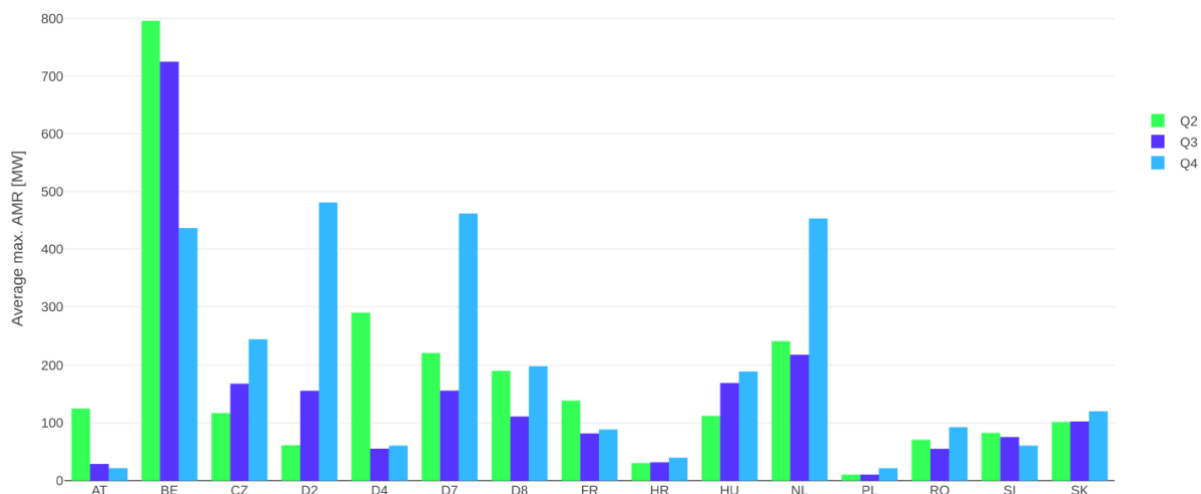
1. Adjustment for minimum RAM Inclusion
2. TSOs' adjustment after validation
3. Power system impact analysis
4. Non-costly remedial action optimisation analysis
5. Market impact assessment



KPI results

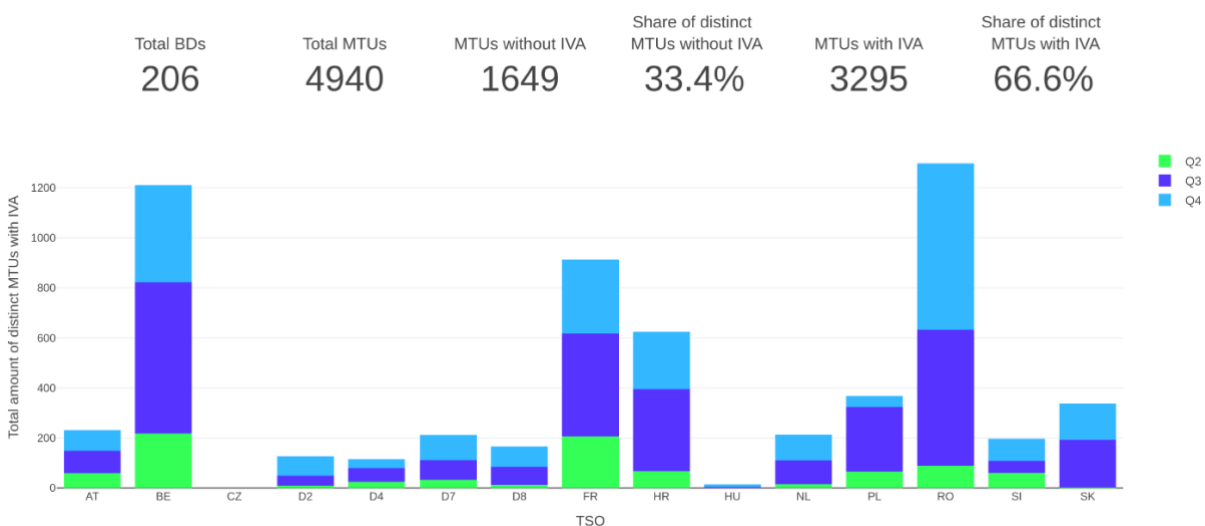
Adjustment for minimum RAM inclusion

- KPI 1: Average maximum AMR per TSO

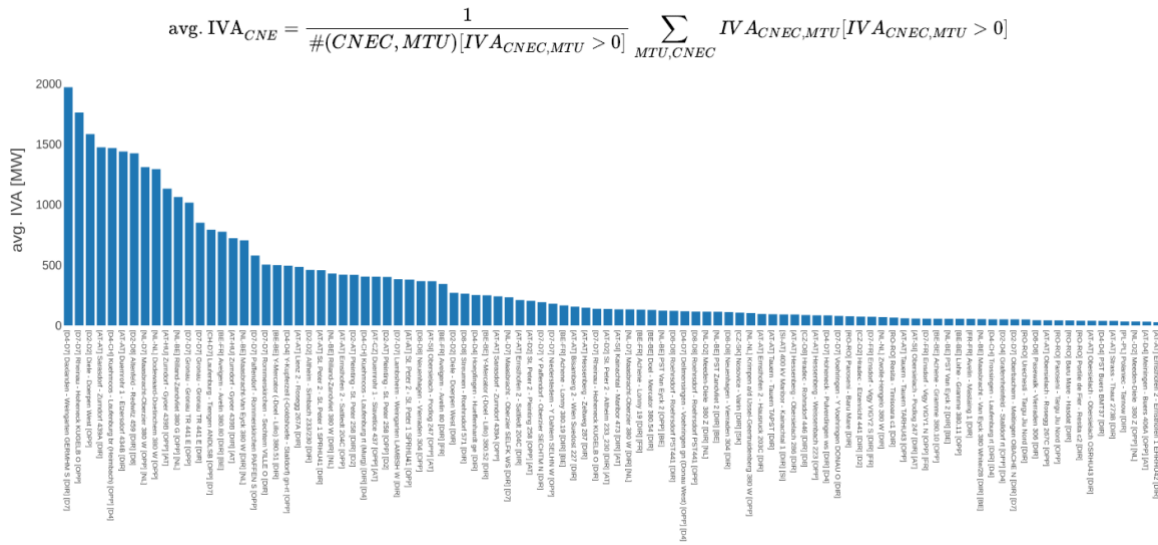


TSOs' adjustment after validation

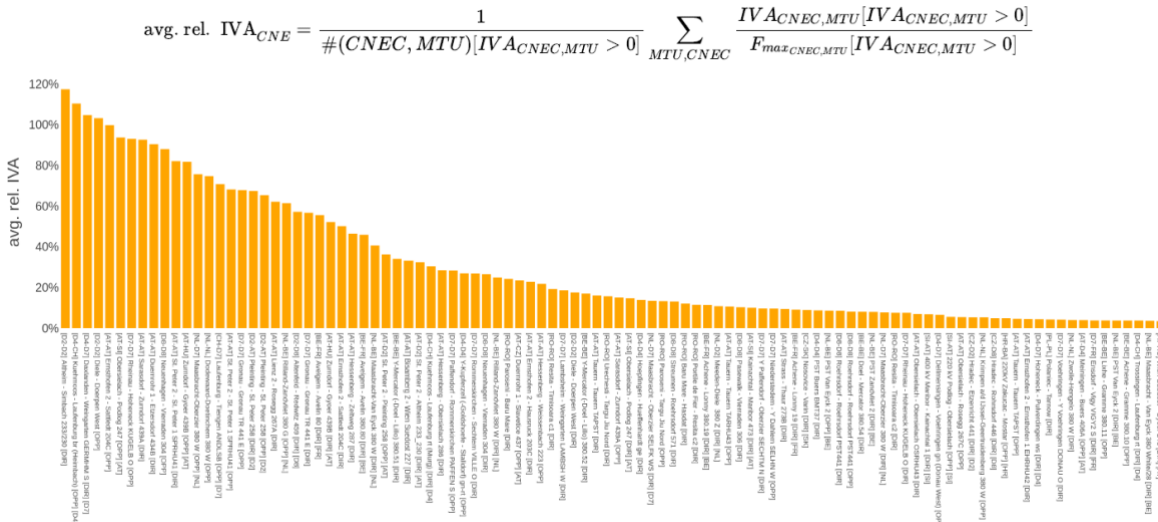
- KPI 2: Total amount of MTUs with intervention per TSO



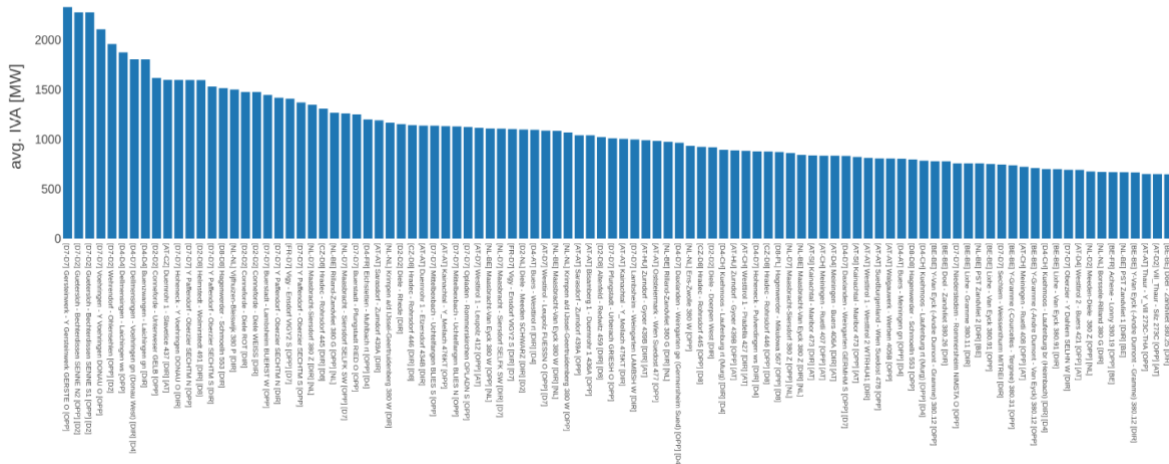
- KPI 2: Average IVA applied for each CNE affected by TSO intervention (Quarter 2)



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

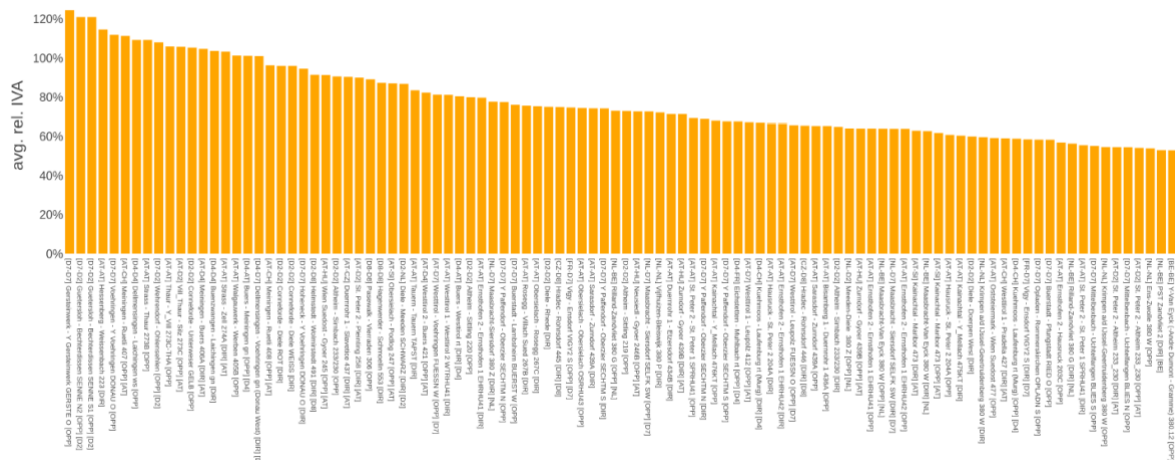


- KPI 2: Average IVA applied for each CNE affected by TSO intervention (Quarter 3)

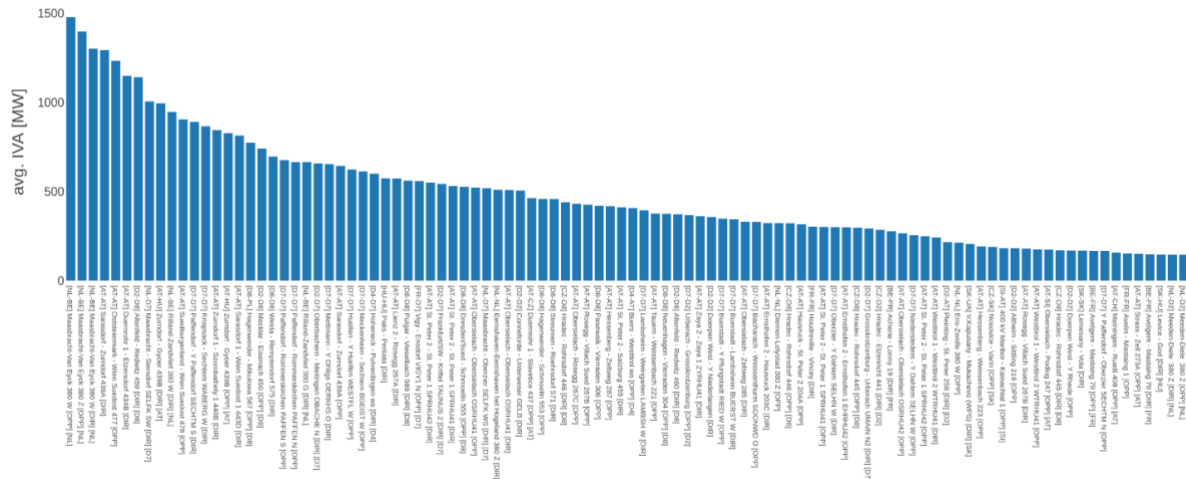




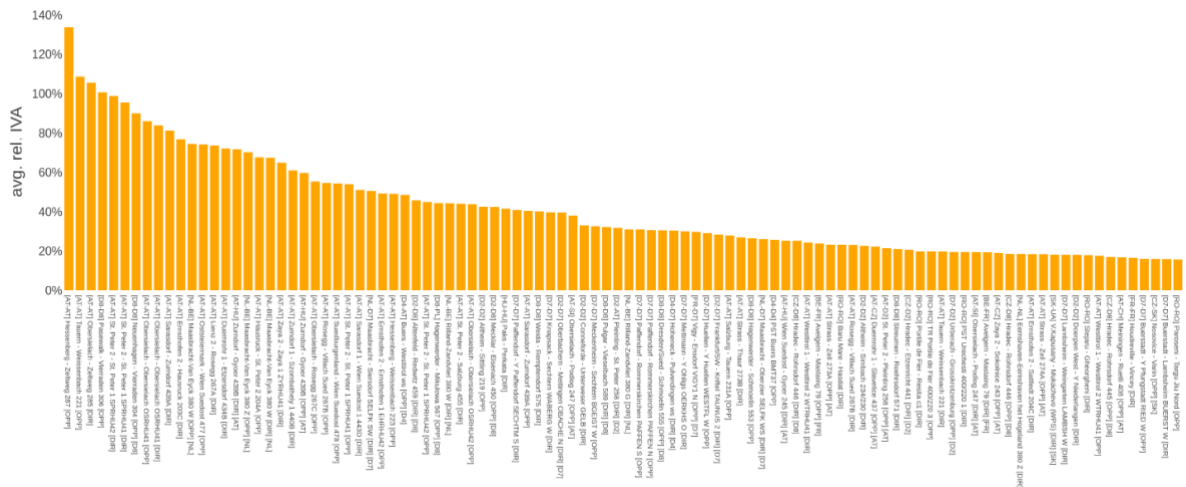
- KPI 2: Average relative IVA applied for each CNE affected by TSO intervention (Quarter 3)



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

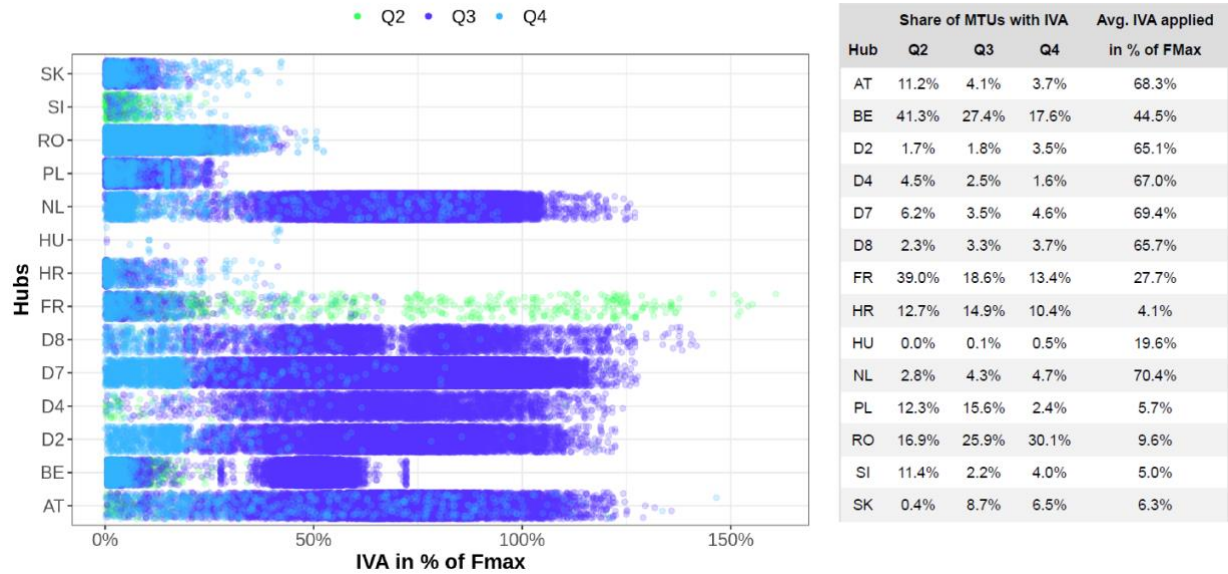


- KPI 2: Average relative IVA applied for each CNE affected by TSO intervention (Quarter 4)



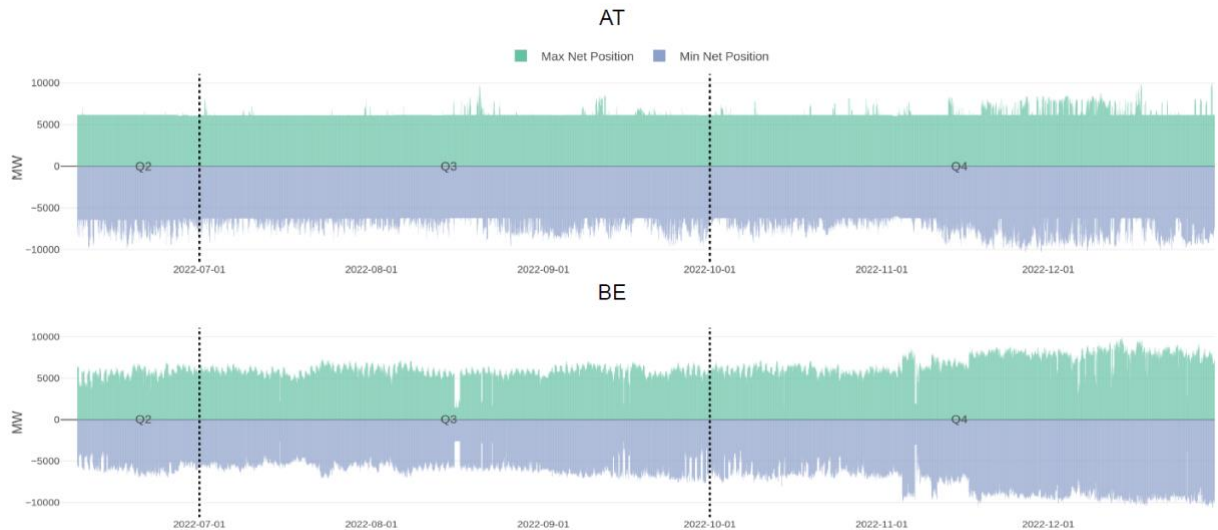


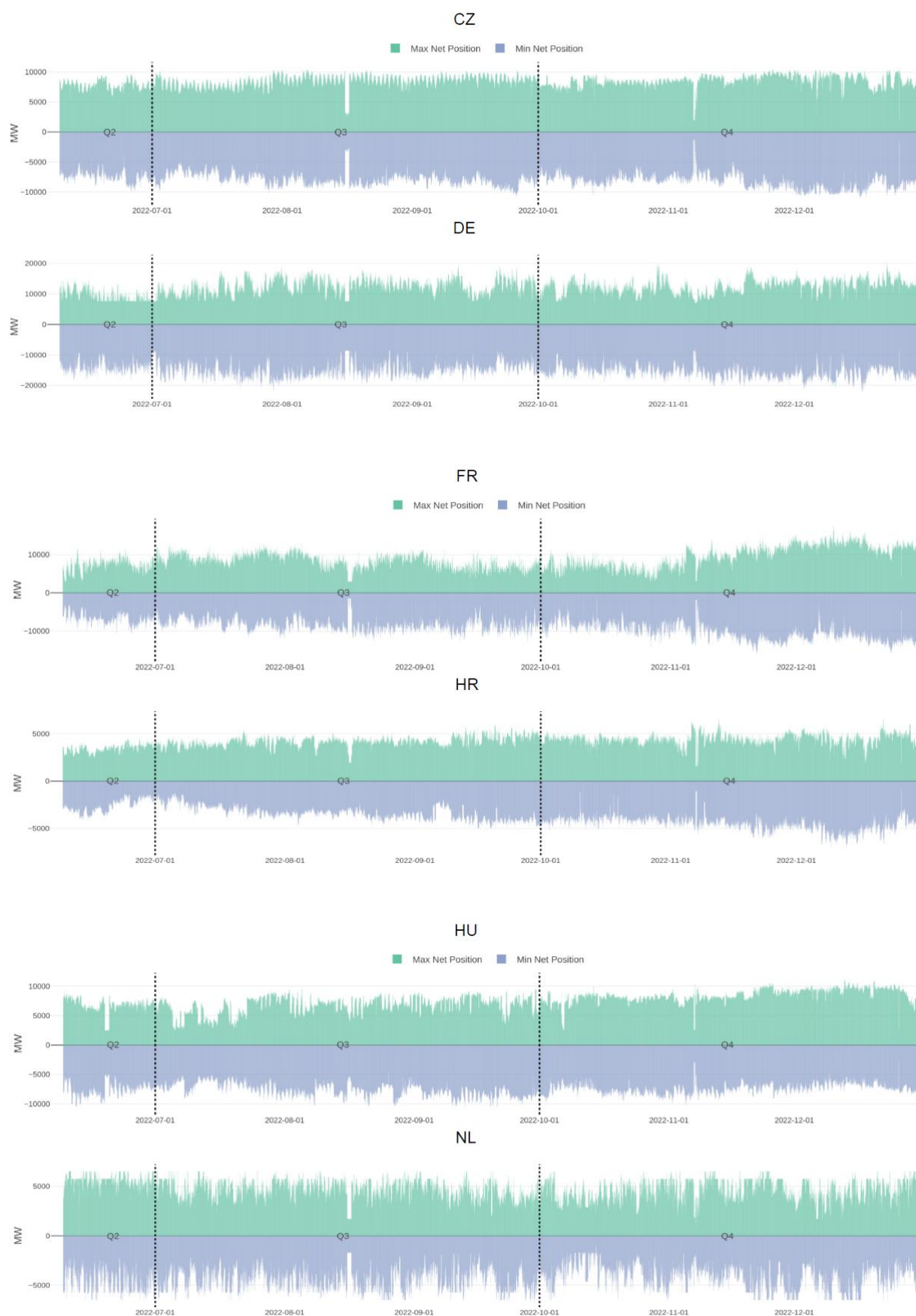
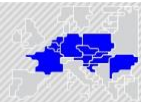
• KPI 3: Total IVA applied per TSO

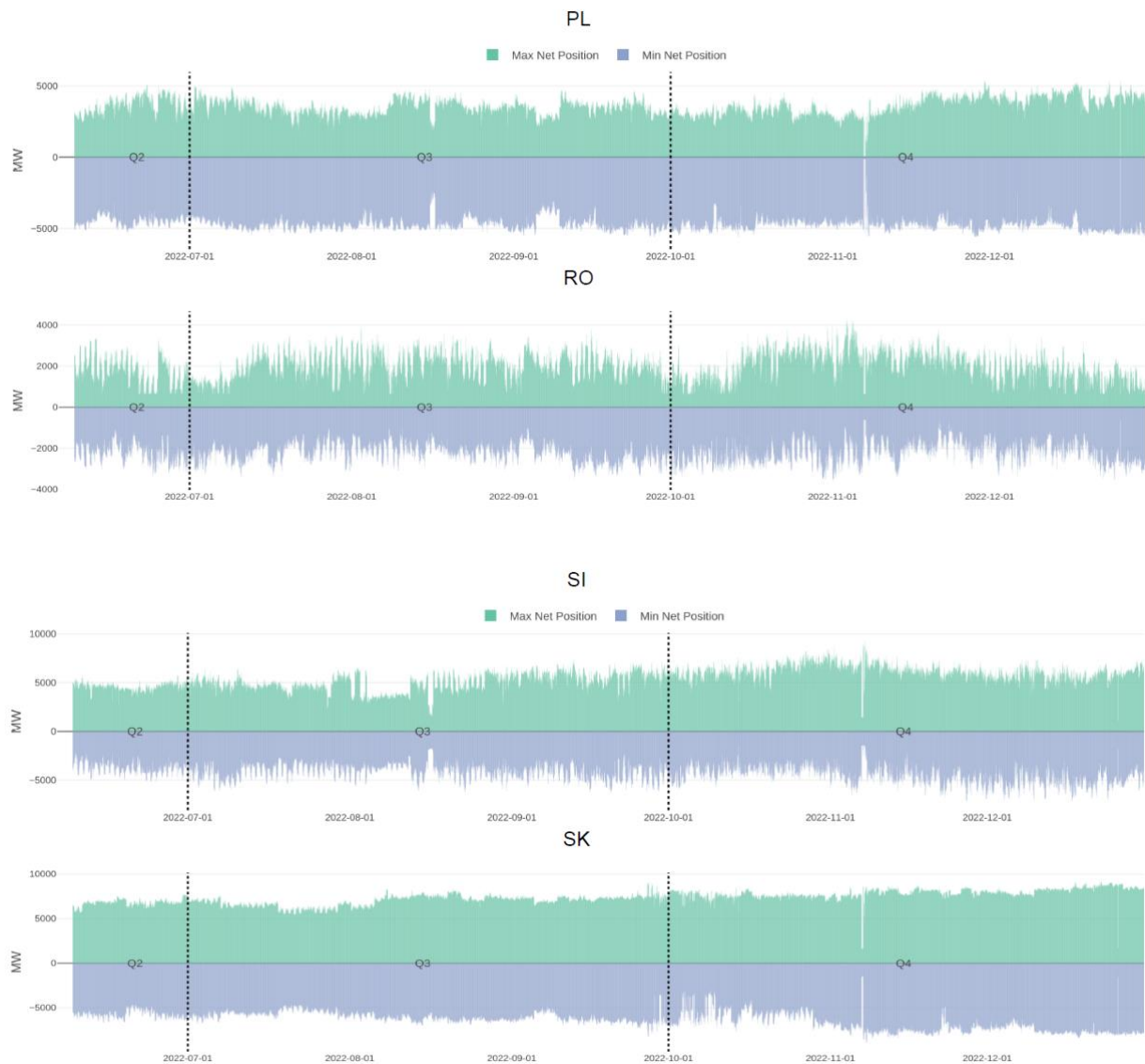
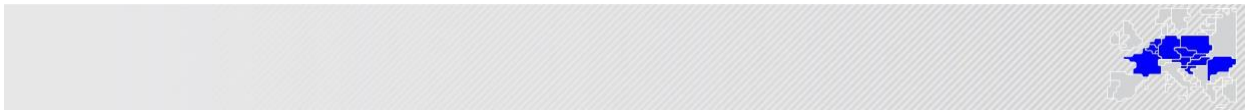


Power System Impact Analysis

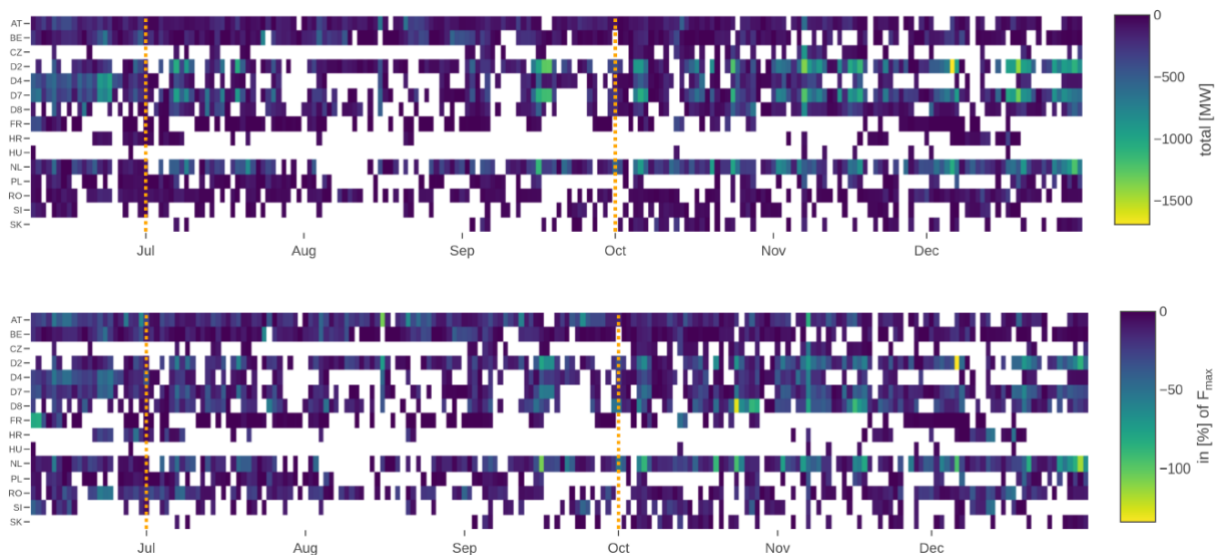
• KPI 4: Min and max net positions per BZ hub

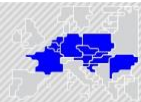




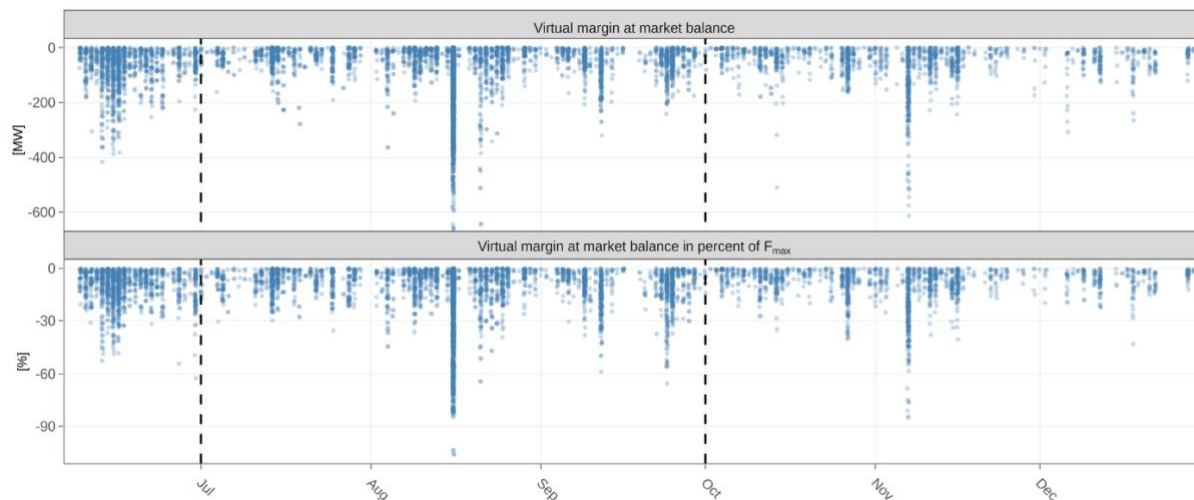


- KPI 5a: Highest virtual margins at market balance (all Core TSOs)

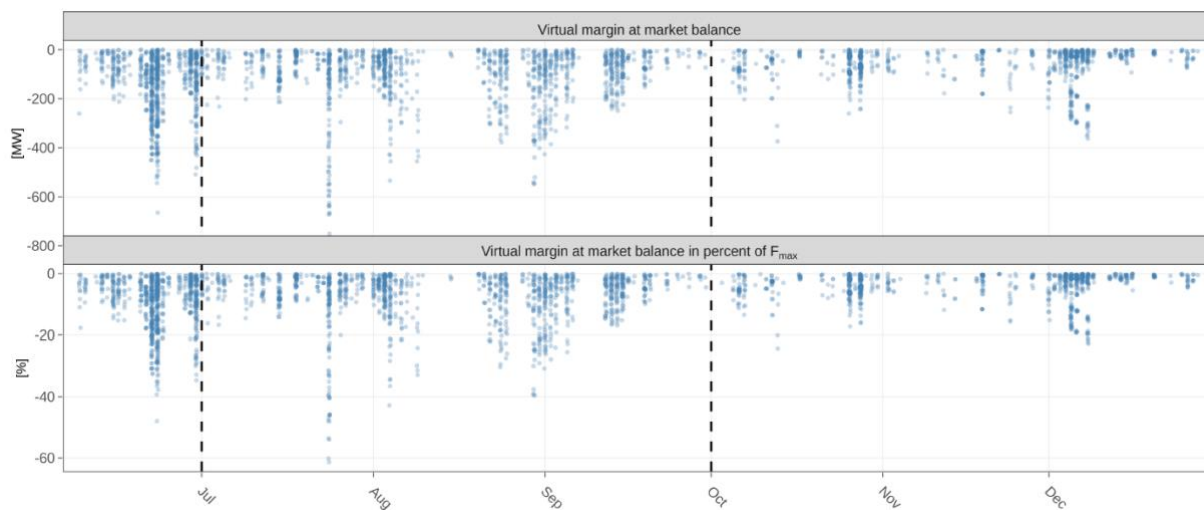




- KPI 5b: Virtual margins at market balance (AT)

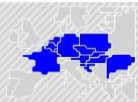


- KPI 5b: Virtual margins at market balance (BE)

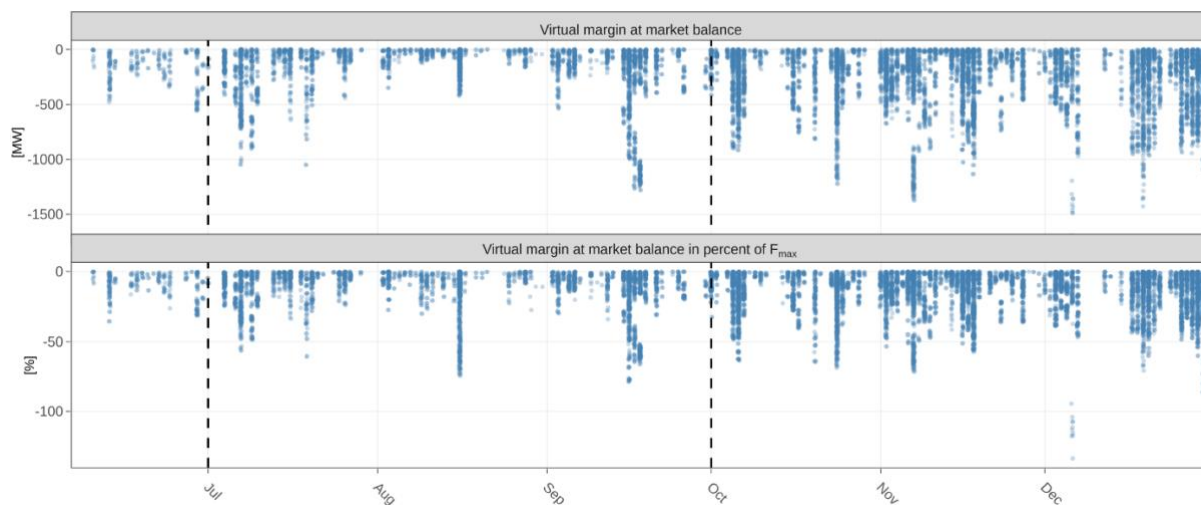


- KPI 5b: Virtual margins at market balance (CZ)

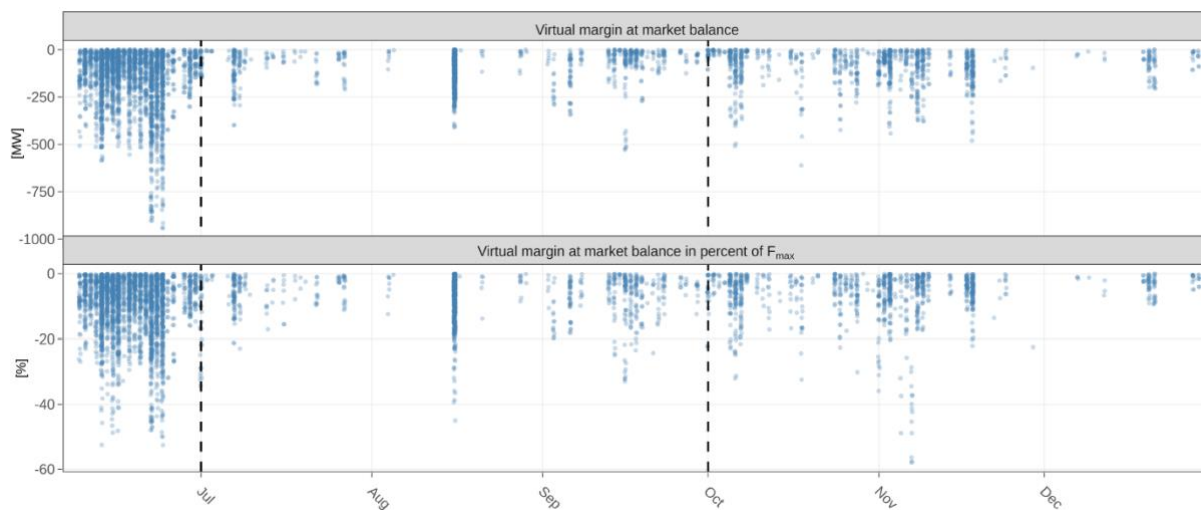




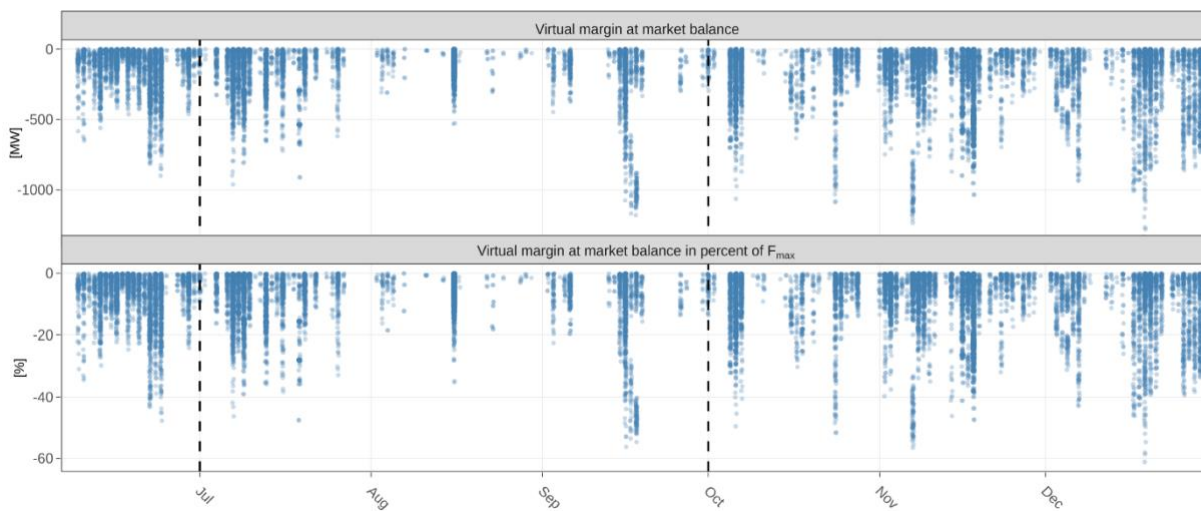
- KPI 5b: Virtual margins at market balance (D2)

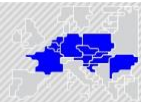


- KPI 5b: Virtual margins at market balance (D4)

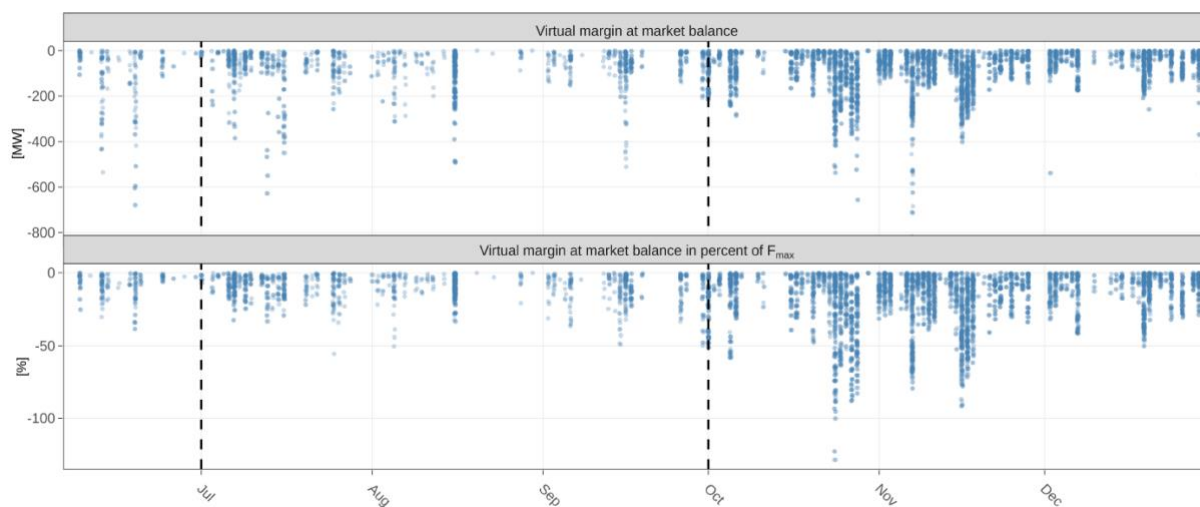


- KPI 5b: Virtual margins at market balance (D7)

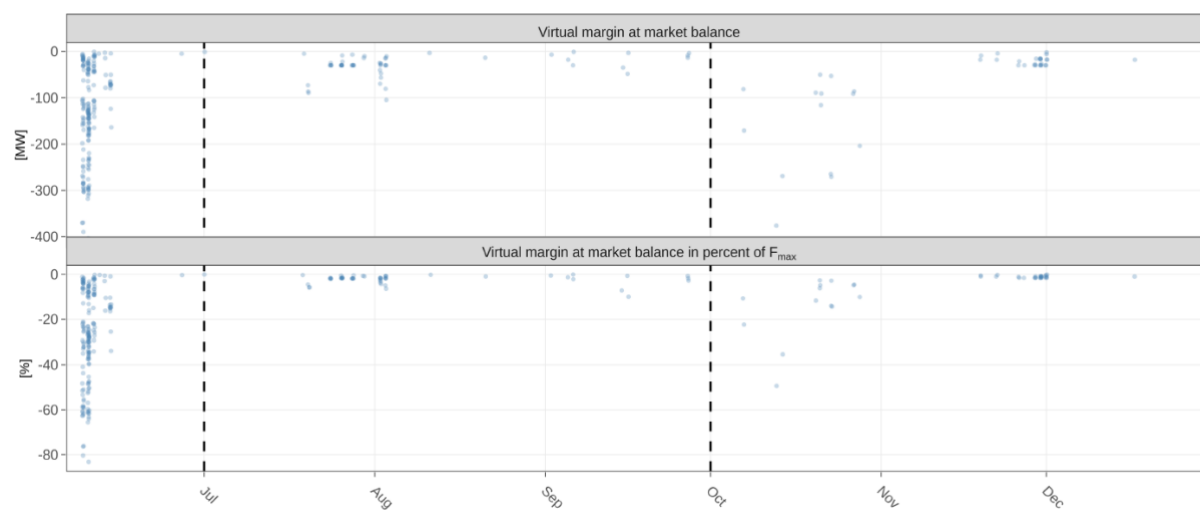




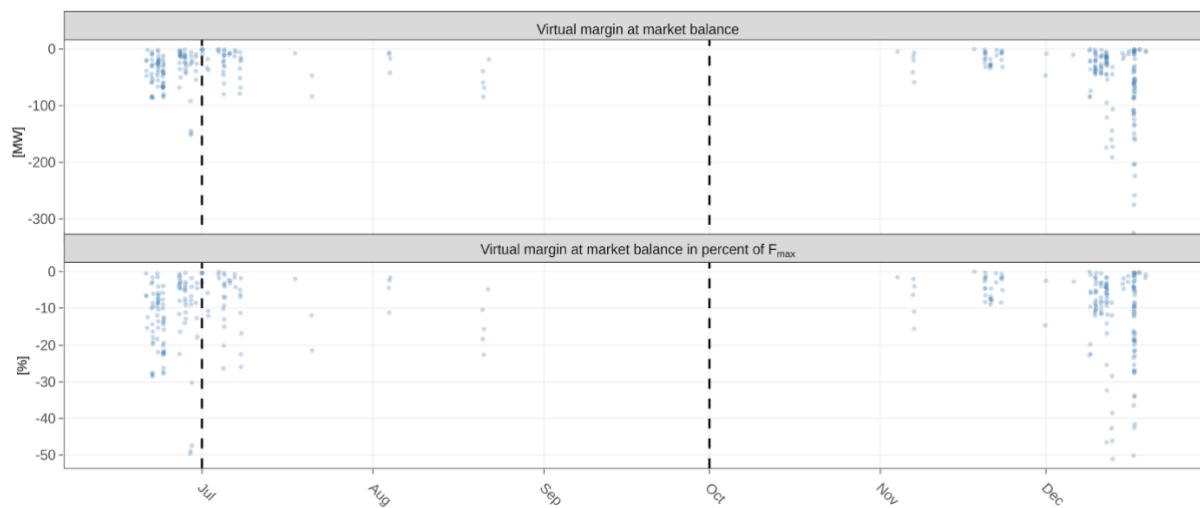
- KPI 5b: Virtual margins at market balance (D8)



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

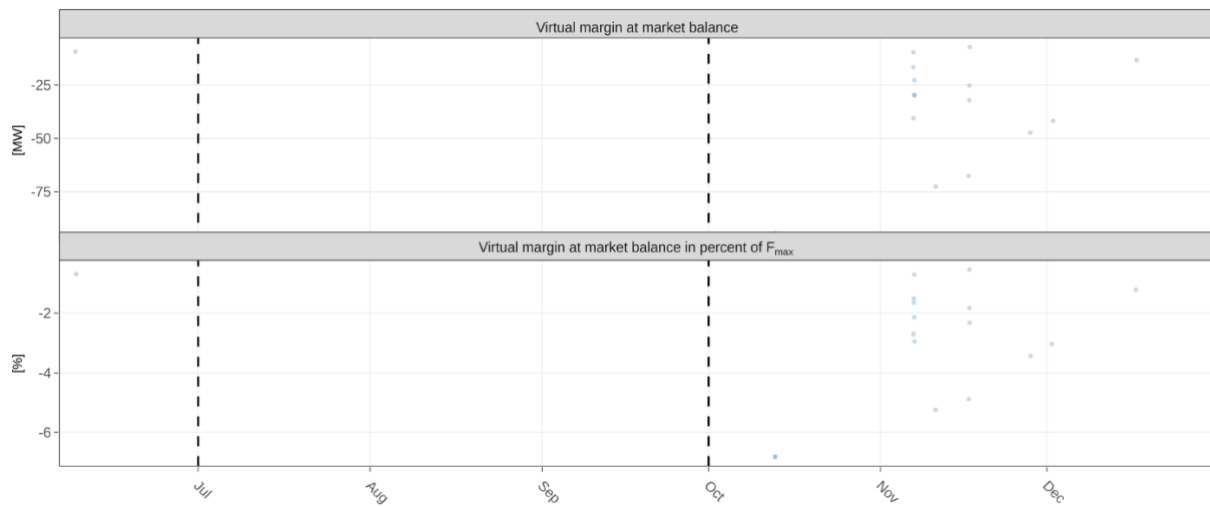


- KPI 5b: Virtual margins at market balance (HR)

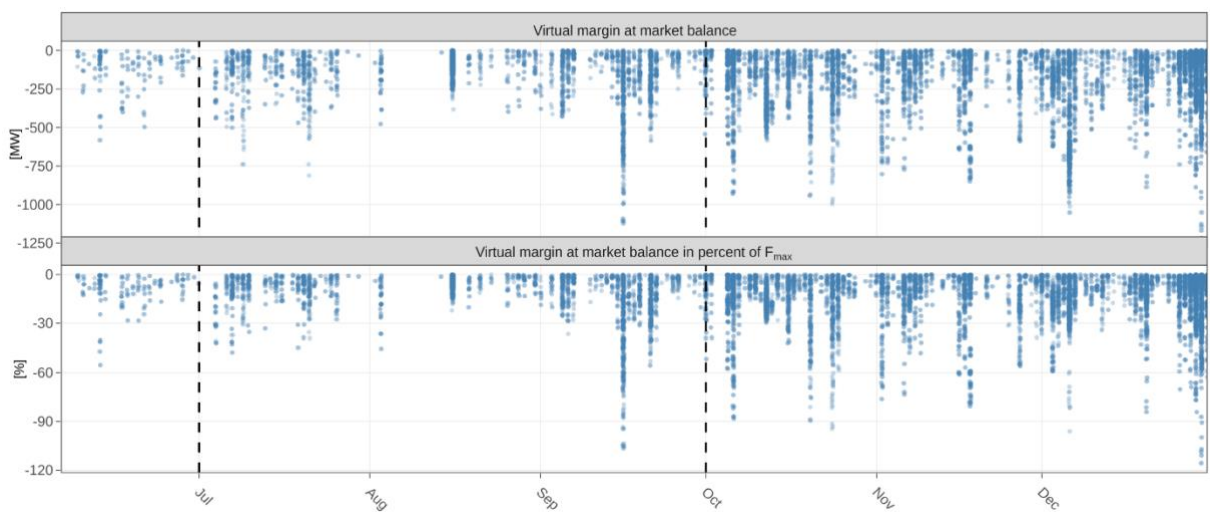




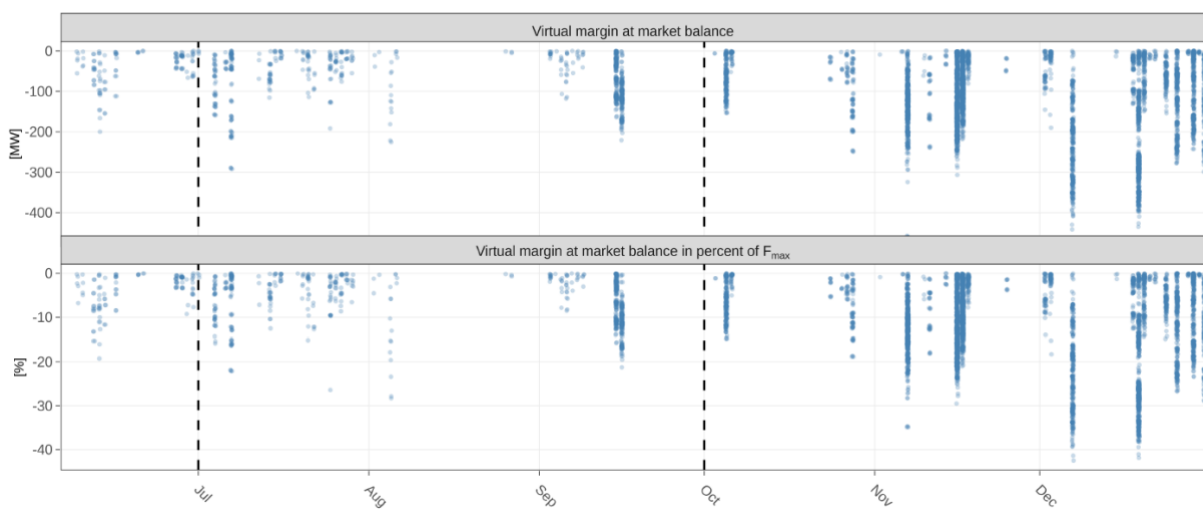
- KPI 5b: Virtual margins at market balance (HU)

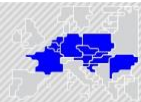


- KPI 5b: Virtual margins at market balance (NL)

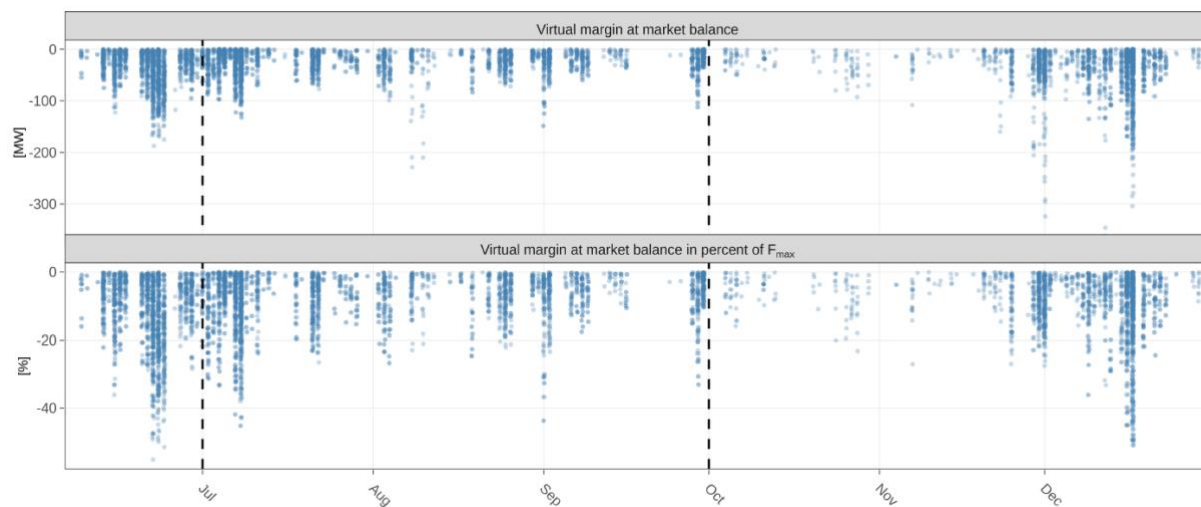


- KPI 5b: Virtual margins at market balance (PL)

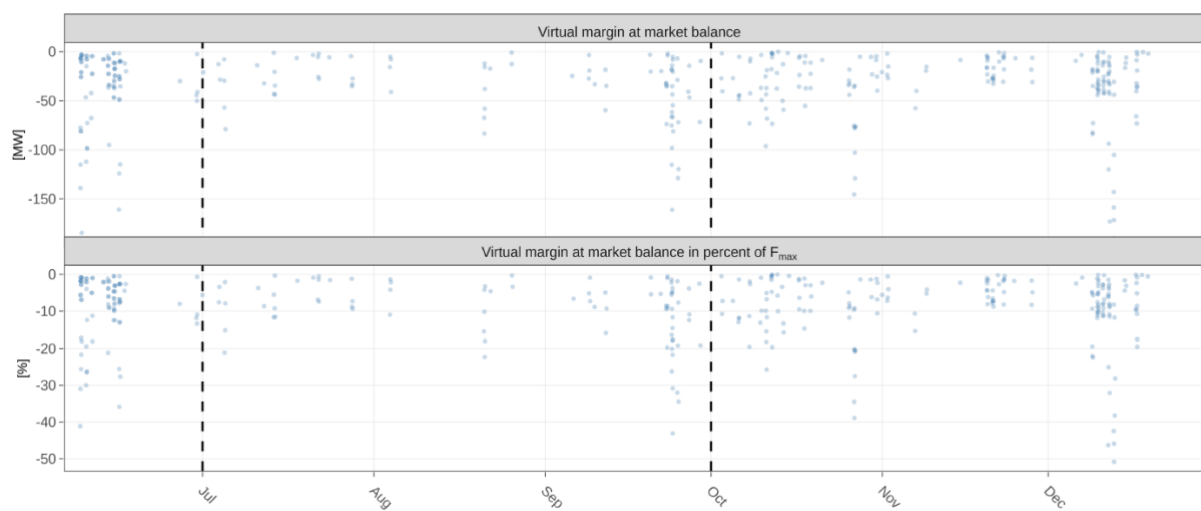




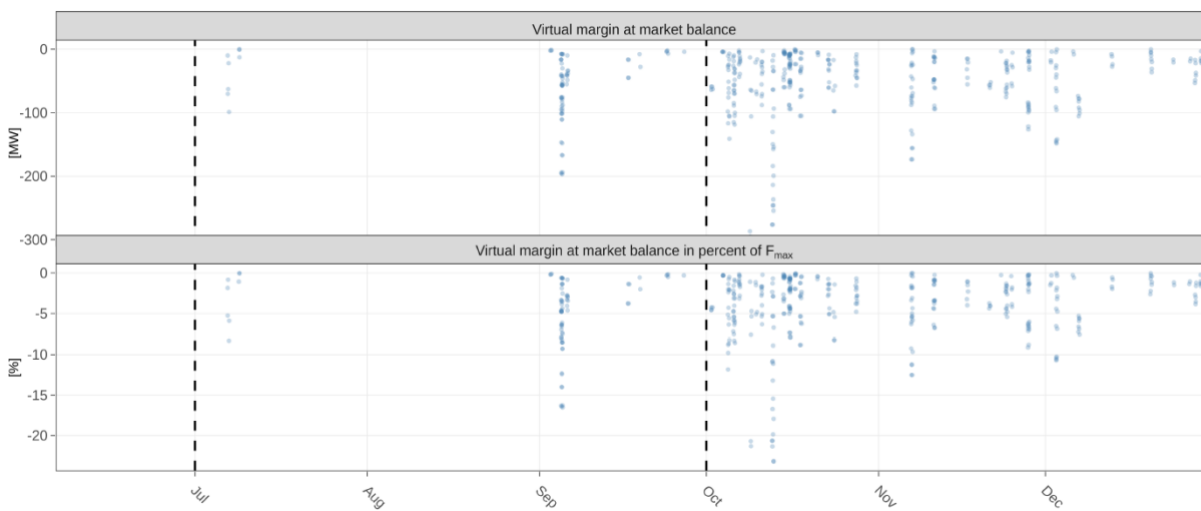
- KPI 5b: Virtual margins at market balance (RO)

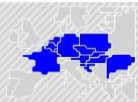


- KPI 5b: Virtual margins at market balance (SI)

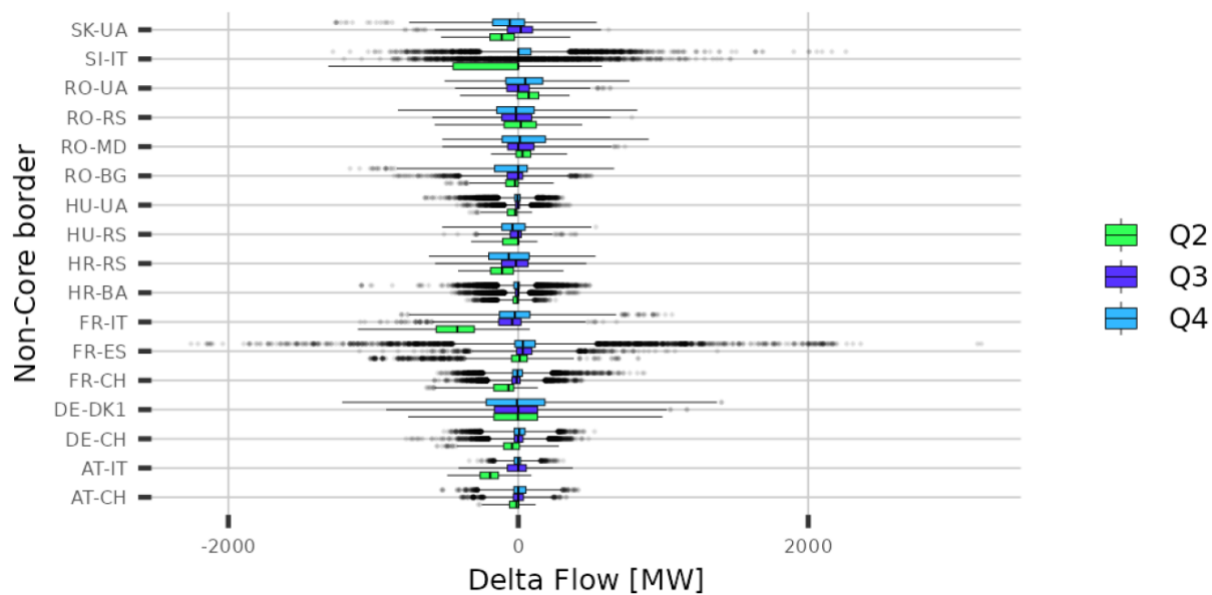


- KPI 5b: Virtual margins at market balance (SK)

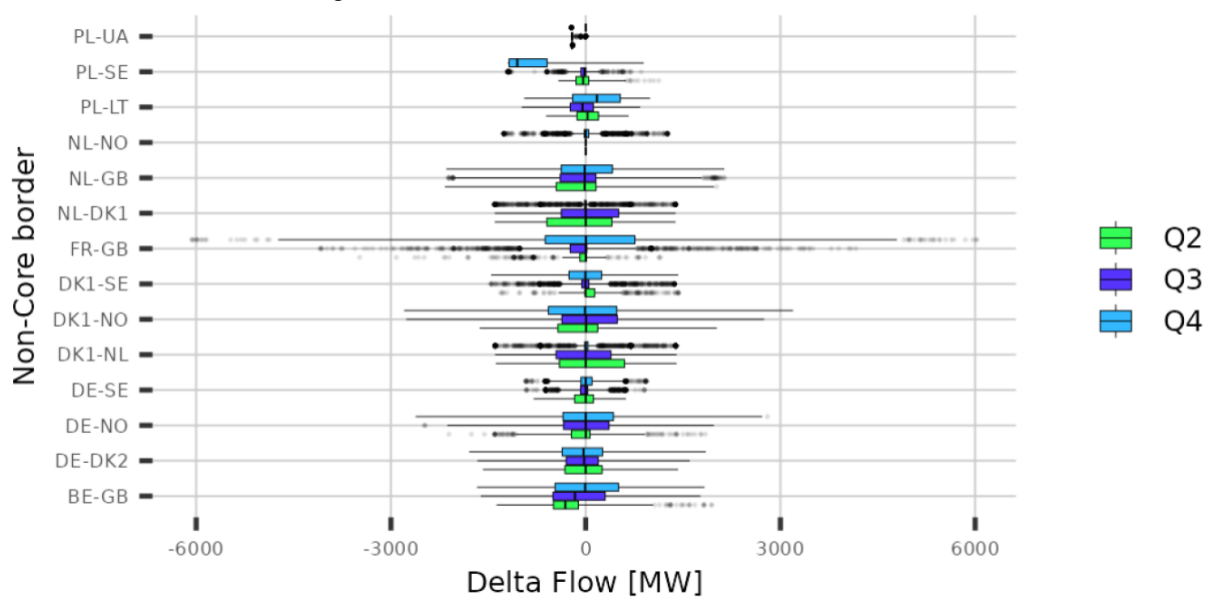


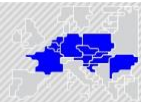


- KPI 6: Non-Core exchanges AC delta flow



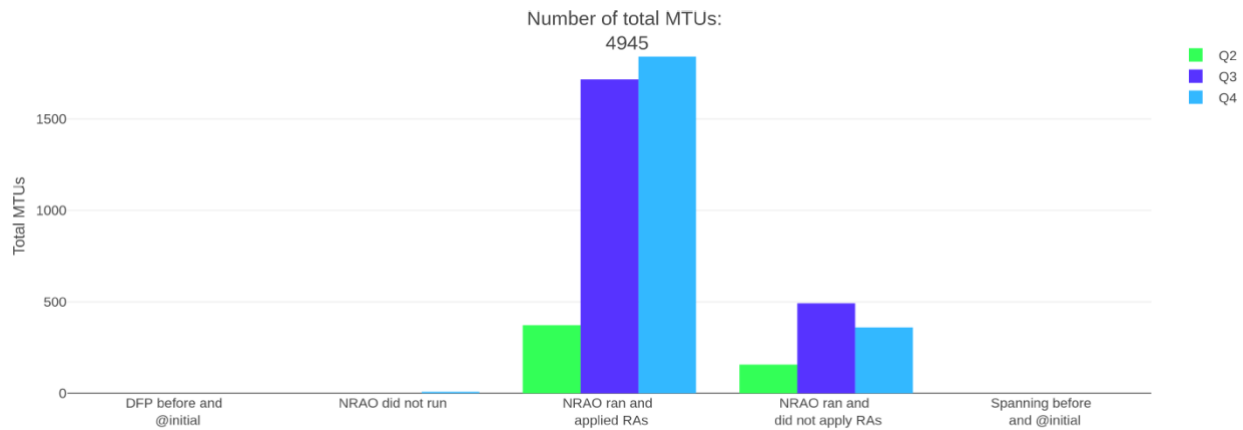
- KPI 6: Non-Core exchanges DC delta flow





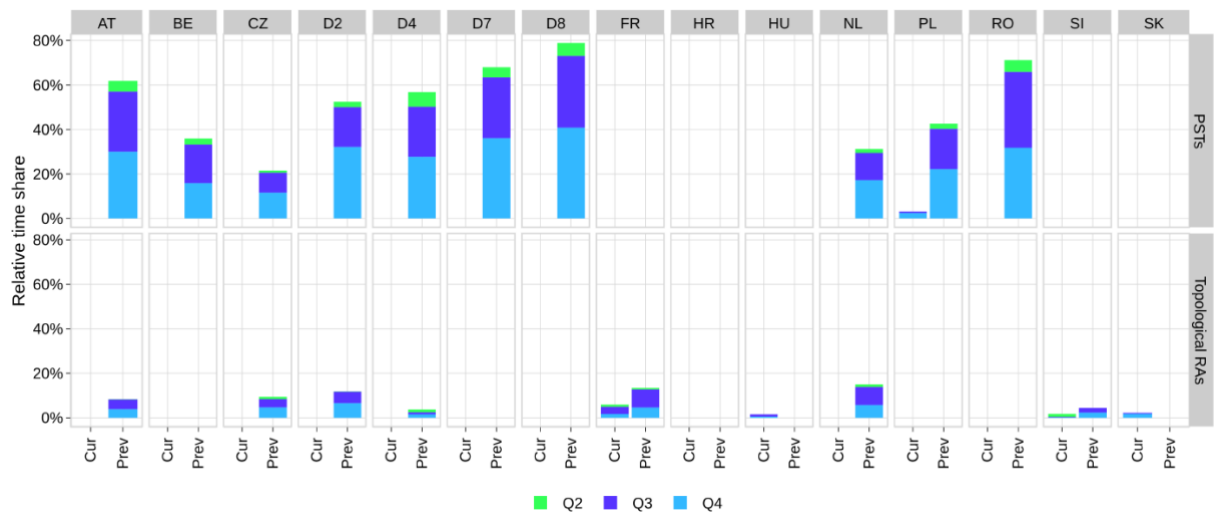
Non-costly Remedial Action Optimization Analysis

- KPI 7: NRAO – Applied Remedial Action



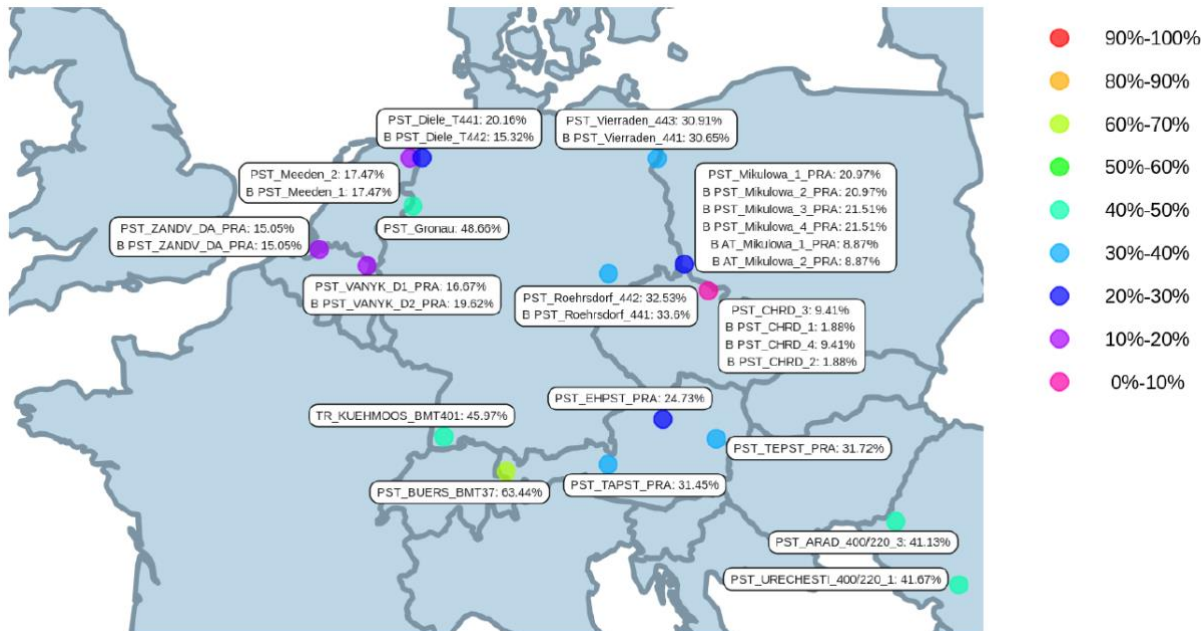
In the following plots, the relative time share relates to the hours labelled ‘NRAO ran and applied RAs’

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

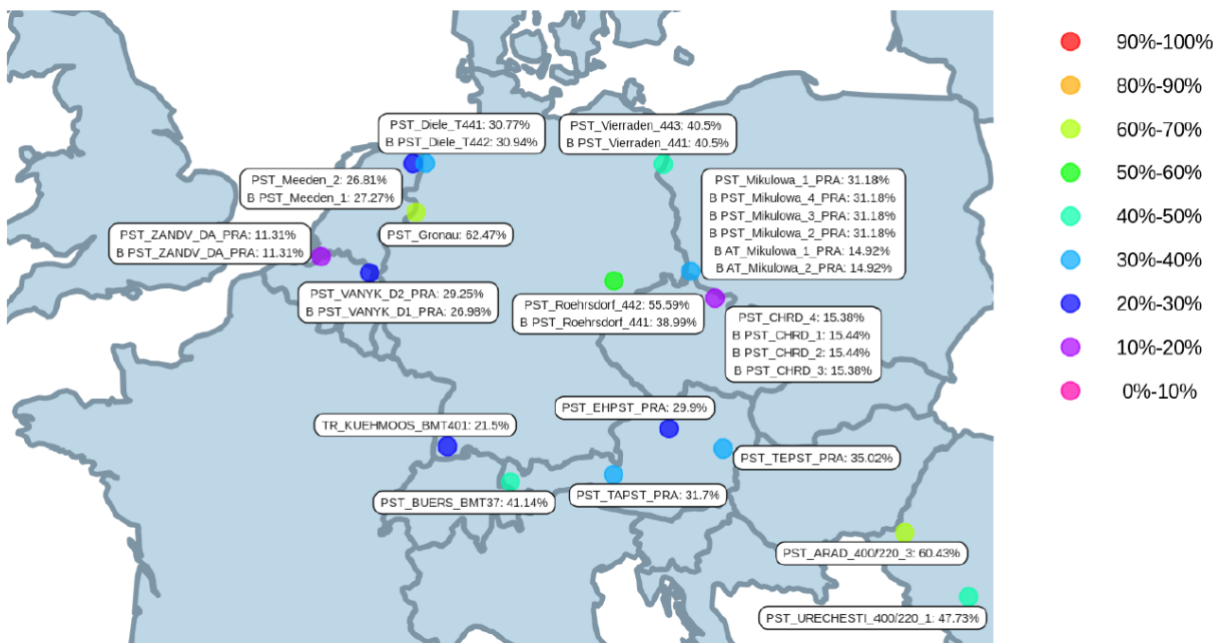


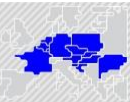


- KPI 7: Relative time share of applied PSTs in preventive mode (Quarter 2)

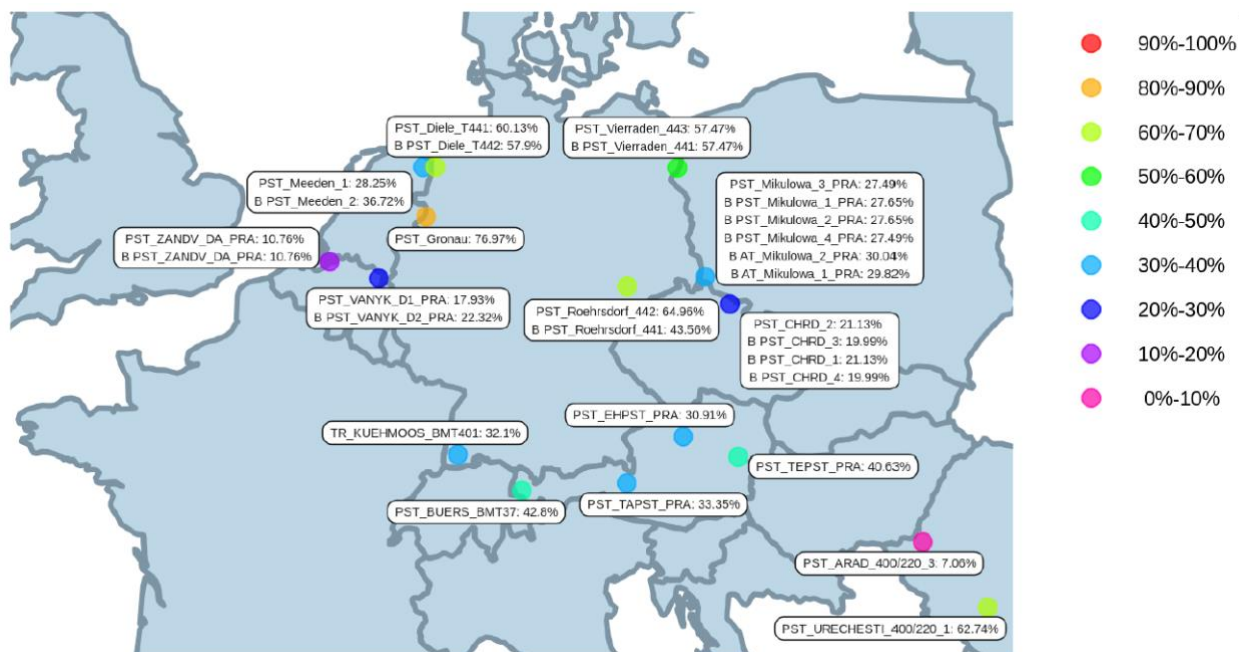


- KPI 7: Relative time share of applied PSTs in preventive mode (Quarter 3)



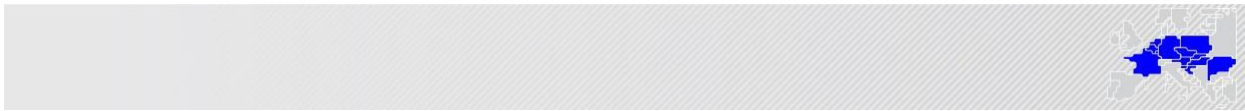


- KPI 7: Relative time share of applied PSTs in preventive mode (Quarter 4)

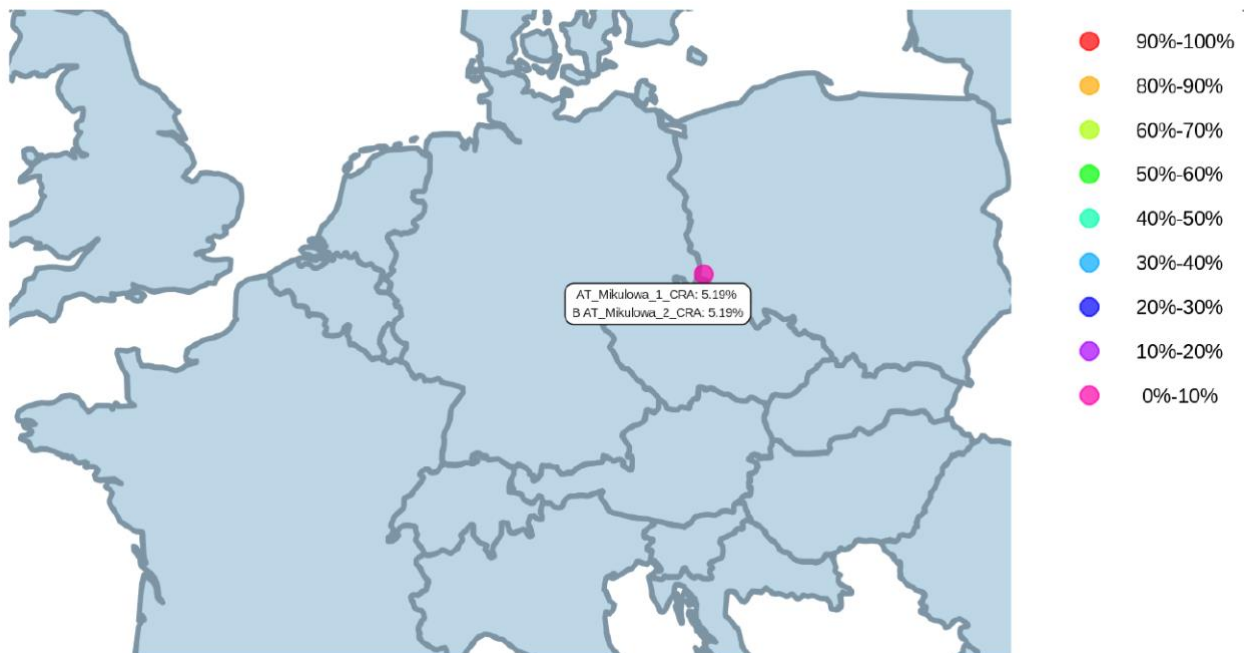


- KPI 7: Relative time share of applied PSTs in curative mode (Quarter 2)

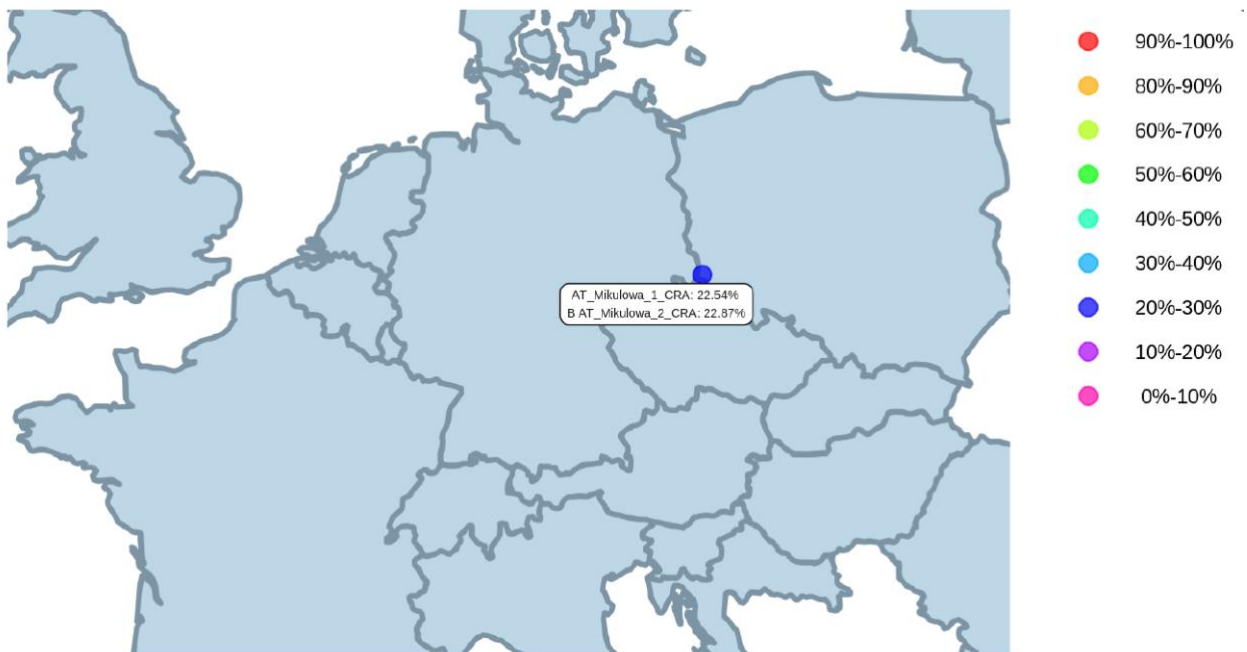




- KPI 7: Relative time share of applied PSTs in curative mode (Quarter 3)

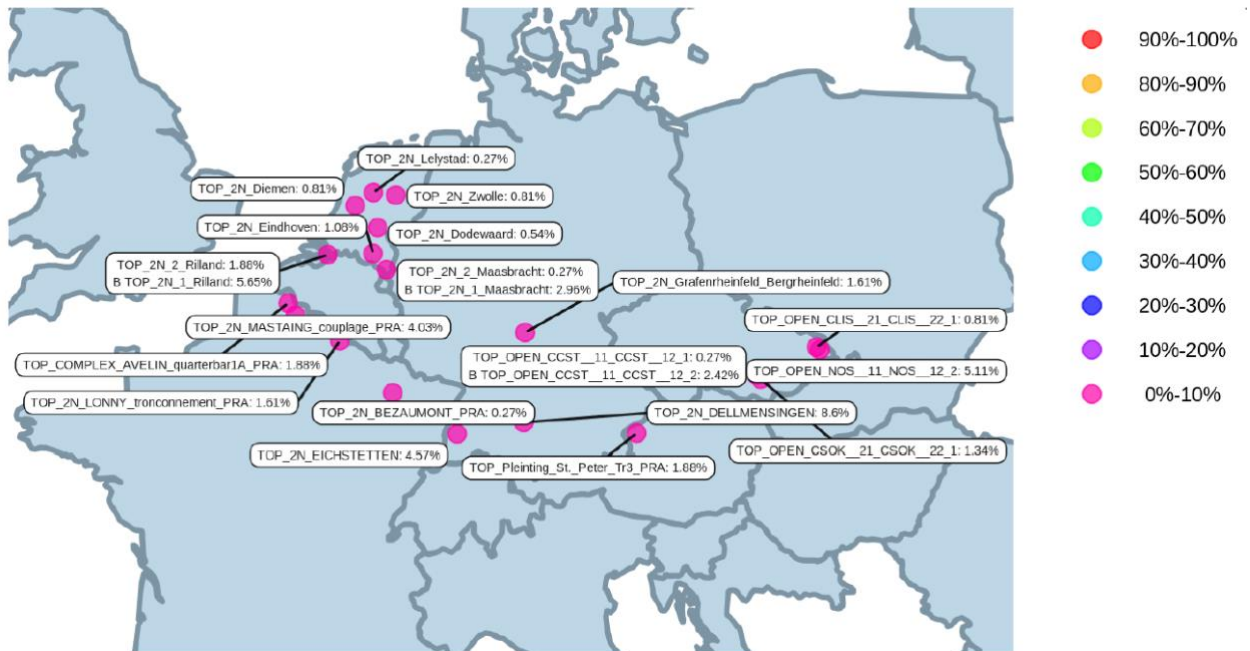


- KPI 7: Relative time share of applied PSTs in curative mode (Quarter 4)

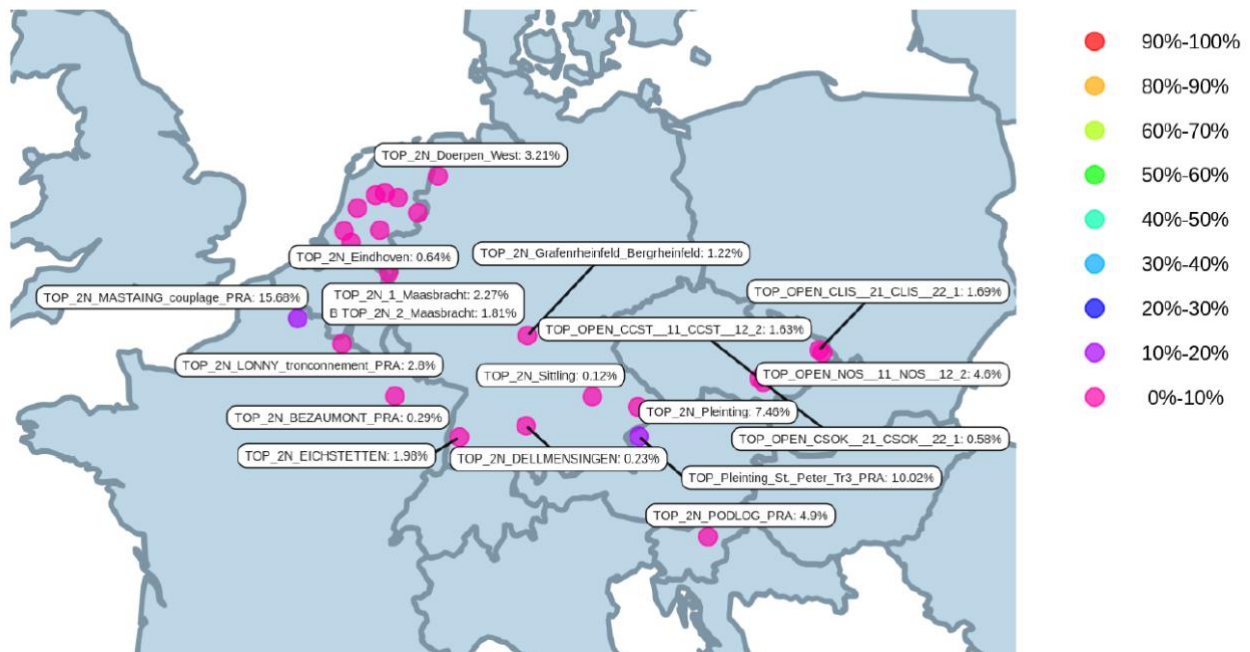


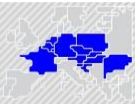


- KPI 7: Relative time share of topological RAs in preventive mode (Quarter 2)

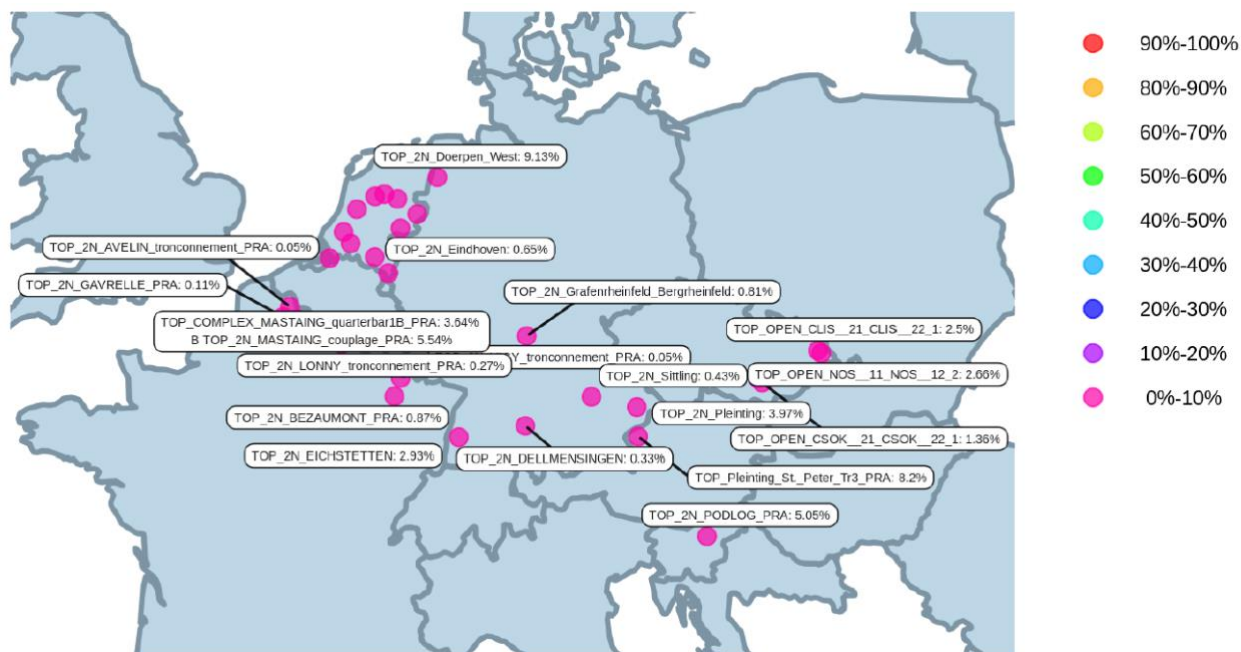


- KPI 7: Relative time share of topological RAs in preventive mode (Quarter 3)

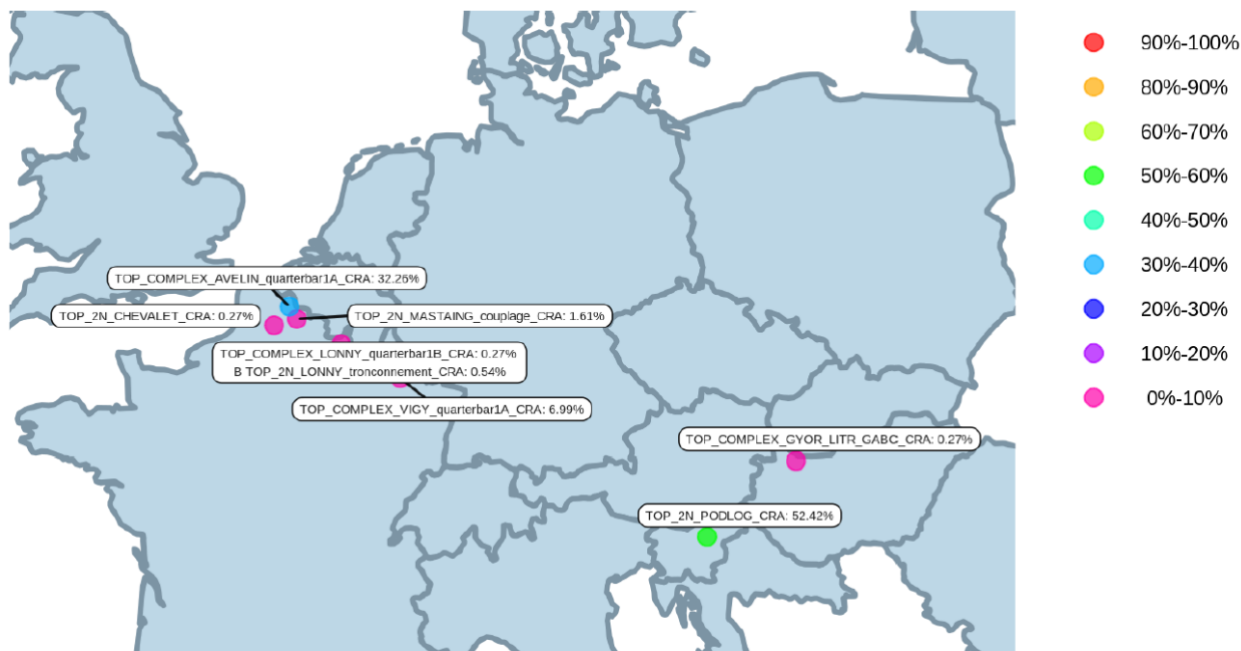




- KPI 7: Relative time share of topological RAs in preventive mode (Quarter 4)

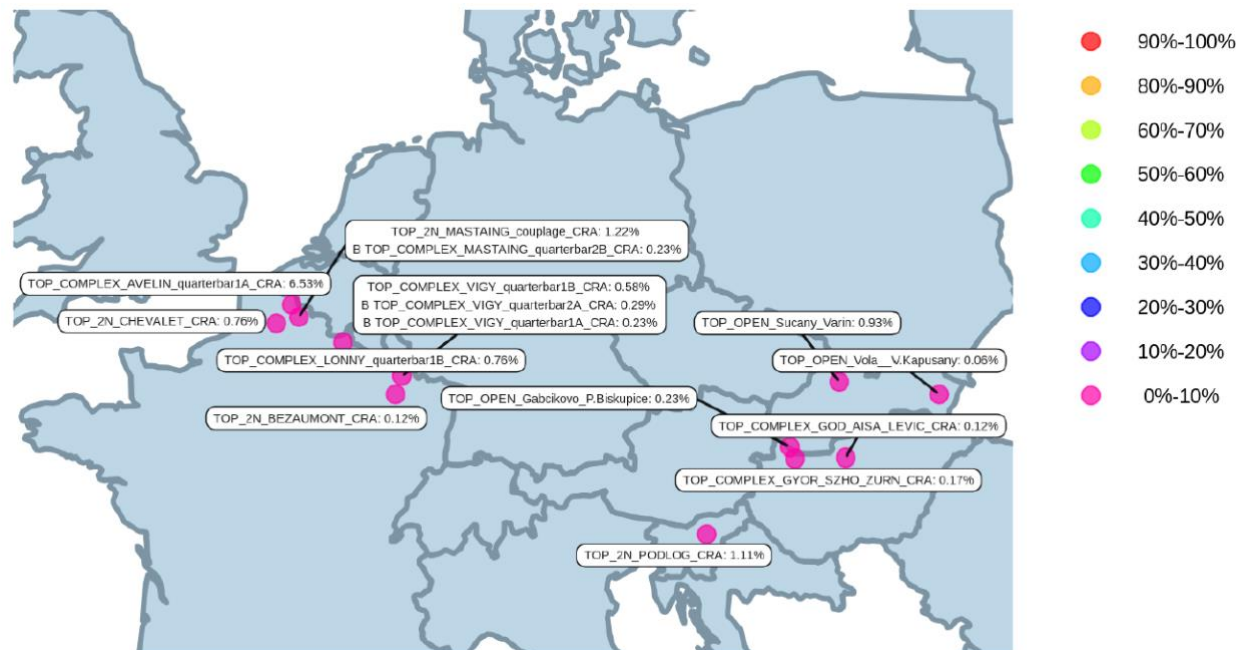


- KPI 7: Relative time share of topological RAs in curative mode (Quarter 2)

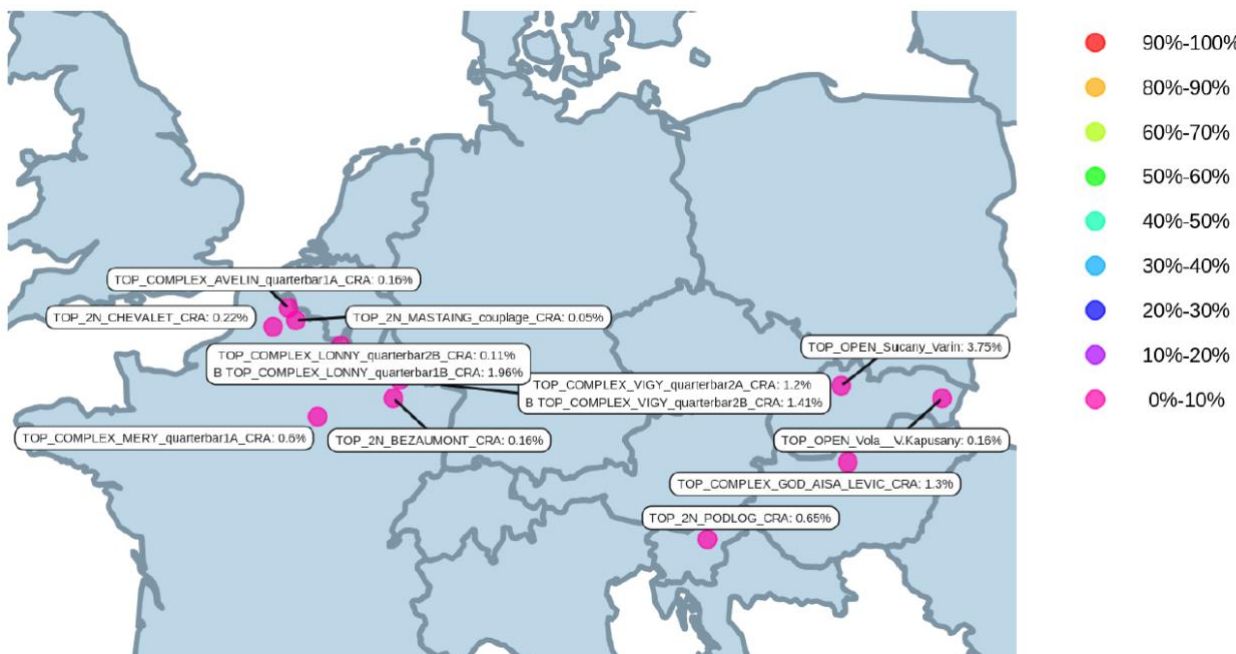




- KPI 7: Relative time share of topological RAs in curative mode (Quarter 3)

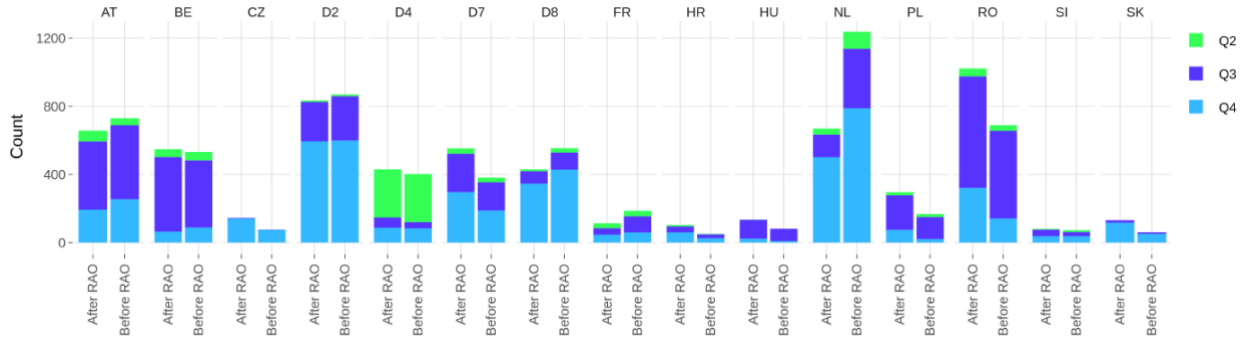


- KPI 7: Relative time share of topological RAs in curative mode (Quarter 4)



- 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



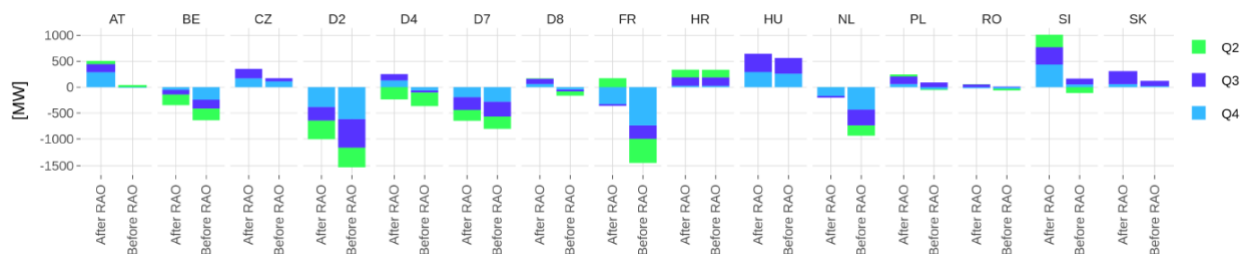
As expected, there is redistributing of the most limiting CNECs. This is because the application of Remedial Actions does not eliminate flows but re-routes, reducing the flows on some limiting CNECs and increasing the load on others, which at the end impacts also the RAM values.

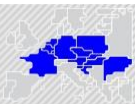
- KPI 9: Average variation of relative RAM before and after NRAO

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 2)

CNE	Distinct hours CNE was presolved	Count of presolved CNECs	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max zzzPTDF	Max sum zzzPTDF	quarter
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	530	533	83.70%	51.87%	122.46%	0.2169	0.5382	2
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	530	1057	88.22%	56.42%	128.34%	0.2169	0.5382	2
[SK-UA] V Kapusany - Mukachevo (WPS) [DIR] [SK]	530	530	88.37%	53.58%	119.58%	0.2739	1.0769	2
[SK-UA] V Kapusany - Mukachevo (WPS) [OPP] [SK]	530	720	88.26%	58.73%	126.56%	0.2739	1.0769	2
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	523	2722	72.73%	8.89%	107.97%	0.3158	0.682	2
[HR-BA] 220kV Zakuac - Mostar [OPP] [HR]	512	512	51.08%	0.00%	142.11%	0.1339	0.4281	2
[SK-SK] Gabcikovo - P Biskupice [DIR]	509	509	82.71%	66.27%	97.41%	0.2797	1.3168	2
[SK-HU] Gabcikovo - Gonyu [OPP] [HU]	508	982	78.25%	58.70%	102.53%	0.2935	1.0094	2
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	501	650	60.00%	41.30%	84.00%	0.3349	1.1848	2
[RO-RO] TR Rosion 400/220 1 [DIR]	500	500	51.05%	24.75%	86.00%	0.1304	0.2203	2
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	499	643	96.38%	30.90%	144.38%	0.1599	0.6179	2
[RO-RS] Portile de Fier - Djerdap [OPP] [RO]	498	526	77.84%	23.07%	111.40%	0.504	0.7006	2
[CZ-SK] Liskovec - P. Bystřice [DIR] [CZ]	491	491	73.21%	57.92%	98.46%	0.0837	0.2941	2
[NL-BE] PST Van Eyck 2 [DIR] [BE]	489	1018	87.92%	54.42%	117.95%	0.3732	0.8452	2
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	486	486	56.30%	27.66%	92.84%	0.3508	1.2209	2
[SI-HR] 220kV Podlog - Zetjavinec [DIR] [SI]	471	837	79.54%	15.13%	112.83%	0.1157	0.4362	2
[NL-BE] PST Van Eyck 2 [OPP] [BE]	470	1319	78.79%	29.96%	111.80%	0.3578	0.8085	2
[PL-PL] Krosno Iskrzynia - Rzeszow [DIR]	468	468	123.30%	87.06%	154.00%	0.3508	1.2209	2
[NL-BE] PST Zandvliet 2 [DIR] [BE]	464	464	85.33%	51.17%	123.67%	0.3713	0.8408	2
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	455	461	73.28%	21.58%	101.20%	0.3506	1.4369	2

Note 1: The shown zzzPTDF 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 zzzPTDFs are calculated only between neighbouring BZs. See KPI reading guide on JAO.

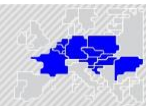
Note 2: RAM for Core exchanges can be higher than 100% due to the relieving effect of F_{uaf} . $RAM_Core = CEP_target - F_{uaf}$. So if F_{uaf} is very negative you can get above 100%.

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

CNE	Distinct hours CNE was presolved	Count of presolved CNECs	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max zzzPTDF	Max sum zzzPTDF	quarter
[HU-HU] Gonyu - Gyor [DIR]	2205	5232	62.96%	37.47%	85.70%	0.2983	1.5069	3
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	2205	2309	90.92%	9.36%	141.98%	0.2624	0.6384	3
[SK-UA] V Kapusany - Mukachevo (WPS) [OPP] [SK]	2202	2311	86.53%	44.85%	125.28%	0.2876	1.0289	3
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	2193	3767	85.01%	38.24%	172.19%	0.2624	0.6384	3
[SK-HU] Gabcikovo - Gonyu [OPP] [HU]	2181	4036	85.10%	59.64%	112.78%	0.3676	1.2748	3
[SK-HU] Gabcikovo - Gonyu [DIR] [HU]	2146	2622	86.81%	67.29%	131.48%	0.3676	1.2748	3
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	2107	3500	56.71%	19.89%	86.22%	0.5082	1.7605	3
[CZ-SK] Sokolnice - Senice [OPP] [CZ]	2098	2098	99.77%	75.17%	134.01%	0.0973	0.371	3
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	2093	2093	65.78%	6.48%	91.64%	0.35	1.4125	3
[SK-UA] V Kapusany - Mukachevo (WPS) [DIR] [SK]	2086	2086	93.05%	54.87%	135.29%	0.2876	1.0289	3
[RO-RS] Portile de Fier - Djerdap [OPP] [RO]	2085	2271	71.70%	22.15%	141.27%	0.3956	0.7181	3
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	2071	2333	71.51%	0.00%	177.96%	0.17	0.6152	3
[CZ-SK] Nosovice - Varin [OPP] [SK]	2069	5592	103.58%	71.48%	146.39%	0.4695	1.7166	3
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	2064	5294	52.65%	3.96%	136.09%	0.3433	0.9109	3
[CZ-SK] Sokolnice - Senice [DIR] [CZ]	2051	2051	80.49%	62.24%	105.10%	0.0973	0.371	3
[RO-RO] TR Rosion 400/220 1 [DIR]	2016	2016	43.05%	17.50%	84.00%	0.1437	0.2477	3
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	2013	2035	57.69%	11.44%	90.75%	0.3789	1.3321	3
[AT-SI] Obersielach - Podlog 247 [OPP] [AT]	1977	4222	116.58%	14.29%	208.42%	0.3433	0.9109	3
[PL-PL] Krosno Iskrzynia - Rzeszow [DIR]	1965	1985	122.53%	89.33%	177.25%	0.3789	1.3321	3
[NL-BE] PST Van Eyck 2 [DIR] [BE]	1951	3969	85.06%	20.28%	127.72%	0.4357	0.9705	3

Note 1: The shown zzzPTDF 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 zzzPTDFs 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 F_{uaf} . $RAM_Core = CEP_target - F_{uaf}$. So if F_{uaf} 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 presolved CNECs	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max zZzPTDF	Max sum zZzPTDF	quarter
[SI-HU] Cirkovce - Heviz [DIR] [HU]	2184	2252	112.63%	59.75%	171.66%	0.228	1.0797	4
[HU-HU] Gonyu - Gyor [DIR]	2184	3896	71.02%	50.25%	110.11%	0.2551	1.4154	4
[SI-HU] Cirkovce - Heviz [OPP] [HU]	2181	2243	65.28%	35.29%	116.43%	0.228	1.0797	4
[RO-RO] TR Rosiori 400/220 1 [DIR]	2177	2200	39.63%	0.00%	103.75%	0.1557	0.2521	4
[HR-SI] 220kV Pehlin - Divaca [OPP] [HR]	2165	3339	105.19%	65.24%	182.35%	0.2704	0.6598	4
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	2163	2186	67.68%	0.00%	114.97%	0.2704	0.6598	4
[SK-CZ] Krizovany - Sokolnice [OPP] [SK]	2156	2156	93.89%	70.71%	121.65%	0.3223	1.3063	4
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	2109	3028	53.76%	20.13%	81.10%	0.4531	1.544	4
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	2076	3340	58.34%	0.00%	152.48%	0.2457	0.659	4
[CZ-SK] Nosovice - Varin [OPP] [SK]	2072	6265	108.81%	65.60%	157.58%	0.4456	1.5985	4
[FR-D7] Vigy - Ensudorf VIGY2 S [DIR] [D7]	2047	2104	71.84%	19.48%	136.36%	0.2491	0.6471	4
[AT-AT] Sarasdorf - Zumdorf 439A [OPP]	2014	2014	74.34%	2.70%	108.35%	0.3386	1.3839	4
[CZ-SK] Nosovice - Varin [DIR] [SK]	2002	6374	73.79%	28.27%	114.29%	0.4469	1.6011	4
[SK-SK] V.Dur - Krizovany [DIR]	1969	2538	89.57%	56.56%	137.46%	0.3076	1.0797	4
[CZ-SK] Sokolnice - Senice [OPP] [CZ]	1961	1961	101.05%	77.21%	142.52%	0.0842	0.3337	4
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	1948	2085	78.04%	0.00%	133.04%	0.1561	0.5713	4
[AT-AT] Westtirol 1 - Westtirol 2 WTRHU41 [DIR]	1924	2734	79.81%	0.30%	165.50%	0.2205	0.9816	4
[HU-HU] Gonyu - Gyor [OPP]	1896	1907	112.94%	69.96%	160.22%	0.2347	1.4154	4
[NL-BE] PST Van Eyck 2 [DIR] [BE]	1888	4448	101.63%	62.07%	133.58%	0.3929	0.9031	4
[CZ-SK] Sokolnice - Senice [DIR] [CZ]	1848	1848	81.38%	60.97%	104.56%	0.0842	0.3337	4

Note 1: The shown zZzPTDF 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 zZzPTDFs 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%.

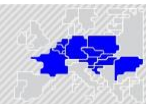
- KPI 11: Most limiting CNECs (top 20 in quarter 2)

CNE	Distinct hours CNE has shadow price	Count of CNECs with shadow price	Max shadow price [€/MW]	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max zZzPTDF	quarter
[D4-D7] Hohenneck - Pulverdingen ws [DIR] [D4]	137	146	2206.22	19.78%	16.99%	29.30%	0.1072	2
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	123	123	853.52	49.71%	27.66%	76.79%	0.3508	2
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	82	83	432.69	19.68%	1.10%	52.21%	0.2292	2
[BE-FR] Avelgem - Avelin 80 [DIR] [FR]	78	78	561.41	79.36%	18.97%	142.68%	0.3964	2
[HR-BA] 220kV Zakucac - Mostar [OPP] [HR]	73	73	1320.06	8.26%	0.00%	31.91%	0.1339	2
[D4-CH] Kuehmoos - Laufenburg br (Heimbach) [DIR] [D4]	60	60	760.23	36.59%	19.32%	74.06%	0.1675	2
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	56	63	923.2	67.45%	8.89%	95.61%	0.3322	2
[NL-D7] Maasbracht-Oberzier 380 W [DIR] [NL]	42	42	105.1	48.44%	19.91%	75.48%	0.6082	2
[RO-RO] Paroseni - Targu Jiu Nord [OPP]	42	43	1959.44	22.31%	0.00%	48.08%	0.0989	2
[AT-D4] Meiningen - Buers 406A [OPP] [AT]	41	43	2485.91	18.83%	5.16%	19.62%	0.0679	2
[NL-D2] Meeden-Diele 380 Z [DIR] [NL]	41	41	1050.66	63.71%	27.83%	116.33%	0.2724	2
[AT-CH] Meiningen - Ruetli 408 [DIR] [AT]	41	41	1183.75	18.91%	14.84%	23.13%	0.0862	2
[D8-PL] Mikulowa PST3 [OPP] [PL]	39	39	354.17	41.67%	19.24%	86.29%	0.3992	2
[D4-CH] Trossingen - Laufenburg rt [DIR] [D4]	36	36	1746.08	20.24%	19.25%	28.50%	0.0687	2
[SI-AT] 220 kV Podlog - Obersielach [OPP] [SI]	35	37	362.02	19.15%	0.27%	53.74%	0.2709	2
[D7-D7] Buerstadt - Lamsheim BUERST W [DIR]	32	32	740.94	29.64%	19.43%	47.36%	0.171	2
[D8-D8] Pasewalk - Vierraden 306 [DIR]	30	30	1676.74	26.02%	19.18%	36.69%	0.1049	2
[NL-BE] PST Zandvliet 2 [DIR] [BE]	29	29	320.61	79.40%	57.60%	94.63%	0.3493	2
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	25	26	738.07	76.60%	55.24%	106.93%	0.129	2
[D8-PL] Mikulowa PST1 [OPP] [PL]	24	24	299.08	31.94%	22.05%	48.56%	0.3499	2

Note 1: The RAM values (expressed as % of Fmax) should not be interpreted as "the capacities offered by the Core TSOs to the market coupling". Indeed, since the introduction of Ext LTA inclusion Euphemia performs an optimization where it takes a portion of the FB domain and a portion of the LTA domain to maximize welfare. The RAM value shown in this KPI report correspond to the "portion of the FB domain" resulting from this optimization

Example:

- RAM = 500MW
- Portion of FB Domain = 40%
- RAM offered by Core TSOs: 500MW / 0.4 = 1250MW



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

CNE	Distinct hours CNE has shadow price	Count of CNECs with shadow price	Max shadow price [€/MW]	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max zzzPTDF	quarter
[BE-BE] Achene - Gramme 380.10 [OPP]	401	403	1524.07	77.22%	19.88%	115.78%	0.3735	3
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	353	353	3312.81	52.96%	13.98%	121.31%	0.1545	3
[D7-D7] Buerstadt - Lamsbshiem BUERST W [DIR]	345	369	2588.56	32.08%	19.08%	68.98%	0.1922	3
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	336	336	2488.62	43.03%	13.84%	82.02%	0.3761	3
[BE-FR] Avelgem - Avelin 80 [DIR] [FR]	239	239	1387.15	75.71%	30.00%	109.08%	0.4472	3
[D8-D8] Pasewalk - Vierraden 306 [DIR]	237	237	7311.52	24.20%	19.42%	44.60%	0.1136	3
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	235	239	1288.04	33.22%	3.96%	117.36%	0.3433	3
[D4-D4] PST Buers BMT37 [OPP]	143	145	7262.4	47.67%	17.72%	83.06%	0.1013	3
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	132	132	2156.15	25.19%	0.00%	73.03%	0.2761	3
[RO-RO] Paroseni - Targu Jiu Nord [OPP]	126	127	6320.41	26.98%	0.00%	67.31%	0.1067	3
[AT-CZ] Duernrohr 1 - Slavetice 437 [OPP] [AT]	114	114	962.8	51.80%	6.48%	83.99%	0.35	3
[NL-BE] PST Zandvliet 1 [DIR] [BE]	89	94	722.37	75.37%	19.83%	113.49%	0.4728	3
[NL-BE] PST Van Eyck 2 [DIR] [BE]	81	82	371.58	67.79%	20.28%	99.01%	0.4174	3
[CZ-PL] Wielopole - Nosovice [DIR] [PL]	81	81	1011.97	37.33%	19.89%	64.14%	0.5082	3
[BE-FR] Avelgem - Avelin 380.80 [DIR] [BE]	72	72	1017.49	70.27%	26.20%	109.47%	0.4482	3
[BE-FR] Achene - Lonny 380.19 [DIR] [BE]	66	66	1370.99	70.69%	19.87%	91.78%	0.3727	3
[D2-D7] Grosskrotzenburg - Urberach UMAIN N2 [DIR] [D7]	63	63	3065.83	23.13%	10.30%	40.55%	0.0952	3
[D2-D2] Altheim - Simbach 233/230 [DIR]	62	62	7215.5	56.26%	1.37%	97.40%	0.0895	3
[NL-D2] Meeden-Diele 380 Z [DIR] [NL]	56	56	951.87	48.13%	20.04%	98.20%	0.2705	3
[BE-FR] Achene - Lonny 19 [DIR] [FR]	56	56	835.82	77.08%	66.52%	98.32%	0.3373	3

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 Euphemie performs an optimization where it takes a portion of the FB domain and a portion of the LTA domain to maximize welfare. The RAM value shown in this KPI report correspond to the "portion of the FB domain" resulting from this optimization

Example:

- RAM = 500MW
- Portion of FB Domain = 40%
- RAM offered by Core TSOs: 500MW / 0.4 = 1250MW

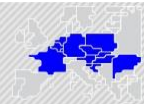
- KPI 11: Most limiting CNECs (top 20 in quarter 4)

CNE	Distinct hours CNE has shadow price	Count of CNECs with shadow price	Max shadow price [€/MW]	Avg RAM/Fmax	Min RAM/Fmax	Max RAM/Fmax	Max zzzPTDF	quarter
[NL-D2] Meeden-Diele 380 Z [OPP] [NL]	420	420	1396.71	27.51%	18.23%	77.30%	0.3087	4
[AT-D2] St. Peter 2 - Pleinting 258 [OPP] [AT]	395	395	1355.28	67.02%	0.00%	104.93%	0.152	4
[D8-D8] Pasewalk - Vierraden 306 [DIR]	371	371	7254.86	22.53%	16.31%	74.10%	0.1109	4
[AT-SI] Obersielach - Podlog 247 [DIR] [AT]	317	324	1568.45	40.58%	1.17%	108.33%	0.2457	4
[RO-RO] TR Rosiori 400/220 1 [DIR]	244	244	4037.23	27.83%	0.00%	52.50%	0.1555	4
[D8-D8] Neuenhagen - Vierraden 304 [DIR] [D8]	232	232	3152.51	23.48%	0.00%	65.95%	0.1021	4
[BE-BE] Achene - Gramme 380.10 [OPP]	210	211	1011.02	82.26%	52.64%	106.76%	0.3557	4
[D7-D7] Buerstadt - Lamsbshiem BUERST W [DIR]	192	192	1535.31	45.41%	25.80%	63.93%	0.1738	4
[HR-SI] 220kV Pehlin - Divaca [DIR] [HR]	178	178	1924.19	56.73%	9.89%	88.50%	0.1974	4
[NL-BE] PST Van Eyck 2 [OPP] [BE]	164	197	236.49	65.24%	41.34%	84.75%	0.3047	4
[D4-D4] PST Buers BMT37 [OPP]	160	163	3736.17	41.15%	11.83%	86.31%	0.0571	4
[SK-SK] V.Dur - Levice 1 [DIR]	148	148	1193.09	53.48%	14.14%	69.84%	0.2423	4
[NL-BE] PST Zandvliet 2 [DIR] [BE]	134	134	604.59	57.80%	36.18%	80.48%	0.3815	4
[PL-PL] Krosno Iskrzynia - Rzeszow [OPP]	130	130	838.06	45.09%	16.77%	71.51%	0.3757	4
[BE-FR] Achene - Lonny 380.19 [DIR] [BE]	118	118	485.72	78.35%	54.52%	99.16%	0.3441	4
[RO-RO] Paroseni - Targu Jiu Nord [OPP]	114	114	3812.43	25.66%	0.00%	71.76%	0.1061	4
[NL-NL] Diemen-Lelystad 380 W [OPP]	109	110	1545.33	24.23%	19.92%	57.70%	0.3256	4
[NL-D7] Maasbracht - Oberzier SELFK WS [DIR] [D7]	105	115	353.48	61.32%	29.07%	87.00%	0.2768	4
[CZ-SK] Nosovice - Varin [DIR] [SK]	105	105	736.69	62.33%	31.46%	84.23%	0.3268	4
[SI-AT] 220 kV Podlog - Obersielach [OPP] [SI]	101	101	1597.46	54.93%	15.78%	104.28%	0.135	4

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 Euphemie performs an optimization where it takes a portion of the FB domain and a portion of the LTA domain to maximize welfare. The RAM value shown in this KPI report correspond to the "portion of the FB domain" resulting from this optimization

Example:

- RAM = 500MW
- Portion of FB Domain = 40%
- RAM offered by Core TSOs: 500MW / 0.4 = 1250MW

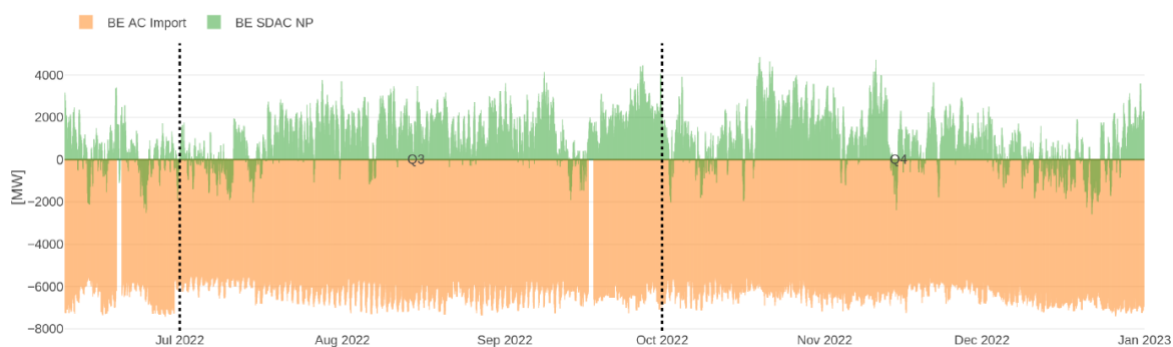


- KPI 12a: Allocation constraints (Belgium)

	# MTUs
AC was Limiting MC	0

BE AC Import [MW]	
Avg.	-6360.8
Min.	-7402.0
Max.	-5473.0

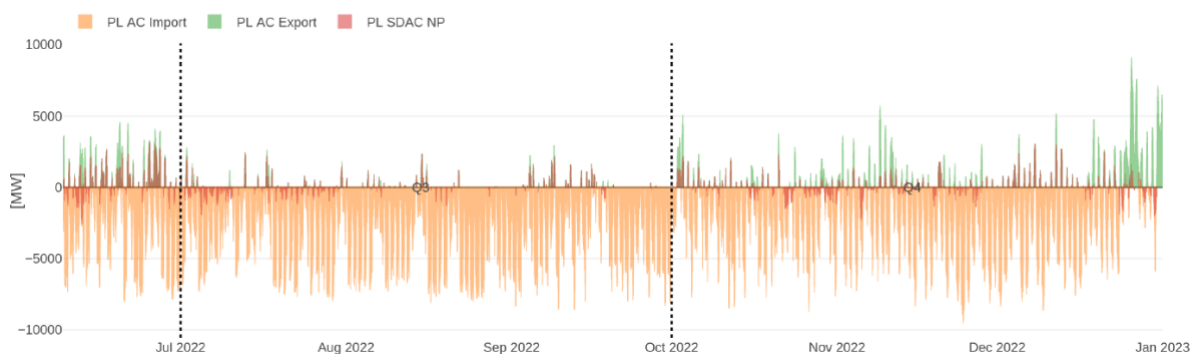
Belgium only uses import allocation constraints

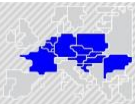


- KPI 12b: Allocation constraints (Poland)

	# MTUs
AC was limiting MC	3864
AC < 0 MW	82
AC = 0 MW	3234
AC > 0 MW	548

	PL AC Import [MW]	PL AC Export [MW]
Avg.	-2950.9	352.77
Min.	-9511.0	0.00
Max.	0.0	9018.00





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:

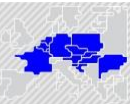
Expected inputs to be provided by concerned Core TSOs	Condition on which input is expected from concerned Core TSOs
Effectiveness of the allocation constraint in preventing the violation of the underlying operational security limits	Concerned Core TSO uses external- or allocation constraints
Alternative 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 added for extra information.



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

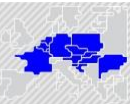
Implementation of external constraints as applied by PSE is related to integrated scheduling process applied in Poland (also called central dispatching model) and the way how reserve capacity is being procured by PSE. In a central dispatching model, in order to balance generation and demand and ensure 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 sold 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.¹ 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

¹ 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.



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 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:

$$EXPORT_{constraint} = P_{CD_{\square}} - (P_{NA} + P_{ER}) + P_{NCD_{\square}} - (P_L + P_{UPres}) \quad (1)$$

$$IMPORT_{constraint} = P_L - P_{DOWNres} - P_{CD_{min}} - P_{NCD_{\square}} \quad (2)$$

Where:

$P_{CD_{\square}}$	Sum of available generating capacities of centrally dispatched units as declared by generators ²
$P_{CD_{min}}$	Sum of technical minima of available centrally dispatched generating units
$P_{NCD_{\square}}$	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.

² 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.

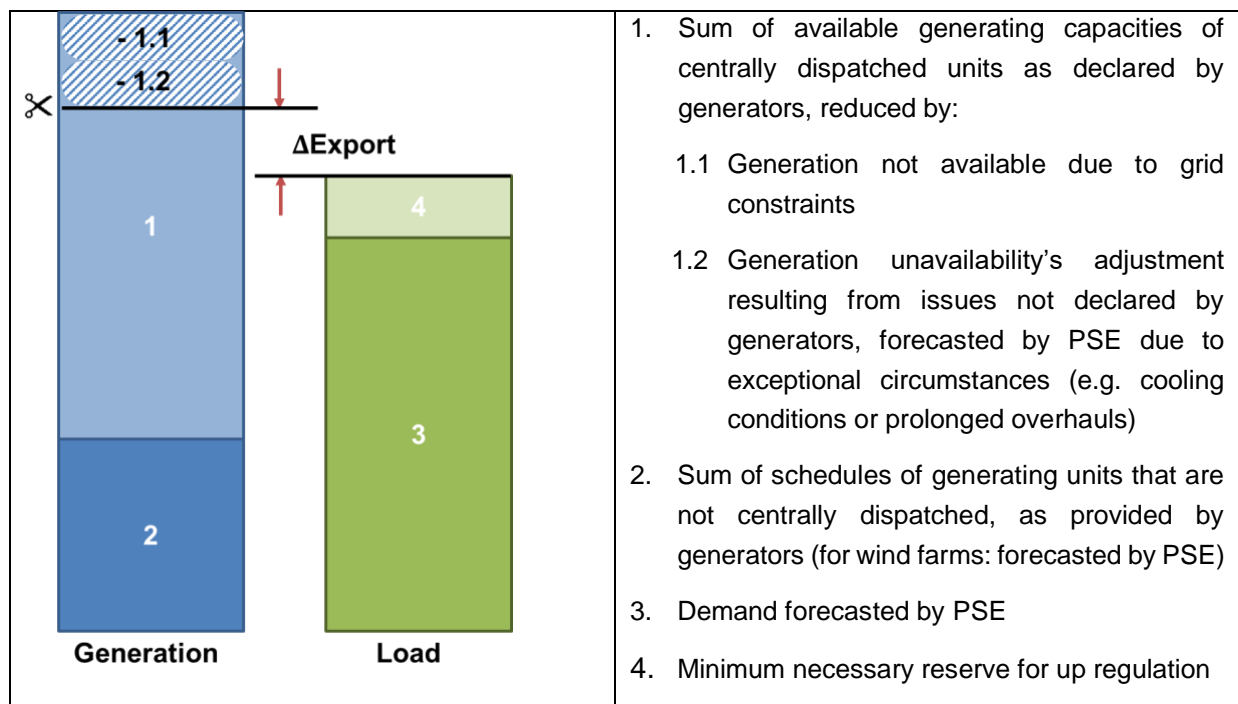


Figure 1: Determination of external constraints in export direction (generating capacities available for potential exports) in the framework of the day-ahead capacity calculation.

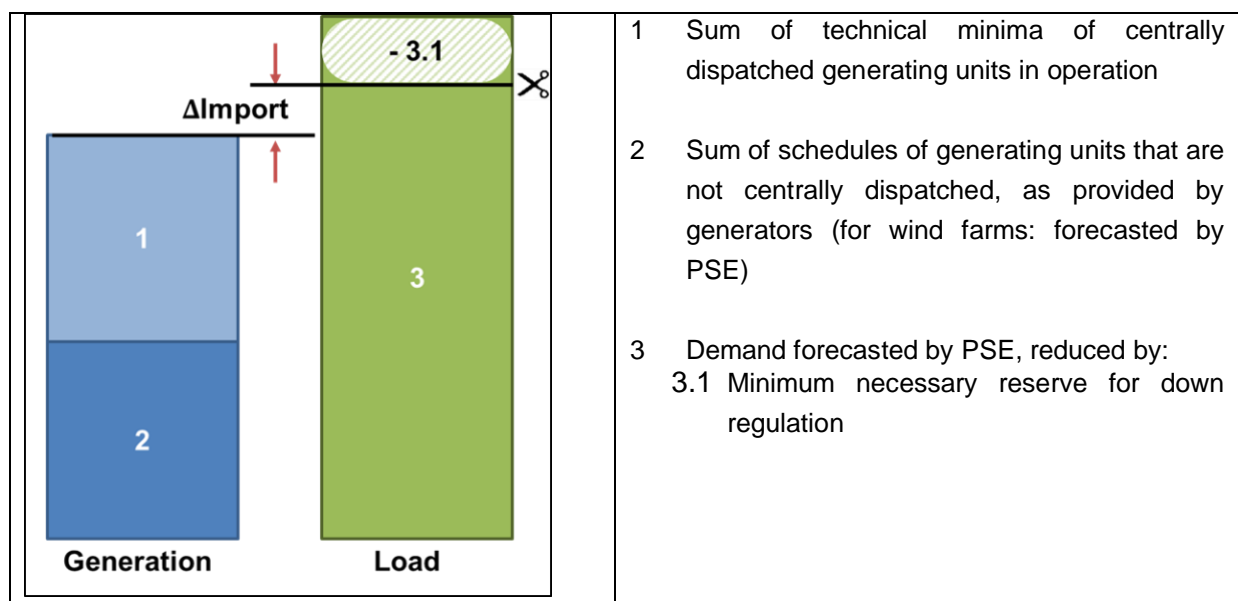


Figure 2: Determination of external constraints in import direction (reserves in generating capacities available for potential imports) in the framework of the day-ahead capacity calculation.

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 Jun – Dec '22 – PSE.pdf](#), which contains an analysis of Polish Allocation Constraints prepared by PSE (comparison of historical data and simulations with no Allocation Constraint).

TenneT TSO BV

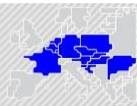
Effectiveness of allocation constraint

In 2022 TenneT NL applied during the DACC an external constraint to satisfy additional grid security risks that cannot be covered during the individual validation. Main risks to be covered are voltage stability, a high total cross border capacities from a physical perspective, and GSK modelling uncertainty.

During 2022 the following can be said about the effectiveness of the external constraint:

- For 651 individual MTUs the EC limited the minimum NP of the Dutch bidding zone in Core CCR
- For 932 individual MTUs the EC limited the maximum NP of the Dutch bidding zone in Core CCR

Zero MTUs resulted in a shadow price >0 , meaning the market never decided to utilize cross border transmission capacities beyond the external constraint NP limits.



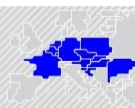
Annex 2: Detailed reasons for Data Quality Indicators Breaches and Action Plans

Introduction

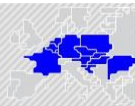
According to Article 26(d) of the DA CCM, the Core TSOs that did not fulfil the ambition levels of the defined Data Quality Indicators (DQI) need to provide to the CCC the detailed reasons for the failure as well as action plans to correct past failures and prevent future failures. This information shall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

Data quality Indicators breaches for 2022 and action plans overview

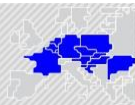
Party	BD	DQI breach category	MTUs with DQI breach	Cause	Mitigation	Corrective Action	Corrective action live since
CREOS	12.06.22	IGM replacement	1 to 24	Due to the major reconstruction work at the Flebour substation and the resulting database changes in our SCADA system, errors occurred in the D2CF and DACH exports. The error was a too high voltage on provisional busbars entered in the database (D6FLEB24 + D6FLEB25), not D6FLEB22 as indicated by Coreso. After analyzing the database, it was found that the problem was caused by a disconnected transformer. This transformer was transforming the voltage from the 65kV level directly to the temporary busbars (220kV D6FLEB24 + D6FLEB25) resulting in a voltage of 265kV.	Correction of the database as described	The problem was solved by database changes and since 13.06 the files are being exported error free.	13.06.22
CREOS	13.06.22	IGM replacement	1 to 24	Due to the major reconstruction work at the Flebour substation and the resulting database changes in our SCADA system, errors occurred in the D2CF and DACH exports. The error was a too high voltage on provisional busbars entered in the database (D6FLEB24 + D6FLEB25), not D6FLEB22 as indicated by Coreso. After analyzing the database, it was found that the problem was caused by a disconnected transformer. This transformer was transforming the voltage from the 65kV level directly to the temporary busbars (220kV D6FLEB24 + D6FLEB25) resulting in a voltage of 265kV.	Correction of the database as described	The problem was solved by database changes and since 13.06 the files are being exported error free.	13.06.22



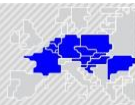
CREOS	14.06.22	IGM replacement	1 to 24	Due to the major reconstruction work at the Flebour substation and the resulting database changes in our SCADA system, errors occurred in the D2CF and DACF exports. The error was a too high voltage on provisional busbars entered in the database (D6FLEB24 + D6FLEB25), not D6FLEB22 as indicated by Coreso. After analyzing the database, it was found that the problem was caused by a disconnected transformer. This transformer was transforming the voltage from the 65kV level directly to the temporary busbars (220kV D6FLEB24 + D6FLEB25) resulting in a voltage of 265kV.	Correction of the database as described	The problem was solved by database changes and since 13.06 the files are being exported error free.	13.06.22
CREOS	22.06.22	IGM replacement	6 to 24	Due to the high number of files to be generated more or less simultaneously (CGMES and UCTE) files in a reduced timeframe it happened that the system was overloaded and thus some files were skipped	Generating files (CGMES, UCTE format) only of the necessary grid (220kV)	Change setting in SCADA (Supervisory Control and Data Acquisition)	30.06.22
TENNET NL	12/06/20022	IGM replacement	10 to 16	Several generators were accidentally in an isolated isle mode in the IGM due to a wrong manual submission of a scheduled outage of these generators. Due to this action the respective generators were still included in the GSLK and the local tool was forced to use these generators for NP shift. Since these generators are in isle mode they cannot contribute to any NP shift, causing our local tool to crash.	N/A	Operators have been informed about the wrong entry of the scheduled outages, including an instruction on how to properly submit the scheduled outage of a generator in the local IGM creation tool.	18.08.22
TENNET NL	20.06.22	IGM replacement	1 to 24	During the export of the IGM model for some generators the PV status was automatically changed to PQ. This was caused by a wrong configuration of these generators in the local IGM creation tool.	N/A	For all generators we checked the settings with regards to PV or PQ, and correspondingly corrected the incorrect PV of PQ status for multiple generators.	18.08.22
CREOS	02.07.22	IGM replacement	1 to 24	Due to some Warnings/Errors in IGM in the CGMES format different tests have been performed with the parameter setting of the SCADA system .Here in this case , unfortunately the dedicated setting skipped the transformers in the UCTE files thus creating IGM with no transformer definition	Reset of default setting in the SCADA System (SCADA: Supervisory Control and Data Acquisition)	Better coordination of internal tests and settings of the SCADA	08.07.22



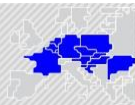
CREOS	24.07.22	IGM replacement	1 to 24	Cyberattack 22/23/07/22 ; A wrong format of the IGMs of CREOS	The DPO team has taken all necessary measures to protect our data. Among other things, thus for instance files couldn't be sent to the "external world".	All necessary steps from Creos IT and other involved departments have been applied	end of august 22
CREOS	27.07.22	IGM replacement	1 to 24	Cyberattack 22/23/07/22 ; missing files of BD 27/07/2022, Problems 25/7 & 26/6	The DPO team has taken all necessary measures to protect our data. Among other things , thus for instance files couldn't be sent to the "external world".	All necessary steps from Creos IT and other involved departments have been applied	end of august 22
CREOS	28.07.22	IGM replacement	1 to 24	Cyberattack 22/23/07/22 ; missing files of BD 28/07/2022; Problems 25/7 & 26/7	The DPO team has taken all necessary measures to protect our data. Among other things, thus for instance files couldn't be sent to the "external world".	All necessary steps from Creos IT and other involved departments have been applied	end of august 22
RTE	05.07.22	IGM replacement	17.30 to 23.30	The issue was not properly an IGM replacement, but a handling of x-node inconsistency by the Merging Entity. This is only a Core internal process issue and has no consequence on the results, thus decision has been taken to exclude this from the DQI reports in the future. Still, RTE is working on reducing this type of issue.	N/A	N/A	N/A
RTE	07.07.22	IGM replacement	0.30 to 23.30	The issue was not properly an IGM replacement, but a handling of x-node inconsistency by the Merging Entity. This is only a Core internal process issue and has no consequence on the results, thus decision has been taken to exclude this from the DQI reports in the future. Still, RTE is working on reducing this type of issue.	N/A	N/A	N/A



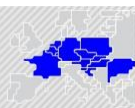
SEPS	04.07.22	IGM replacement	1 to 24	There was an issue with the voltage regulation in node QLEME that increased voltage above the predefined limits	Correction of the voltage regulation in node QLEME that was causing the troubles with convergence	Update of the IGM creation	09.07.22
SEPS	05.07.22	IGM replacement	1 to 24	There was an issue with the voltage regulation in node QLEME that increased voltage above the predefined limits	Correction of the voltage regulation in node QLEME that was causing the troubles with convergence	Update of the IGM creation	09.07.22
SEPS	20.07.22	IGM replacement	1 to 24	The IGM did not contain Pmin/Pmax limit for node that is included in the GLSK file and that led to the issue with merging	Data quality checks introduced in order to check whether all nodes from GLSK have Pmin/Pmax limits defined in the IGM	New data quality checks introduced	26.07.22
TENNET NL	17.07.22	IGM replacement	N/A	X-node inconsistencies are wrongly translated to IGM replacement. So on this BD no real IGM replacement occurred, only X-node inconsistency cause a technical replacement at Coreso side.	none	manual correction in IGM creation	17.07.22
TENNET NL	20.07.22	IGM replacement	only MTU 24	Wrong IGM format for one MTU. Single occurrence.	None		20.07.22
TSCNET	12.09.22	NRAO results not applied	1 to 14 and 19 to 24	Ambiguity in the starting procedure of specific NRAO service application components on the vendor side, which lead to application component shutdowns.	Vendor implemented application component restart scripts. This measure was unsuccessful.	Restart scripts were shut down and removed on the 22.09.22. The correct application component starting procedure was redefined, documented, and shared with all support levels via workshops.	22.09.2022



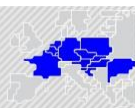
						Implemented a 24/7 application components monitoring and notification system to ensure all components are running.	
TSCNET	17.09.22	NRAO results not applied	1 to 9	Ambiguity in the starting procedure of specific NRAO service application components on the vendor side, which lead to application component shutdowns.	Vendor implemented application component restart scripts. This measure was unsuccessful.	Restart scripts were shut down and removed on the 22.09.22. The correct application component starting procedure was redefined, documented, and shared with all support levels via workshops. Implemented a 24/7 application components monitoring and notification system to ensure all components are running.	22.09.2022
TSCNET	21.09.22	NRAO results not applied	1 to 24	Ambiguity in the starting procedure of specific NRAO service application components on the vendor side, which lead to application component shutdowns.	Vendor implemented application component restart scripts. This measure was unsuccessful.	Restart scripts were shut down and removed on the 22.09.22. The correct application component starting procedure was redefined, documented, and shared with all support levels via workshops. Implemented a 24/7 application components monitoring and notification system to ensure all components are running.	22.09.2022
TSCNET	22.09.22	NRAO results not applied	1 to 24	Ambiguity in the starting procedure of specific NRAO service application components on the vendor side, which lead to application component shutdowns.	Vendor implemented application component restart scripts. This measure was unsuccessful.	Restart scripts were shut down and removed on the 22.09.22. The correct application component starting procedure was redefined, documented, and shared with all support levels via workshops. Implemented a 24/7 application	22.09.2022



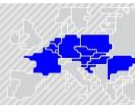
						components monitoring and notification system to ensure all components are running.	
ELES	17.10.22	IGM replacement	23 and 24	The ICGM merging failed due to issue during the PST Divaca and Patriciano special procedure. This happened due to the fact that there was no active generation in Eles IGM.	CORESO to fix merging tool to avoid process fail is such cases	Merging tool fixed.	1.12.2022
ELES	18.10.22	IGM replacement	1 to 24	The ICGM merging failed due to issue during the PST Divaca and Patriciano special procedure. This happened due to the fact that there was no active generation in Eles IGM.	CORESO to fix merging tool to avoid process fail is such cases	Merging tool fixed.	1.12.2022
ELES	19.10.22	IGM replacement	1 to 24	The ICGM merging failed due to issue during the PST Divaca and Patriciano special procedure. This happened due to the fact that there was no active generation in Eles IGM.	CORESO to fix merging tool to avoid process fail is such cases	Merging tool fixed.	1.12.2022
ELES	20.10.22	IGM replacement	7, 8 and 17	The ICGM merging failed due to issue during the PST Divaca and Patriciano special procedure. This happened due to the fact that there was no active generation in Eles IGM.	CORESO to fix merging tool to avoid process fail is such cases	Merging tool fixed.	1.12.2022
ELES	21.10.22	IGM replacement	10 to 16 and 22 to 24	The ICGM merging failed due to issue during the PST Divaca and Patriciano special procedure. This happened due to the fact that there was no active generation in Eles IGM.	CORESO to fix merging tool to avoid process fail is such cases	Merging tool fixed.	1.12.2022



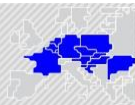
ELES	22.10.22	IGM replacement	9 to 12 and 17	The ICGM merging failed due to issue during the PST Divaca and Patriciano special procedure. This happened due to the fact that there was no active generation in Eles IGM.	CORES0 to fix merging tool to avoid process fail in such cases	Merging tool fixed.	1.12.2022
CORES0	07.11.22	Default flow-based parameters	1 to 7	DFPs triggered for MTUs 1 to 7 of BD 07/11/2022 following a failed FB computation due to high DC imbalance (5% imbalance threshold was reached). The root cause of this imbalance lies in the merging process: - A human error occurred during the update of a configuration of the CC DA IN process, leading to a misconfiguration of the CC DA CORE merging process (loss of X-nodes list required for the merging) -This caused a wrong computation of the final net positions in the CGM and divergences between the CGM and RefProg.	Configuration was corrected on the day after the event.	As a corrective action, a quality check has been introduced in our local communications tool, so that such a misconfiguration in the merging process will be detected by the operator immediately after the merging has been performed, and the merging process can be restarted. Additionally, a development of the merging tool is planned for 2023 that would make this error impossible by improving the handling of the X-node configuration.	20.12.2022
TSCNET	15.12.22	NRAO results not applied	10	The GROM subcomponent encountered failures in the Production environment due to inadequate RAM memory on certain VMs. The root cause has been identified as a result of the larger input data size.	Temporary memory increase on GROM component VMs	TSCNET has put in place a series of measures, including cleaning and reconfiguring the environment, allocating the GROM component additional freed up memory, boosting SWAP memory, and recomputation as a fallback in case of reoccurrence.	Feb. 2023
TSCNET	17.12.22	NRAO results not applied	8	The GROM subcomponent encountered failures in the Production environment due to inadequate RAM memory on certain VMs. The root cause has been identified as a result of the larger input data size.	Temporary memory increase on GROM component VMs	TSCNET has put in place a series of measures, including cleaning and reconfiguring the environment, allocating the GROM component additional freed up memory, boosting SWAP memory, and recomputation as a fallback in case of reoccurrence.	Feb. 2023
TSCNET	18.12.22	NRAO results not applied	14,15,20	The GROM subcomponent encountered failures in the Production environment due to inadequate RAM memory on certain VMs. The root cause has been identified as a result of the larger input data size.	Temporary memory increase on GROM component VMs	TSCNET has put in place a series of measures, including cleaning and reconfiguring the environment, allocating the GROM component additional freed up memory, boosting	Feb. 2023



						SWAP memory, and recomputation as a fallback in case of reoccurrence.	
TSCNET	19.12.22	NRAO results not applied	10. Dec	The GROM subcomponent encountered failures in the Production environment due to inadequate RAM memory on certain VMs. The root cause has been identified as a result of the larger input data size.	Temporary memory increase on GROM component VMs	TSCNET has put in place a series of measures, including cleaning and reconfiguring the environment, allocating the GROM component additional freed up memory, boosting SWAP memory, and recomputation as a fallback in case of reoccurrence.	Feb. 2023
TSCNET	22.12.22	NRAO results not applied	1-17, 19-24	Improper GROM subcomponent handling logic for a rare case where spanning is applied (for affected BD, CGM for one TS was missing in the inputs provided by CCCtool)	No mitigation actions were available, TSCNET directly proceeded with corrective actions after failures occurred.	New version of GROM application subcomponent was developed, released and extensively tested in handling cases where spanning is applied. Deployment on Production environment expected in CW6 (6.2-10.2.)	Feb. 2023
TSCNET	25.12.22	NRAO results not applied	1-23	Improper GROM subcomponent handling logic for a rare case where spanning is applied (for affected BD, CGM for one TS was missing in the inputs provided by CCCtool)	No mitigation actions were available, TSCNET directly proceeded with corrective actions after failures occurred.	New version of GROM application subcomponent was developed, released and extensively tested in handling cases where spanning is applied. Deployment on Production environment expected in CW6 (6.2-10.2.)	Feb. 2023
TSCNET	27.12.22	NRAO results not applied	Nov 17	The GROM subcomponent encountered failures in the Production environment due to inadequate RAM memory on certain VMs. The root cause has been identified as a result of the larger input data size.	Temporary memory increase on GROM component VMs	TSCNET has put in place a series of measures, including cleaning and reconfiguring the environment, allocating the GROM component additional freed up memory, boosting SWAP memory, and recomputation as a fallback in case of reoccurrence.	Feb. 2023

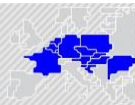


CORESO	15/12/2022 23/12/2022 24/12/2022 25/12/2022 26/12/2022 27/12/2022 28/12/2022	NRAO results not applied	15/12/2022 - 3,6,19,22,24 23/12/2022 - 8,16,23 24/12/2022 - 13,17,20 25/12/2022 - 1,3,10,12,14 26/12/2022 - 3,9,11 27/12/2022 - 1,9,14,17,20 28/12/2022 - 15,16,19,21,23	Castor (Coreso NRAO tool) failed due to an IT infrastructure issue.	Coreso to fix infrastructure issue causing Castor to fail	Software patched	20.01.2023
CORESO	22.12.22	Spanning	18	Merging for timestamps 17:30 (MTU 18) failed due to BCI issue which lead to spanning. The issue was known and accepted as a risk before go-live.	Improvements to be made to merging server	Improvements to correct BCI issue included in development scope for April 2023	April 2023
CORESO	25.12.22	Default flow-based parameters	24	DFP triggered for MTU 24 of BD 25/12/2022 following a merging failure caused by a BCI issue. The issue was known and accepted as a risk before go-live.	Improvements to be made to merging server	Improvements to correct BCI issue included in development scope for April 2023	April 2023

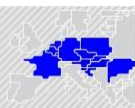


Annex 3: Quality of data published - Raw survey results

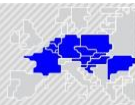
		#	1	2	3	4	5
Introduction	Introduction	What is your name? - Name					
		What is your email address? - Email					
		What is your organisation? - Organisation					
		Which category of stakeholders do you belong to? - category of stakeholder	Other	Energy Trader	Energy Trader	Energy Trader	Energy Trader
		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	Yes	Yes
		I want my answer to remain confidential - If you tick this box, we will not publish your answer to this consultation - Confidentiality	No	Yes	No	Yes	No
Data Published on JAO (PuTo Handbook & monitoring tool)	Publication Tool Handbook	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	3	3	3	3
		Publication Tool Handbook: Any feedback on highlighting good practices or examples? - Views			No		
		Publication Tool Handbook: Any comments or suggestions for improvement? - Views	Only a small thing, but we would welcome the inclusion of an exemplary code in		For each item-specific questions below, we provide improvements in terms of both the publication tool and the		



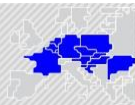
			python / R / Excel VBA example for retrieving data.		associated handbook description.		
	Monitoring Tool	Monitoring Tool: How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	4	5	Not Answered	2	1
		Monitoring Tool: 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	Not Answered	3	3	5	4
		Monitoring Tool: Any feedback on highlighting good practices or examples? - Views		The clarity is ok, but on some recent business days (Christmas period 2022) the output were totally wrong and misleading market participants. We need to be able to rely on this published data .	This tool serves as a useful means to efficiently monitor the available data. The clarity is ok, but on some recent business days (Christmas period 2022) the output were wrong and mislead market participants. We need to be able to rely on this published data.		



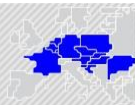
		Monitoring Tool: Any comments or suggestions for improvement? - Views		<p>It appears that there are still some issues with the monitoring tool, such as cases where the status remains "Expected" even though the data is already present, or where the status shows "Received" but part of data is missing (as was the case for BD 2023-03-11 for initial computation in the virgin domain).</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>We have some comments on API and data download:</p> <p>1. 24 hours restriction</p> <ul style="list-style-type: none">• we use the API to download csv files:• we send following parameters within the download request: payload = {"from": " 2023-05-05T22:00:00.000Z", "until": " 2023-05-06T22:00:00.000Z", "fileType": "csv"}• however, from time to time it's necessary to use „from:2023-05-05T22:00:00.000Z" and „until: 2023-05-06T21:59:00.000Z" instead to get all the data we need for that day. Otherwise it doesn't return the last hour (it's especially true for the Final Computation dataset) <p>2. different parameters for Alpha factor</p> <ul style="list-style-type: none">• for some reason we have to use a different set of parameters to download the Alpha factor data then for the rest of the data <p>payload = {" FromUtc": " 2023-05-05T22:00:00.000Z", " ToUtc": " 2023-05-06T22:00:00.000Z", "fileType": "csv"}</p>
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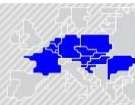
Data Published on JAO (PuTo pages)	Core Market View	Core Market View - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	3	5	Not Answered	1	1
		Core Market View - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	3	4	5	Not Answered
		Core Market View - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Any comments or suggestions for improvement for this page? - Views			It would be useful to give a short description of what the "tests" do directly on the page (currently users must refer to the handbook).	Not useful, as it does not add any new raw information.	
	Core Market Graphs	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	3	5	Not Answered	1	1
		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	Not Answered	3	3	5	Not Answered
		Core Market Graphs - Any feedback on highlighting good practices or examples for this page? - Views			The option to zoom (located in the top right corner) and select zones of interest is a useful feature.		



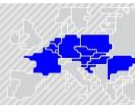
		Core Market Graphs - Any comments or suggestions for improvement for this page? - Views			An interactive graph would be a valuable addition to the current display format. Users could benefit from features such as the ability (directly from the graph) to select or deselect borders, zoom in and out, and dynamically view values by hovering the mouse over the lines. Being able to directly save the charts would also be welcomed.	Not useful, as it does not add any new raw information.	
	Core Map	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	2	5	Not Answered	2	Not Answered
		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	Not Answered	5	5	5	Not Answered
		Core Map - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Core Map - Any comments or suggestions for improvement for this page? - Views			No		



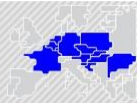
	Border Data Overview	Border Data Overview - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	5	Not Answered	1	1
		Border Data Overview - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	3	3	5	Not Answered
		Border Data Overview - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Border Data Overview - Any comments or suggestions for improvement for this page? - Views			No	Not useful, as it does not add any new raw information.	
	Max Net Positions	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	4	5	Not Answered	2	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	Not Answered	4	4	5	3



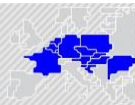
		Max Net Positions - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Max Net Positions - Any comments or suggestions for improvement for this page? - Views			The explanation of how Max Net Positions is obtained could be improved, particularly in terms of providing a high-level overview of the calculation.	Can be computed from PTDF domain LTA but more complex to calculate	
	Max Exchanges (MaxBex)	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	4	5	Not Answered	2	1
		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	Not Answered	4	5	5	4
		Max Exchanges (MaxBex) - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Max Exchanges (MaxBex) - Any comments or suggestions for improvement for this page? - Views			The explanation of how MaxBex are obtained could be improved, particularly in terms of providing a high-level overview of the calculation.	Can be computed, but more complex to calculate	



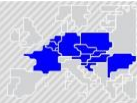
	Initial Comp.(VirginDomain)	Initial Comp.(VirginDomain) - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	2	5	Not Answered	5	1
	Initial Comp.(VirginDomain)	Initial Comp.(VirginDomain) - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	3	3	3	5	4
	Initial Comp.(VirginDomain)	Initial Comp.(VirginDomain) - Any feedback on highlighting good practices or examples for this page? - Views			No		
	Initial Comp.(VirginDomain)	Initial Comp.(VirginDomain) - Any comments or suggestions for improvement for this page? - Views			We understand that the Initial Comp. is based on the F_ref_init and that F-ref does not exist at this point 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. It would be useful to clarify this aspect.	a. There are some missing columns to make the data fully transparent - A column distinguishing CNECs from MNECs would be required to make the result fully transparent. This is because not all CBCOs are actually considered as part of the presolve (CNECs are but MNECs are not) and so some CBCOs may not be part of the presolved (constraining) set although they may be otherwise constraining. - A column stating if the CBCO was excluded or included in the presolve due to the 5% rule. This is required	



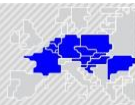
						<p>for clarity and reproducibility, as there are CBCOs oscillating around this value for example some CBCOs in Austria.</p> <p>b. There are some duplicates issues, despite all the identifiers columns, there sometimes exist non-unique rows and often with different values. Extra identification and explanation is required if these CBCOs are truly different, or otherwise duplicates removed if the undistinguishable rows are truly duplicates.</p> <p>c. UCTE codes identifying the CBCOs/substations, as well as in the Static grid model, to make mapping much easier. This is already being done in CSE publications.</p>	
	Remedial Actions Preventive	<p>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</p> <p>- Views</p>	2	5	Not Answered	5	1
		<p>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?</p> <p>- Views</p>	Not Answered	3	3	5	Not Answered
		<p>Remedial Actions Preventive - Any feedback on highlighting good practices or examples for</p>			No		



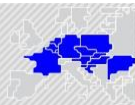
		this page? - Views					
		Remedial Actions Preventive - Any comments or suggestions for improvement for this page? - Views			Replace the term "Parameters" in the right-hand side section by a term that reflects more adequately what the numerical values "baseline" & "after NRAO" refer to.	a. There is only information about the PRA that are found by the RAO, we don't have information about the base PRA implemented in the D2CF basecase that are not changed or part of the RAO (2N topologies applied in the basecase / PST tap position applied in the basecase) b. For topological RA there are no description of the detailed 2 node topology of the substation (which lines connect to which electrical nodes) c. No information about preventive redispatching implemented in the basecase (use of reserve plant)	
	Remedial Actions Curative	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	2	5	Not Answered	5	1
		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	Not Answered	4	4	4	Not Answered



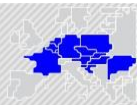
		Remedial Actions Curative - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Remedial Actions Curative - Any comments or suggestions for improvement for this page? - Views			As of today, it seems only the CNEC & cRA#1 names are given, both baseline & NRAO columns remain empty. Difficult to find any useability of this page with the limited amount of information available.		
	Validation Reductions	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	3	5	Not Answered	5	1
		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	Not Answered	3	3	3	Not Answered
		Validation Reductions - Any feedback on highlighting good practices or examples for this page? - Views			We welcome the addition of the "Share of IVA reducing the domain" from Davinci which facilitates analyses by market participants.		



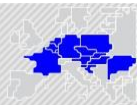
		Validation Reductions - Any comments or suggestions for improvement for this page? - Views			TSOs seem not to use all the fields in a standardized way, sometimes the information is all contained in the justification column, sometimes in the extra NP columns . The handbook is also not up to date and does not include a description of all the columns of this page.	a. Textual justification should not contain data because they are unparseable. It already appears to be the case that there are columns for providing the data often seen in text with the values for each country. However, these columns appear not to be used in some cases. b. Highlighting the type of cut is required for full transparency – for example whether they are fundamental cut, or cut due to IT failure. c. Standardised columns with categories of problems could be used, and perhaps replace the Justification column. Exceptional cases could be reported in a dedicated column.	
	Pre-Final (EarlyPub)	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	4	5	Not Answered	5	4
		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	3	4	4	5	4



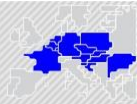
		<p>Pre-Final (EarlyPub) - Any feedback on highlighting good practices or examples for this page? - Views</p>		<p>Timeline of publication should be respected as it is not always the case (while crucial). Also there is a strong need for communication when the process is late (current communication missing). Furthermore, all hours should be published at the same time. Ex: on some days in Jan/Feb 23, they were flagged as fallback in the monitoring but it was impossible to know if the domain was empty and/or not published yet.</p>	<p>Timeline of publication should be respected as it is not always the case (while crucial). Also there is a strong need for communication when the process is late (current communication missing). Furthermore, all hours should be published at the same time. Ex: on some days in Jan/Feb 23, they were flagged as fallback in the monitoring but it was impossible to know if the domain was empty and/or not published yet.</p>		
		<p>Pre-Final (EarlyPub) - Any comments or suggestions for improvement for this page? - Views</p>			<p>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.</p> <p>Furthermore, the labeling "R_amr" and "minRAM for Core target" is confusing, and a better naming structure would be preferable.</p>	<p>a. In addition to the other two similar PTDF publications, we observed that the Early publication only contains the presolved domain as opposed to the full domain. However, since the presolved domain is obtained, the full domain has to be available. Publishing the full domain to standardise format and allow for comparison between this and the Final Publication is required.</p> <p>b. There are some missing columns to make the data fully transparent</p> <ul style="list-style-type: none"> - A column distinguishing CNECs from MNECs would be required to make the result fully transparent. This is because not all CBCOs are actually considered as part of the 	



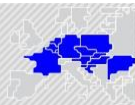
						<p>presolve (CNECs are but MNECs are not) and so some CBCOs may not be part of the presolved (constraining) set although they may be otherwise constraining.</p> <p>- A column stating if the CBCO was excluded or included in the presolve due to the 5% rule. This is required for clarity and reproductibility, as there are CBCOs oscillating around this value for example some CBCOs in Austria.</p> <p>c. There are some duplicates issues, despite all the identifiers columns, there sometimes exist non-unique rows and often with different values. Extra identification and explanation is required if these CBCOs are truly different, or otherwise duplicates removed if the undistinguishable rows are truly duplicates.</p> <p>d. UCTE codes identifying the CBCOs/substations, as well as in the Static grid model, to make mapping much easier. This is already being done in CSE publications.</p>	
	LTN	<p>LTN -</p> <p>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</p> <p>- Views</p>	2	5	Not Answered	5	4



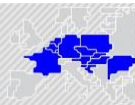
		LTN - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	4	4	5	4
		LTN - Any feedback on highlighting good practices or examples for this page? - Views			No		
		LTN - Any comments or suggestions for improvement for this page? - Views			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.		
	Final Computation	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	4	5	Not Answered	5	3
		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	Not Answered	3	4	5	4



		Final Computation - Any feedback on highlighting good practices or examples for this page? - Views		Timeline of publication should be respected as it is not always the case (while crucial). Also there is a strong need for communication when the process is late (current communication missing). Furthermore, all hours should be published at the same time. Ex: on some days in Jan/Feb 23, they were flagged as fallback in the monitoring but it was impossible to know if the domain was empty and/or not published yet.	Timeline of publication should be respected as it is not always the case (while crucial). Also there is a strong need for communication when the process is late (current communication missing). Furthermore, all hours should be published at the same time. Ex: on some days in Jan/Feb 23, they were flagged as fallback in the monitoring but it was impossible to know if the domain was empty and/or not published yet.		
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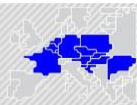


		<p>Final Computation - Any comments or suggestions for improvement for this page? - Views</p>			<p>We propose two modifications to the PTDF Final Computation:</p> <ul style="list-style-type: none"> • Add a new column indicating if the CNEC (Critical Network Element Constraint) meets the maxz2z threshold of 5% (boolean or checkmark). This provides better transparency to market participants 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 market participants. 	<p>a. There are some missing columns to make the data fully transparent</p> <ul style="list-style-type: none"> - A column distinguishing CNECs from MNECs would be required to make the result fully transparent. This is because not all CBCOs are actually considered as part of the presolve (CNECs are but MNECs are not) and so some CBCOs may not be part of the presolved (constraining) set although they may be otherwise constraining. - A column stating if the CBCO was excluded or included in the presolve due to the 5% rule. This is required for clarity and reproducibility, as there are CBCOs oscillating around this value for example some CBCOs in Austria. <p>b. There are some duplicates issues, despite all the identifiers columns, there sometimes exist non-unique rows and often with different values. Extra identification and explanation is required if these CBCOs are truly different, or otherwise duplicates removed if the undistinguishable rows are truly duplicates.</p> <p>c. UCTE codes identifying the CBCOs/substations, as well as in the Static grid model, to</p>	
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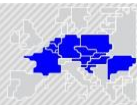


					<p>make mapping much easier and data closer to their original format (less conversion losses). This is already being done in CSE publications.</p> <p>d. ALBE and ALDE PTDF (Alegro) : Apart from being needed by the Euphemia coupling process, there are great insight about the nodal PTDF as ALBE and ALDE represents only one node in the network and are "free" from GSK assumptions. Unfortunately they can't be use for CNECs that are very far from those two nodes. It would be useful to have additional nodal PTDF column (maybe one strong node per region, included external regions) for better transparency on the nodal PTDF matrix.</p> <p>e. Zonal PTDF for external regions that are used for the calculation of Fuaf are not published while being a key information for understanding external impact (loop flows) of neighbouring regions</p> <p>f. BASECASE PTDF and Flow on more non-monitored CNECs: to better help forecasting / understanding the flowbased domain, having an exhaustive view on all 400kV / major</p>	
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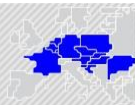
						<p>220kV flows and PTDF in the CORE network. We would welcome if all CORE TSOs decided to put all their network as MNEC so that we have full observability on TSOs assumptions. This solution would also allow to provide full transparency on assumed transmission outages and substation special topology.</p>	
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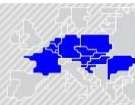
	LTA	LTA - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	3	5	Not Answered	5	4
		LTA - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	4	5	5	4
		LTA - Any feedback on highlighting good practices or examples for this page? - Views			No		
		LTA - Any comments or suggestions for improvement for this page? - Views		It could be very useful to add a graph view.	It could be very useful to add a graph view.		
	Final Bilateral Exchange Restrictions	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	3	5	Not Answered	5	1
		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	Not Answered	3	3	5	Not Answered



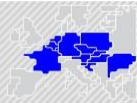
		Final Bilateral Exchange Restrictions - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Final Bilateral Exchange Restrictions - Any comments or suggestions for improvement for this page? - Views		It would be very important to add a "curtailment" section. Curtailments published on the Message Board are still not machine readable. It could also be very useful to add a graph view.	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 normal operation days. It would be advantageous to include a message stating whether DFP is in force directly on this page. It would be very important to add a "curtailment" section.		
	Allocation Constraints	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	4	5	Not Answered	5	4
		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	Not Answered	4	5	5	4
		Allocation Constraints - Any feedback on highlighting good practices or examples for this page?			No		



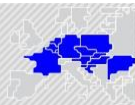
	D2CF	- Views					
		Allocation Constraints - Any comments or suggestions for improvement for this page? - Views			No		
		D2CF - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	5	Not Answered	5	1
		D2CF - How 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	Not Answered	3	4	5	Not Answered
		D2CF - Any feedback on highlighting good practices or examples for this page? - Views			No		



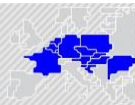
		D2CF - Any comments or suggestions for improvement for this page? - Views		<p>If would be useful if generation were broken down by fuel type.</p> <p>We think there are still doubts as to the perimeters, e.g. whether DE includes DK1.</p>	No	<p>a. We require also having the full net positions of each country in addition to the CORE net position, to ensure that the numbers balance with generation and load.</p> <p>b. We would require having the total load and total generation in addition to the vertical load and high voltage generation, because the netting linked to embedded generation in non modelled voltage level makes it very difficult to make sense of those numbers. We would like to keep the vertical load and high voltage generation, but add the total load and total generation (high + low voltage).</p> <p>c. We need visibility into the generation per type. We could use same classification as Entsoe. In particular having transparency on the renewable forecast (wind/solar/hydro) that are made by the TSOs in the D2CF are key information to understand the level stress of the network.</p> <p>d. We do not currently have visibility into the voltage coverage for each TSO for the D2CF. This is required to understand the netting levels and to ensure appropriate use of the current numbers. If the</p>	
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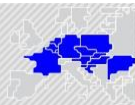
						voltage coverage changes, then a step change in the vertical load and generation series would occur, and make it impossible to use the dataset correctly.	
	Refprog	Refprog - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	Not Answered	5	Not Answered	5	1
		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	3	3	4	5	Not Answered
		Refprog - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Refprog - Any comments or suggestions for			No		



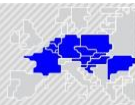
		improvement for this page? - Views					
	Reference Net Position	Reference Net Position - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	5	Not Answered	5	1
		Reference Net Position - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	3	5	5	Not Answered
		Reference Net Position - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Reference Net Position - Any comments or suggestions for improvement for this page? - Views			No		
	ATCs on Core external borders	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	5	Not Answered	1	4
		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	Not Answered	4	5	5	4



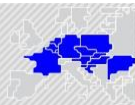
		being very clear? - Views					
		ATCs on CORE external borders - Any feedback on highlighting good practices or examples for this page? - Views			No		
		ATCs on CORE external borders - Any comments or suggestions for improvement for this page? - Views		It could be very useful to add a graph view.	It could be very useful to add a graph view.		
	ShadowAuction ATC	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	5	Not Answered	1	1
		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	Not Answered	3	5	5	Not Answered
		ShadowAuction ATC - Any feedback on highlighting good practices or examples for this page? - Views			No		
		ShadowAuction ATC - Any comments or suggestions for improvement for this page? - Views			No		



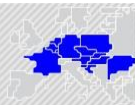
	ShadowPrices	ShadowPrices - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	5	5	Not Answered	3	1
		ShadowPrices - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	3	5	5	Not Answered
		ShadowPrices - Any feedback on highlighting good practices or examples for this page? - Views			No		
		ShadowPrices - Any comments or suggestions for improvement for this page? - Views			We would welcome adding in the handbook a description of the precise formula used to compute the $\max_{Z_2} Z_2^{\text{ptdf}}$ 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).		
	Congestion Income	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	3	5	Not Answered	3	1



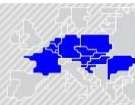
		Congestion Income - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	2	3	5	Not Answered
		Congestion Income - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Congestion Income - Any comments or suggestions for improvement for this page? - Views			No		
	Scheduled Exchanges	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	3	5	Not Answered	5	4
		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	Not Answered	4	5	1	4
		Scheduled Exchanges - Any feedback on highlighting good practices or examples for this page? - Views			No	CZ / DE / SK / PL , not fully consistent with other sources publication (Entsoe TP / TSO website)	
		Scheduled Exchanges - Any comments or suggestions for improvement for this page? - Views		It could be very useful to add a graph view.	It could be very useful to add a graph view.	It seems the published data relates only to DA schedules and not compounded long term nomination + DA	



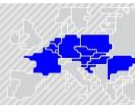
						schedule. Ideally both information are available (DA schedule / DA + LT schedule)	
	Net Position	Net Position - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	5	Not Answered	5	4
		Net Position - How would you 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	Not Answered	4	5	5	4
		Net Position - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Net Position - Any comments or suggestions for improvement for this page? - Views		It could be very useful to add a graph view.	It could be very useful to add a graph view.		
	Intraday ATC	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	3	5	Not Answered	1	1
		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	Not Answered	3	5	1	Not Answered



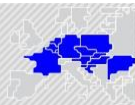
		being very clear? - Views					
		Intraday ATC - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Intraday ATC - Any comments or suggestions for improvement for this page? - Views		It could be very useful to add a graph view.	No		
	Intraday NTC	Intraday NTC - How 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	3	5	Not Answered	1	1
		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	Not Answered	3	5	1	Not Answered
		Intraday NTC - Any feedback on highlighting good practices or examples for this page? - Views		On some days, the Intraday NTC was not published, which then implied the need for MP to perform manual calculation from Intraday ATC and Scheduled exchanges.	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.		
		Intraday NTC - Any comments or suggestions for improvement for this page? - Views		It could be very useful to add a graph view.	The description of the Intraday NTC page is missing in the current version of the publication handbook. It could		



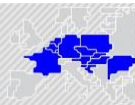
					be very useful to add a graph view.		
	Price Spread	Price Spread - How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week - Views	4	5	Not Answered	1	1
		Price Spread - How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	4	5	5	Not Answered
		Price Spread - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Price Spread - Any comments or suggestions for improvement for this page? - Views		It could be very useful to add a graph view.	It could be very useful to add a graph view.		
	Spanning/DFP	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	3	5	Not Answered	5	1
		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	Not Answered	3	5	5	Not Answered



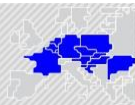
		being very clear? - Views					
		Spanning/DFP - Any feedback on highlighting good practices or examples for this page? - Views			No		
		Spanning/DFP - Any comments or suggestions for improvement for this page? - Views			It would be helpful to include additional information in the publication handbook 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 0MW max import/export are not reported for all computations (initial/pre- final/final). One such example is on BD 2022-12-25. All 3 publications are described as DFP, but only the Final actually contains the data (rest being empty).		
Ease-of-use of data retrieval	Navigation, Downloadin g of data (on ease-of-use of data retrieval - manual, Art. 26(3)(b))	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	4	5	Not Answered	4	Not Answered



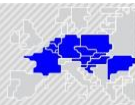
		Navigation, Downloading of data (on ease-of-use of data retrieval - manual, Art. 26(3)(b)): How would you rate the ease-of-use of navigation among the different pages from the JAO Publication Tool and downloading of data on a scale from 1 to 5, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	3	3	4	Not Answered
		Navigation, Downloading of data (on ease-of-use of data retrieval - manual, Art. 26(3)(b)): Any feedback on highlighting good practices or examples for the navigation and downloading of data? - Views			The addition of filters for in-page navigation & data download is also appreciated.		
		Navigation, Downloading of data (on ease-of-use of data retrieval - manual, Art. 26(3)(b)): Any comments or suggestions for improvement of the navigation and downloading of data? - Views		Improvements are needed: for example for the FB domain calculation results, it should be allowed to download in only 1 file all the data. Also, a MP should be allowed to download data only for specific CNECS (like pre solved for example) directly via the web interface (on the top of the API currently available today).	<ul style="list-style-type: none"> 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. Additionally, a dedicated tab for (or linking) published CSVs (FB & LTA Intraday domains), ID parameters, and other data that are not currently easily accessible would be beneficial for users. Introduce a tab with a link to the static grid model into the publication tool. 		



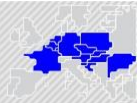
	API (on ease-of-use of data retrieval - automated, Art. 26(3)(b))	API (on ease-of-use of data retrieval - automated, Art. 26(3)(b)): How often do you use the API from JAO Publication Tool on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	5	5	Not Answered	4	Not Answered
	API (on ease-of-use of data retrieval - automated, Art. 26(3)(b))	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	3	4	5	4	Not Answered
	API (on ease-of-use of data retrieval - automated, Art. 26(3)(b))	API (on ease-of-use of data retrieval - automated, Art. 26(3)(b)): Any feedback on highlighting good practices or examples for the API? - Views			The option to test the API queries directly on the webpage is a very useful feature.		
	API (on ease-of-use of data retrieval - automated, Art. 26(3)(b))	API (on ease-of-use of data retrieval - automated, Art. 26(3)(b)): Any comments or suggestions for improvement of the API? - Views		One suggestion could be to explore the Push mechanism instead of pull, which can improve the availability timings and reduce the load caused due to periodic polling to check for new data.	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.		1. 24 hours restriction • we use the API to download csv files: • we send following parameters within the download request: payload = {"from": " 2023-05-05T22:00:00.000Z", "until": " 2023-05-06T22:00:00.000Z", "fileType": "csv" } • however, from time to time it's neccessary to use „from:2023-05-05T22:00:00.000Z" and „until: 2023-05-06T21:59:00.000Z" instead to get all the data we



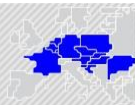
							need for that day. Otherwise it doesn't return the last hour (it's especially true for the Final Computation dataset) 2. different parameters for Alpha factor • for some reason we have to use a different set of parameters to download the Alpha factor data then for the rest of the data payload = {" FromUtc": "2023-05-05T22:00:00.000Z", " ToUtc": "2023-05-06T22:00:00.000Z", "fileType": "csv" }
Regular publications or reports	Static Grid Model	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	2	5	Not Answered	5	Not Answered
		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	Not Answered	3	1	5	Not Answered
		Static Grid Model: Any feedback on highlighting good practices or examples for this page? - Views			The recent addition of the changelog has been very welcomed by market participants.		



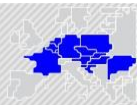
		Static Grid Model: Any comments or suggestions for improvement for this page? - Views		<p>The map could be made more user-friendly and is of suspicious quality (e.g.) there is no interconnection between FR and BE.</p>	<p>Not solely related to this page but ensuring consistency in element names across publications (SGM, CNE names, KPI reports, intermediate ID domains, etc...) is key to provide optimal traceability.</p>	<p>1. We require UCTE codes for each substation, consistent with the ones we propose using for the PTDF dataset publication, to allow for mapping of these to the grid.</p> <p>2. There are missing voltage levels in this publication with respect to the ones considered in the D2CF. The publication should be consistent with the D2CF voltage levels considered.</p> <p>3. Description of the two nodes topologies is required for a full description of the grid.</p> <p>4. Coordinates of the substations would allow visualization of the grid and of the CBCOs on the grid, given the UCTE codes are also published.</p> <p>5. Transformers voltage levels conversion should be standardised across the file (eg 400/220 vs 380/220), and the parameters adjusted accordingly. Some transformers appear to have inconsistent voltage levels in name with respect to their primary and secondary voltage level. Eg: TR Guestrow 220/400 403 has voltage levels 380kV and 231kV. Meaning of Electrical parameters is unclear, as</p>	
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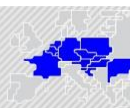
					<p>resistance for flow going from 400kV to 220kV is not the same as from 220kV to 400kV, what those parameters really mean needs clarification.</p> <p>6. Tripods - no easy way to obtain all the tripods from the data – adding a column that distinguishes between substation/power plant/tripod would be desirable.</p> <p>7. The grid evolves over time. If possible, it would be great if each line/transformer had a timestamp representing the date it was commissioned, at least for the recent elements – to make comparison with older files easier – which is currently difficult also due to format changes. Decommissioned elements should be mentioned in the log or in a dedicated space.</p> <p>8. Some transmission lines have a missing substation in the Substation_2 column. This needs resolved, as by definition any conductor is between two points, description of substation may need to be explained further for this (eg if a line is within a substation).</p>	
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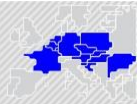
	Operational KPI reports	Operational KPI reports: How often do you use this publication on a scale from 1 to 5, with 1 being less than once a year and 5 being more than once a week? - Views	3	5	Not Answered	Not Answered	Not Answered
		Operational KPI reports: How would you rate the clarity and completeness of the information included in this page, with 1 being not clear at all and 5 being very clear? - Views	Not Answered	3	3	Not Answered	Not Answered
		Operational KPI reports: Any feedback on highlighting good practices or examples for this page? - Views		We think a lot of KPI are missing since March 2022 ?	No		
		Operational KPI reports: Any comments or suggestions for improvement for this page? - Views			The page does not seem of use anymore (last ppt from 11/2022), KPIs are rather reported monthly in the DQI reports below. It could be useful to highlight if market participants should follow this page at all.		
	Monthly DQI reports	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	3	5	Not Answered	Not Answered	Not Answered
		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	Not Answered	3	3	Not Answered	Not Answered



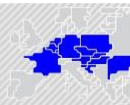
		Monthly DQI reports: Any feedback on highlighting good practices or examples for this page? - Views		We think November 2022 is missing, and also all months of 2023.	No		
		Monthly DQI reports: Any comments or suggestions for improvement for this page? - Views			It would be preferable if the attachments section were located at the top of the page rather than requiring the user to scroll down.		
	Quarterly reports	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	3	5	Not Answered	Not Answered	Not Answered
		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	Not Answered	3	3	Not Answered	Not Answered
		Quarterly reports: Any feedback on highlighting good practices or examples for this page? - Views			No		
		Quarterly reports: Any comments or suggestions for improvement for this page? - Views			It would be preferable if the attachments section were located at the top of the page rather than requiring the user to scroll down.		



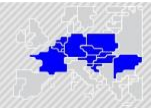
Closing	Closing	<p>What general feedback or suggestions do you have for improving the data published on JAO webpages? - Views</p>	<p>One of the critical aspects of the JAO PuTo is to publish all data on time and respecting public deadlines.</p> <p>Also, before published, all data should complete.</p> <p>Another point would be the addition (in the PuTo) of a section publishing public message when deadlines are not met (reason for this delay and expected new publication time) by TSOs/JAO (on the top of the "Message Board" which is confusing).</p> <p>This section would only be dedicated to data published regarding DA FB.</p> <p>Finally, even if it's not the subject matter of the consultation, it is worth reminding that "IT incidents" such as the one in August and the one in April should not occur.</p>	<ul style="list-style-type: none"> 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 feedbacks. 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 in particular, it would also bring clarity to highlight which elements are true CNECs and which are not, and whether the 5% threshold is reached. We also proposed above some minor improvements of the handbook. It is important that all data are published on time and respect public deadlines. Also, all data should be complete before published. We propose to add to the publication tool a section publishing public message when deadlines are not met (reason for this delay and expected new publication time) by TSOs/JAO (on the top of the "Message Board" which is confusing). This section 	<p>1. It may be easier if the static grid model was extracted directly from the D2CF file and published daily. This would reduce the workload required to obtain the static grid model on TSO side, and give us true representation of what is used in operational related to grid evolution and transmission outages.</p> <p>2. Outage publication is rather poor and not harmonized, with each TSO using a different format. There should be a common standardized platform where the TSOs publish their outages and JAO could be this platform. Publication can be similar to what is currently done in the Nordics – the NUCS platform.</p> <p>3. Transmission Outage information going forward is very poor. For example for Tennet NL as of 17 May 2023, the outage view is only up until April 2023. This is not compliant with the REMIT standards.</p>	
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					would only be dedicated to data published regarding DA FB.		
		What general feedback or suggestions do you have for improving the format of this survey? - Views			None		
Admin	Admin	Response ID	ANON-ZNDK-EXK1-G	ANON-ZNDK-EXKR-H	ANON-ZNDK-EXKW-P	ANON-ZNDK-EXKN-D	ANON-ZNDK-EXK4-K
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		Analysed	No	No	No	No	No
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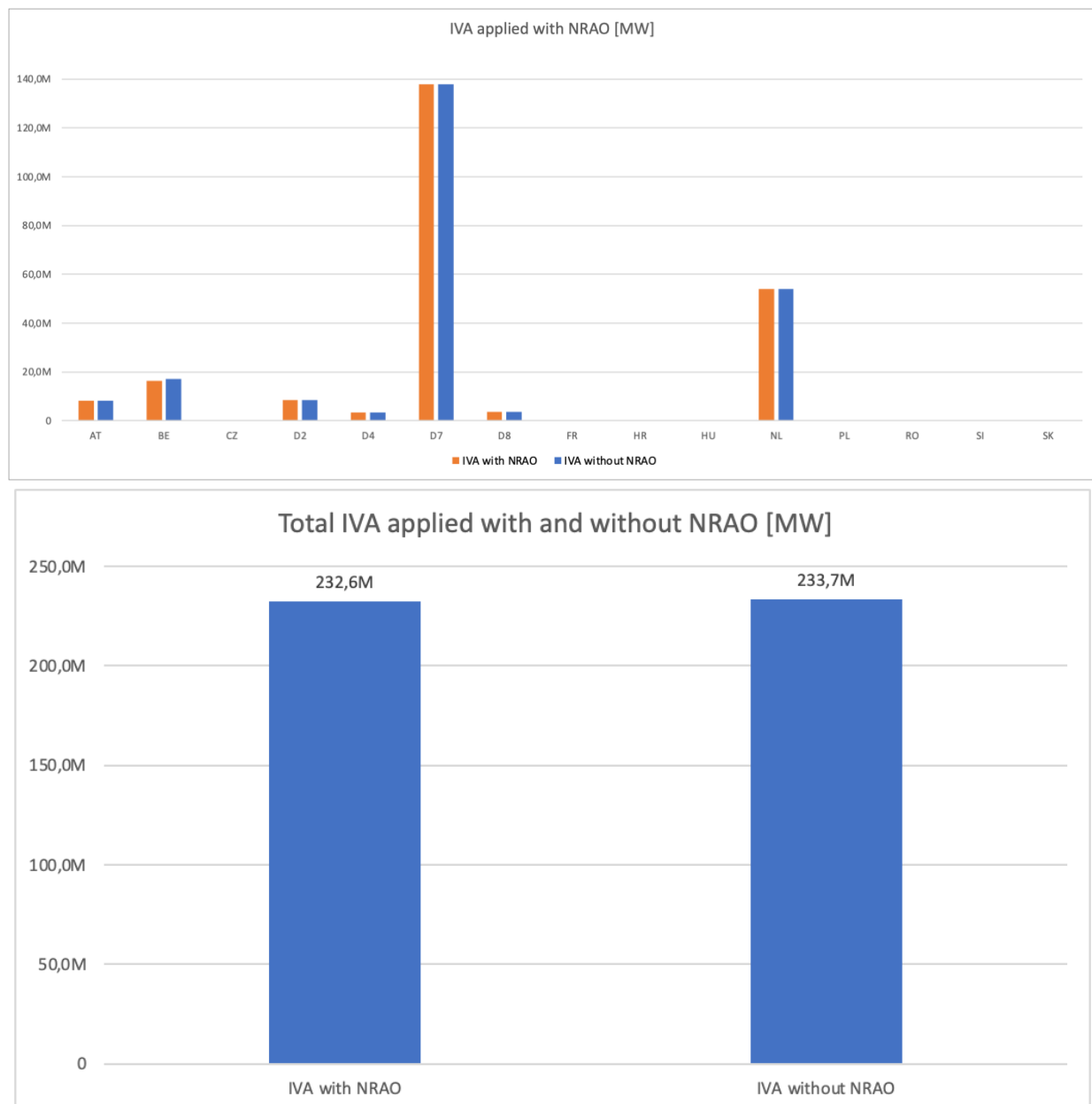
		Visited Pages - Introduction	Introduction	Introduction	Introduction	Introduction	Introduction
		Visited Pages - Data published on JAO	Data published on JAO	Data published on JAO	Data published on JAO	Data published on JAO	Data published on JAO
		Visited Pages - JAO Publication Tool	JAO Publication Tool	JAO Publication Tool	JAO Publication Tool	JAO Publication Tool	JAO Publication Tool
		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	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	Regular publications or reports
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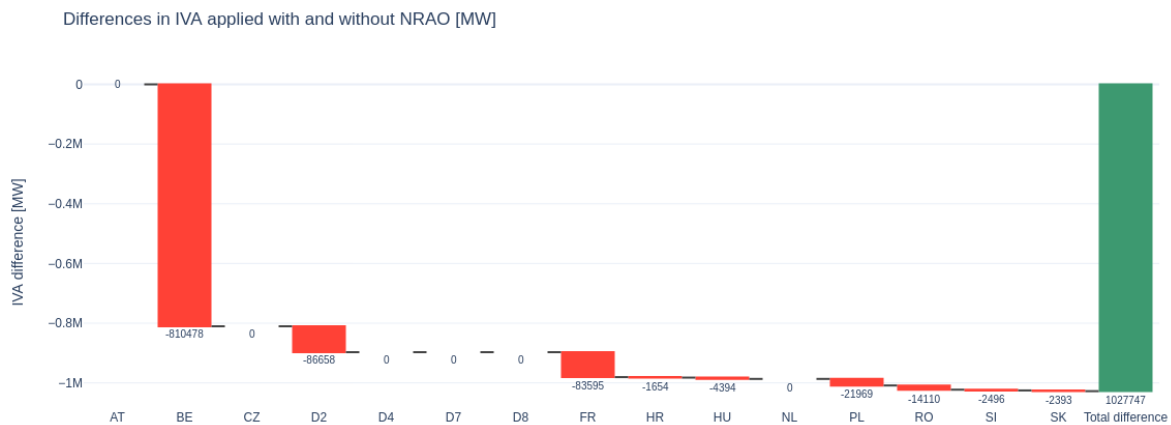
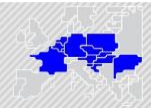
Annex 4: Results with IVA estimated values

This annex covers the results of the section Estimated IVA values.

The image below shows the IVA values with NRAO (results from the process) and IVA without NRAO (estimated) for each TSO.



Analysing the difference between IVA with NRAO and IVA without NRAO values, the following graphs are obtained. (IVA with NRAO – IVA without NRAO)



Knowing the IVA values with and without NRAO, and the Shadow Prices for each CNEC, the market gain/loss can be computed as:

$$\text{Market gain/loss} = \Delta \text{IVA} * \text{SP}_{\text{CNEC}}$$

where $\Delta \text{IVA} = \text{IVA}_{\text{without NRAO}} - \text{IVA}_{\text{with NRAO}}$

Data source and processing logic for SP_{CNEC} (shadow price of the CNEC) is the one described from the Quarterly Report.

In the image below, the market gain/loss due to the IVA difference between the calculations with and without NRAO is represented.

