USERS' GROUP

WG EMD-SO

Mar 19, 2021

Agenda

Approval report previous meeting and follow-up actions

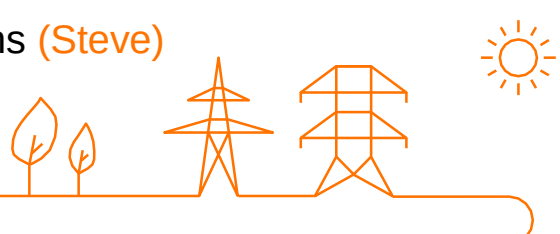
Action	By	Due date	Finalised
ALEGrO: evaluate how to monitor performance in operations	G. Etiennes / B. Genêt	Next WG EMD-SO	☐
Intraday: evaluate impact of new access to German ID market	J-M Reghem	Summer 2021	☐
System operations: timing new proposal for market suspension rules	P. Van Meirhaeghe	Next WG EMD-SO	☐

System Operations

1. Emergency and restoration: status (Peter)
2. Status and progress on the solutions for frequency deviations (Bernard)
3. Status of the investigations on the 8 January System split (Bernard)
4. Export limitations on 11 and 13 March 2021 (Bernard)
5. Elia summer outlook 2021 <=> risks for incompressibility (Cindy / Filip)

European Market Design

1. ALEGrO: monitoring of market usage (Gilles)
2. Brexit: loose volume coupling (Gilles)
3. ENTSO-E consultations: block bids, shadow auctions (Steve)



System Operations

Emergency and restoration: status

Emergency and restoration: netcode implementation status

NCER document	To Approve by	Status	Next steps
Terms & Conditions for Restoration Service Providers (black start)	Creg	V 1.01 Approved	V 2.0 (=prolongation of current design) to be submitted by Q1 2022 V 3.0 (new design) to be submitted in 2023
Rules for suspension and restoration of market activities and rules imbalance settlement during market suspension	Creg	V 1.0 Not approved	V 1.01 to be submitted by Q1 2022 (public consultation in Q4 2021)
Test Plan	Minister	V 1.0 Partially approved	V 1.01 submitted 30/10/2020. Waiting for approval
System Defense Plan (SDP = reviewed reddingscode)	Minister	V1.01 approved (under certain conditions) for a period of 2 years	V 2.0 to be submitted by 19/12/2021 Changes will be presented in WGSO Summer and Autumn sessions
Restoration Plan (RP = reviewed reconstruction code)			
List of SGUs identified for defense and restoration plan			
List of High priority SGUs for defense and restoration plan	Minister	V 1.01 approved by MB 13/01/21	V 2.1 submitted 21/01/2020

Emergency and restoration: System state notifications

- Notification system went live on 19/12/2020
- First scada-to-scada test on January 5th
- First combined test scada-sms-mail on February 2nd
- Recurrent testing each month on 1st Tuesday

- 103 grid users registrations via Customer Hub
- 18 other stakeholder registrations

- Implementation of scada-to-scada notification signals is still ongoing for some SGUs

- No real emergency state occurred so far since go-live

Emergency and restoration: Blackout proof voice communication

Objective	In line with art 40 of NCER, **facilitate blackout proof phones** at SGU identified in the restoration plan **to improve the restoration process efficiency** through adequate communication

Status

- One phone installed
- Ongoing contacts with 12 SGUs
- Project faces **delays** due to coronavirus and Data Communication department of Elia currently facing important overload
- Complex situations: SGUs not having 24/7 permanence, multiple SGUs on same industrial site, …
- **SGUs will be contacted by Elia** in order to start the process and prepare as much as possible on their side.
- Exact **timing for phone installation** will be **agreed with the SGU**

Indicative planning

- **Objective for end 2021**: 24 phones installed
- The planning is regularly updated depending on the project progress

SGU: Significant Grid Users

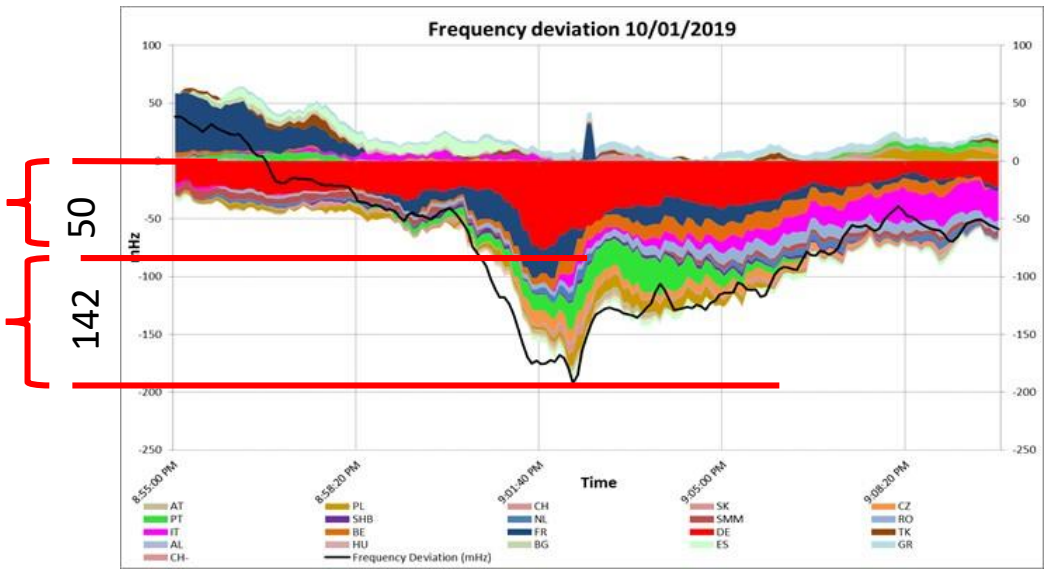
Outlook 2021

- Update of the system defence plan and restoration plan
  - WGSO Summer: overview of items to be adapted
  - WGSO Autumn: track change versions
- Further development of market suspension rules
- Follow up roll out Elia phones
- Follow up of execution of testplan

Status and progress on the solutions for frequency deviations

CE Frequency Deviations reminder

- Between 9th and 11th January 2019, CE experienced the following:
  - A long-lasting frequency deviation (**LLFD**), averaging 30 mHz and about **50 mHz** on 10th January at 21:00,
  - A Deterministic Frequency Deviation (**DFD**) during the evening peak-load at the hourly schedule transition of about **142 mHz**;



The cumulative effect of the permanent frequency deviation due to the frozen measurement, in addition to the large evening DFD, culminated **on 10th January at 21:02 when the steady-state frequency in the CE system reached 49.808 Hz**.

Both effects need effective mitigation measures to avoid reoccurrence of this situation

TSOs have worked hard and can now present

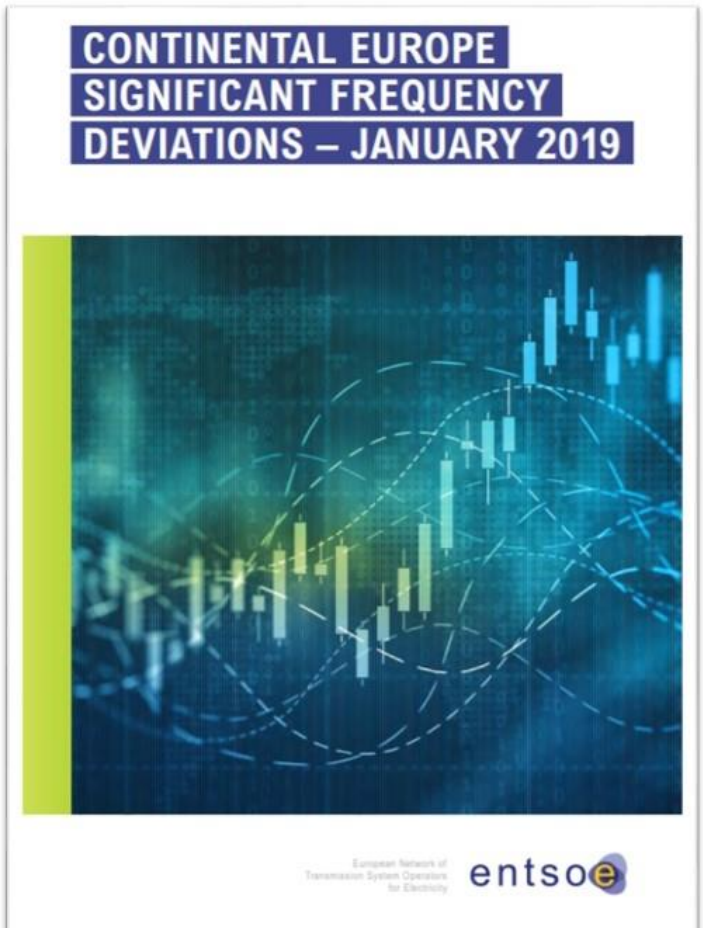
- The measures taken to prevent, detect and resolve the LLFD
- The mitigation measures envisaged or implemented to reduce DFD

ENTSO-E Investigation

- In February 2019, ENTSO-E created a dedicated Task Force
  - to investigate the events during January 2019
  - to identify the Causal Factors
  - to propose mitigating actions for preventing a re-occurrence of this type of event

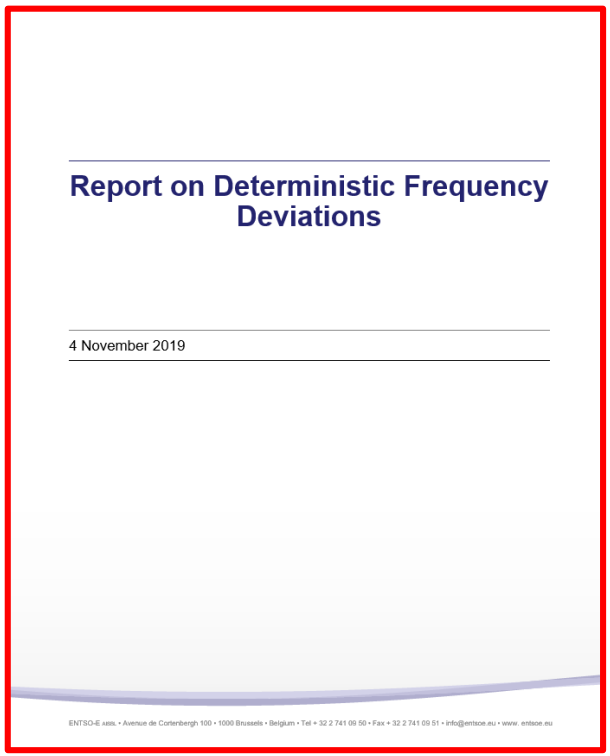
- In May 2019, ENTSO-E published a Technical Report

- https://www.entsoe.eu/news/2019/05/28/entso-e-technical-report-on-the-january-2019-significant-frequency-deviations-in-continental-europe/



ENTSO-E Investigation

- On 1st December 2019, ENTSO-E published a Second Technical Report specifically on DFD
- ENTSO-E also launched a two month public consultation beginning on 1st December 2019 on the subject of DFD
- The results of the consultation are in a new release of the report, published in November 2020



Market and/or TSO proposals to mitigate against DFDs

Proposed measures	• All control block managers have investigated the DFD contribution of the control block and have proposed mitigation measures
	• Following mitigations have been proposed
	  • Introduce 15 minute MTU and ISP for internal market area trading (most control blocks)
	  • Introduce the 15 or 30 minute MTU in intraday (by end of this year) and day-ahead (in a few years) on cross-border trade (mainly in CORE region)
	  • Restrictions on ramping speed for fast acting generation units (several control blocks)
	  • Introduce ramping on schedules for BRPs
	  • Increase the availability of fast acting aFRR or mFRR reserves (inseveral control blocks)

Current status	• The list of proposed mitigations has been presented to all Continental Europe TSOs, and a regular follow-up on progress has been agreed. End of this month a first update will be presented by all control block managers • The target values of maximum contibutions from each control block have been agreed and added to the SAFA of Continental Europe • The reporting of the DFD contribution of each control block has been developed and is now in test phase
Next steps	• Continue the implementation of all mitigation measures • Follow-up of the DFD contribution of each control block in the TSO decisional body and decide on the right time to commence the enforcement of the target values

Measures on long lasting frequency deviations

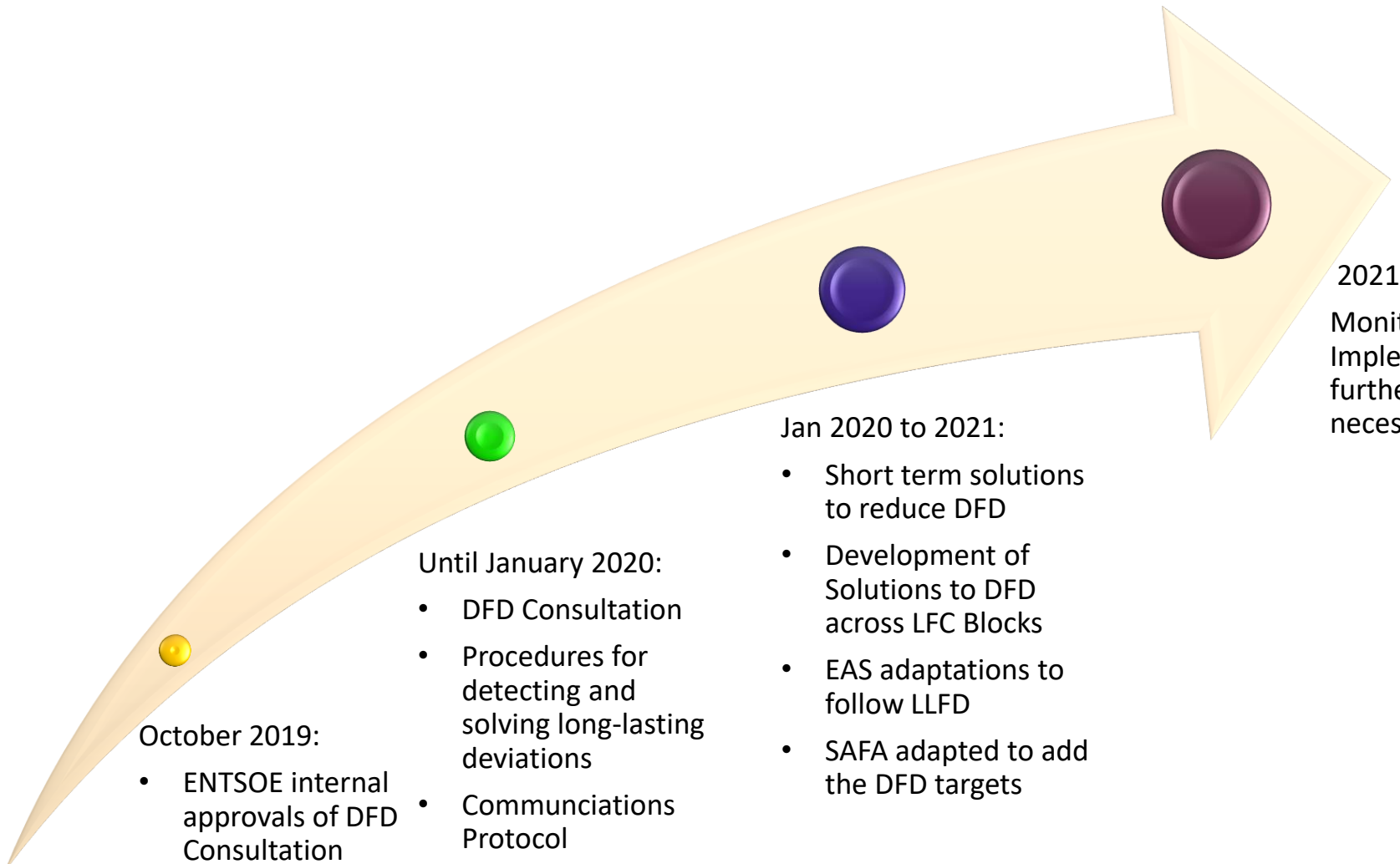
- Fail-safe measurement and telecommunication standards used by LFC, across CE have been established
- Control System functionality standards, to detect “frozen” LFC values, across CE have been identified and a list of mitigation measures has been implemented locally
- European Awareness System Functionality has being extended to help detect LLFD
- EAS has additional alarm states defined for CC South and CC North related to the frequency deviations
- Traffic lights for frequency are set automatically by the system. The CC calculates the alarms and then send it to EAS. This way all TSOs know that there is a frequency issue that needs to be investigated.
- Discrepancy checks in EAS by having individual border flows
  - Step 1: automatic reporting of discrepancies in EAS
  - Step 2: automatic highlighting of mismatches in EAS

Measures on long lasting frequency deviations (2)

- Quality checks on FRCE values are regularly performed to increase the reliability of data in EAS.
- A new trigger criteria has been implemented to detect LLFD : 6 seconds time deviation in 4 hours (or less). This creates a trigger on average 6 times per year. EAS will then also set to Yellow
- An additional Operational Procedure to consider Long-Lasting Frequency deviations has been developed
  - A checklist is defined on what a CC has to do and a checklist for each individual TSO. These checklists are followed when a Yellow alarm on frequency is generated by the CC
  - The check list for individual TSOs has been distributed.
  - All TSOs have added the individual checklist in the control room to local procedures.

Entso-e intends to publish more details on the implemented measures in an LLFD report by april

ENTSO-E Recommendations Timeline



October 2019:

- ENTSOE internal approvals of DFD Consultation Paper

Until January 2020:

- DFD Consultation
- Procedures for detecting and solving long-lasting deviations
- Communciations Protocol

Jan 2020 to 2021:

- Short term solutions to reduce DFD
- Development of Solutions to DFD across LFC Blocks
- EAS adaptations to follow LLFD
- SAFA adapted to add the DFD targets

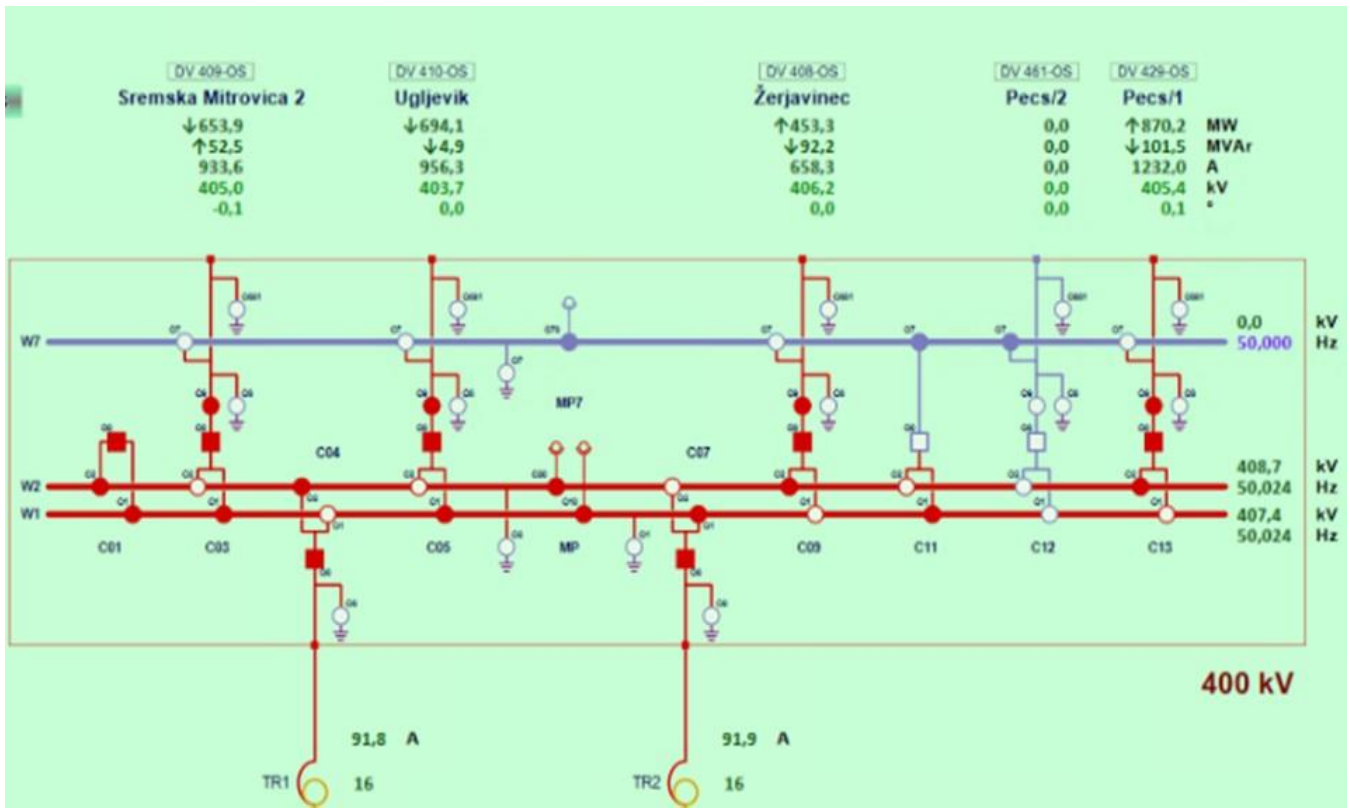
2021+:

Monitoring, Implementation of further solutions if necessary...

Status of the investigations on the 8 January System split

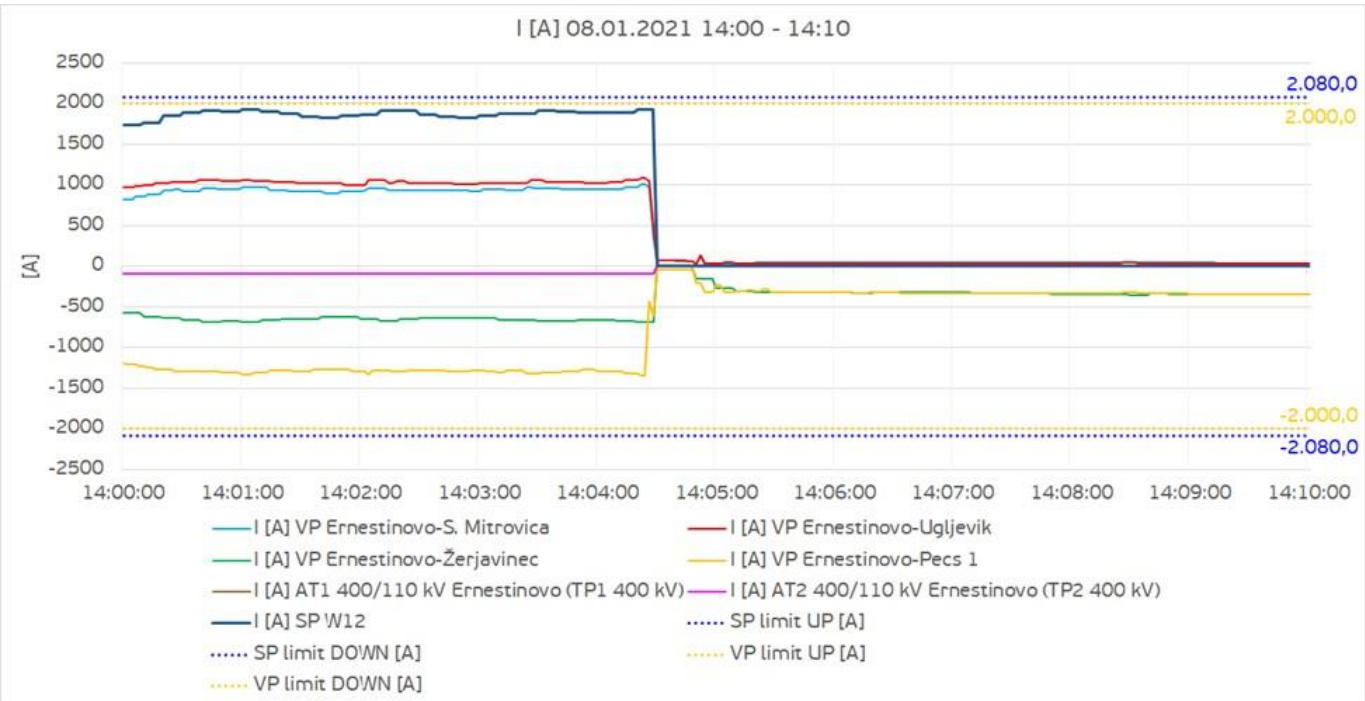
Topology in SS Ernestinovo just before the system separation

- Both 400/110kV transformers (TR1 and TR2) are not connected to the same busbar.
- Both 400 kV tie-lines between Ernestinovo and Pecs (no. 1 and no. 2) are not connected to the same busbar.
- The topology was not changed, when the line Ernestinovo (HR) – Pecs (HU) 2 was taken out of service on 5 of January 2021.
- The tripping of the busbar coupler was not identified as an ordinary contingency pursuant to the methodology for coordinating operational security analysis



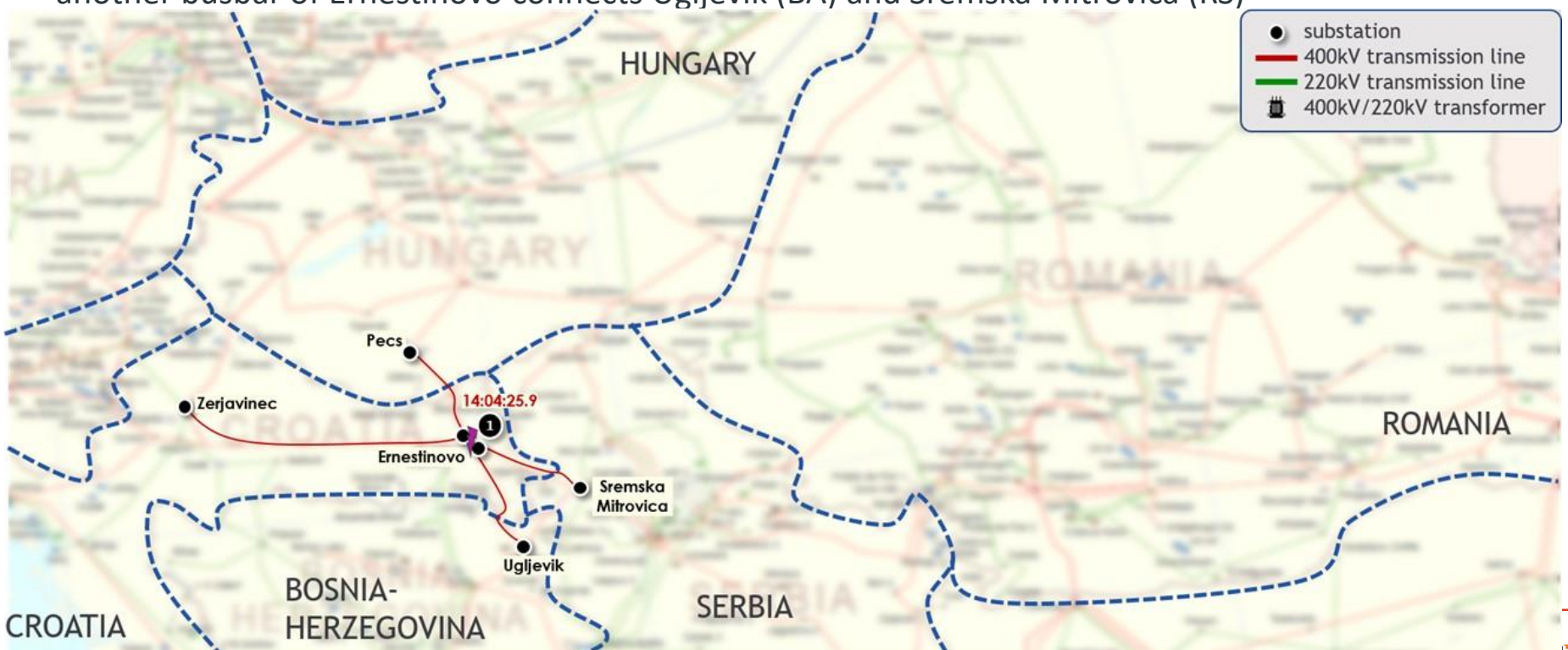
Currents of transmission network elements in SS Ernestinovo between 14:00 and 14:10 (SP W12 corresponds to the flow through the busbar coupler)

- The limits for the transmission lines is 2000 A, whereas the limit for the busbar coupler is 2080 A
- At 14:04:21 the current through the busbar coupler reached a value of 1989 A.
- Because of the refreshing rate of the SCADA system the operators could not see the last value of 1989 A (last reported value was 1922 A)
- The relay, which opens the circuit breaker of the busbar coupler uses a different measurement equipment, noticing > 2080 A value



Sequence of events on 8 January 2021 (1/2)

- Initial event was the tripping of a busbar coupler in Ernestinovo (HR) by overcurrent protection at 14:04:25.9
- The resulting two decoupled busbars in Ernestinovo lead to a separation of north-west and south-east flows
  - one busbar of Ernestinovo connects Zerjavinec (HR) and Pecs (HU)
  - another busbar of Ernestinovo connects Ugljevik (BA) and Sremska Mitrovica (RS)

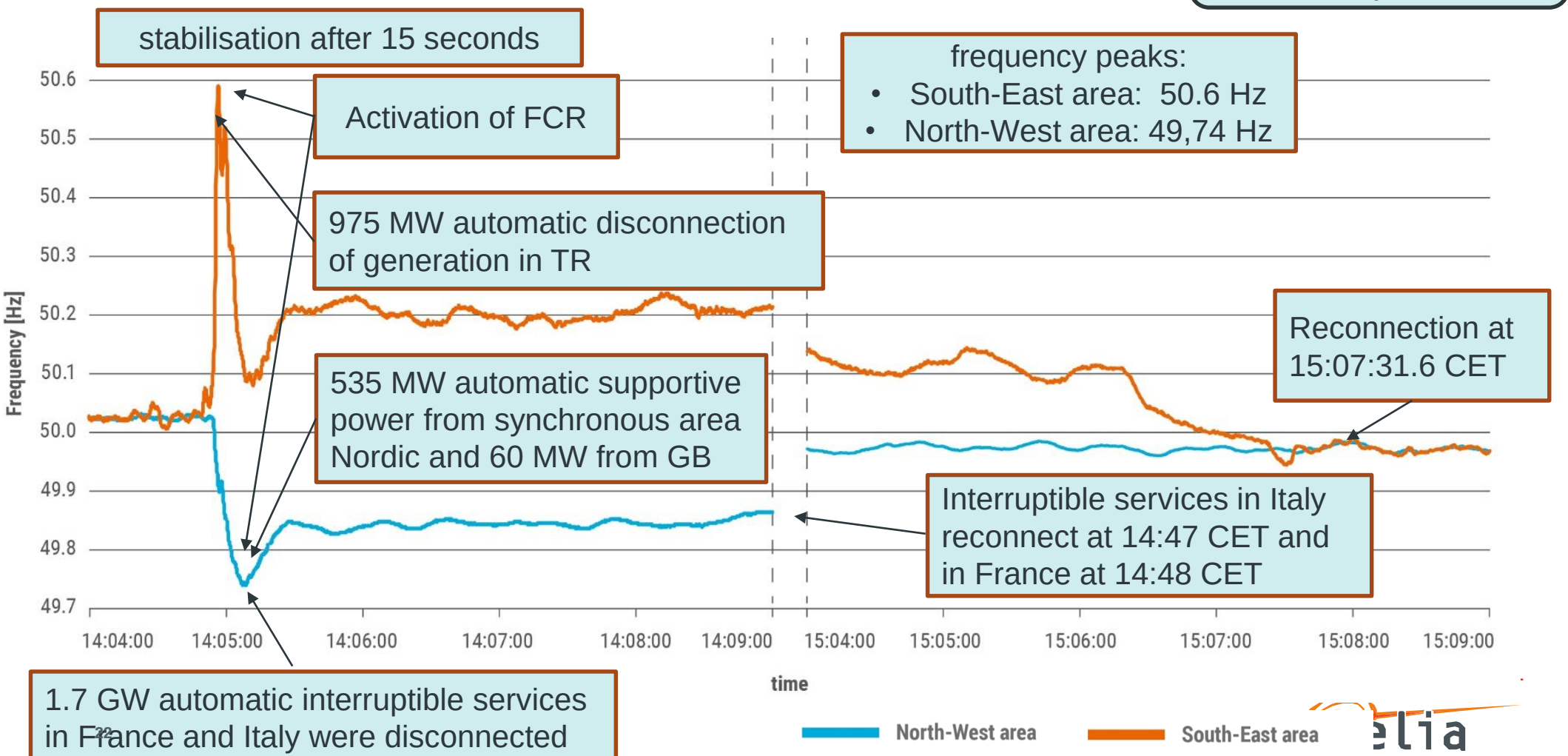


Sequence of events on 8 January 2021 (2/2)

- Separation of flows in Ernestinovo (at 14:04:25.9) shifted flows to neighbouring lines
- Tripping of line Subotica – Novi Sad (RS) due to overcurrent protection at 14:04:48.9
- Further tripping of lines due to distance protection and system separation into two areas at 14:05:08.6

System behaviour after the system separation

Preliminary – further measures are currently analysed



Procedure for the investigation of scale 2 and scale 3 incidents

- For incidents on scale 2 and 3 a detailed report shall be prepared by an expert panel

- Expert panel shall be composed of:
  - Leader (from non-affected TSO)
  - Representatives of affected TSOs
  - RSC representative of the concerned region
  - ICS SG representatives
  - NRAs and ACER (on request)

- An official invite to NRAs and ACER for the expert panel will be made by ENTSO-E in due course

- Latest by 6 months after the event the expert panel shall prepare a **Factual Report**

- Latest by the publication of the ICS annual report for the year of the event the expert panel shall prepare a **Final Report**

- To perform the analysis and reporting of the event a **data collection** is necessary

Export limitations on 11 and 13 March 2021

Introduction

On 11 and 13 March 2021 negative prices occurred on the Day-head Market for a.o. the Belgian hub. These negative prices find their source in three main effects:

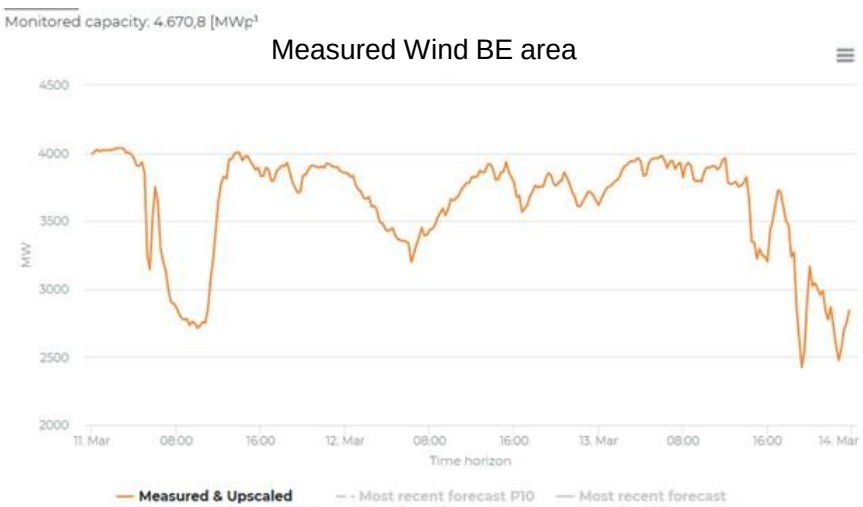
A fully available nuclear park in Belgium in combination with high wind conditions (close to storm) creating a surplus of energy compared to the electricity consumption needs. The German TSOs also issued a warning to the others TSOs about the extreme wind conditions;

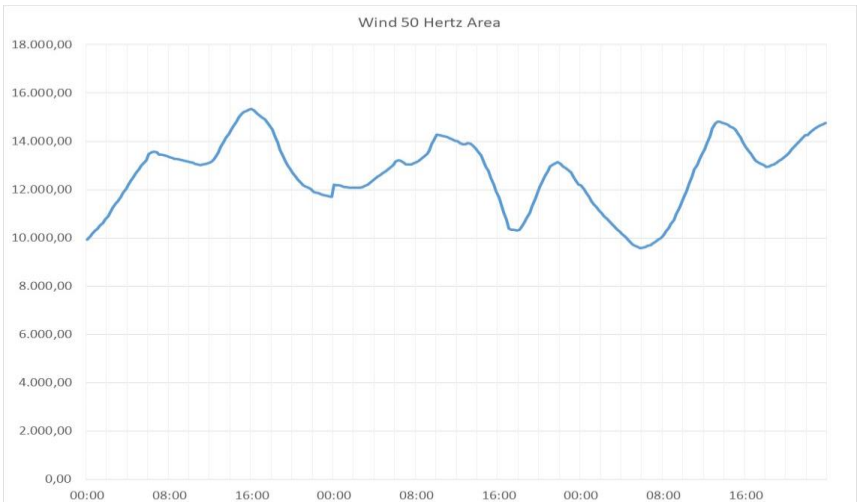
Inputs to the flow based market coupling failed for the whole day on 11/3 and for a few (5) hours on 13/3 causing the application of the fallback process with default cross-border capacities*;

A planned maintenance on Alegro cable starting at 07:00 on 11/3 further reduced cross-border capacities.

* Default flow based parameters are based on long term allocated (LTA) values and thus significantly lower (by lack of a full flow based calculations ensuring grid security)

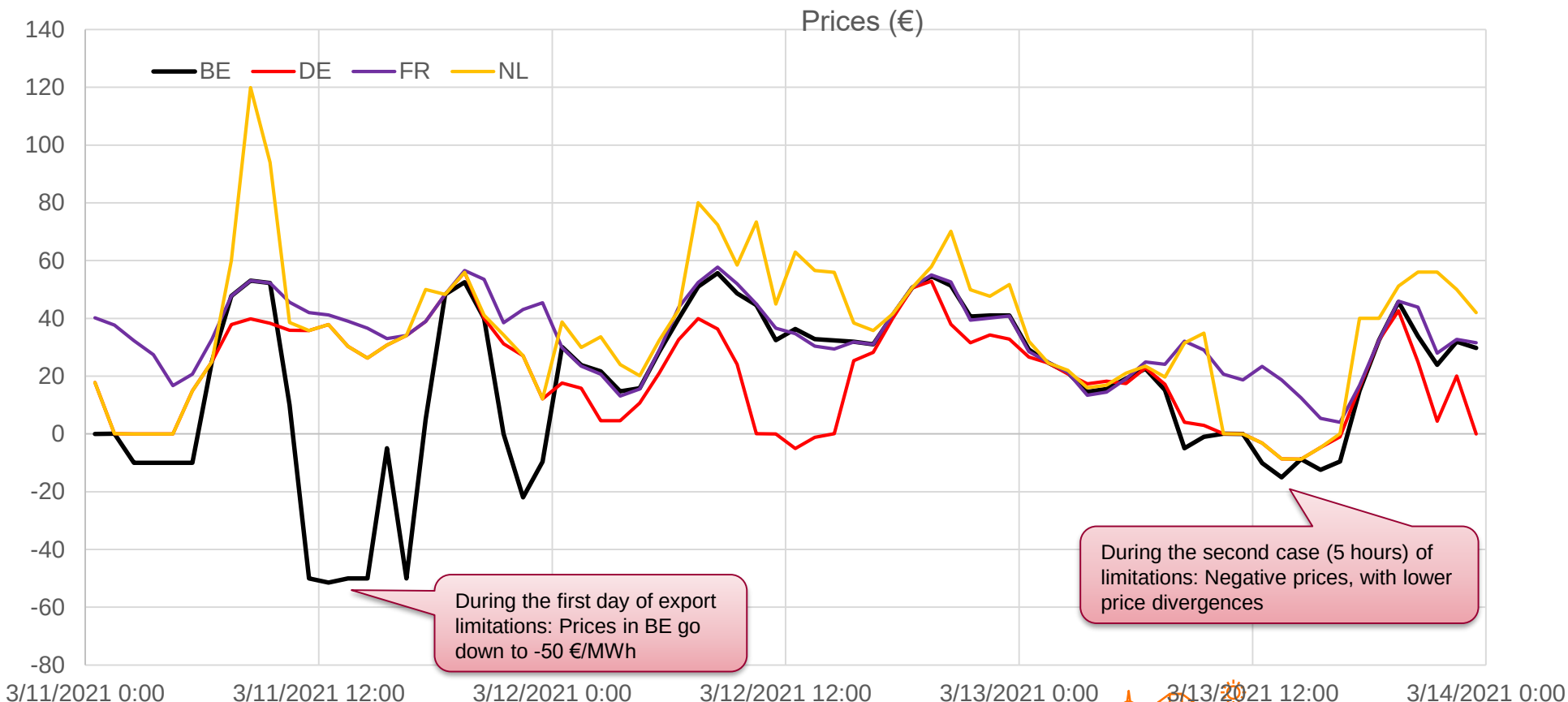
Specific weather conditions



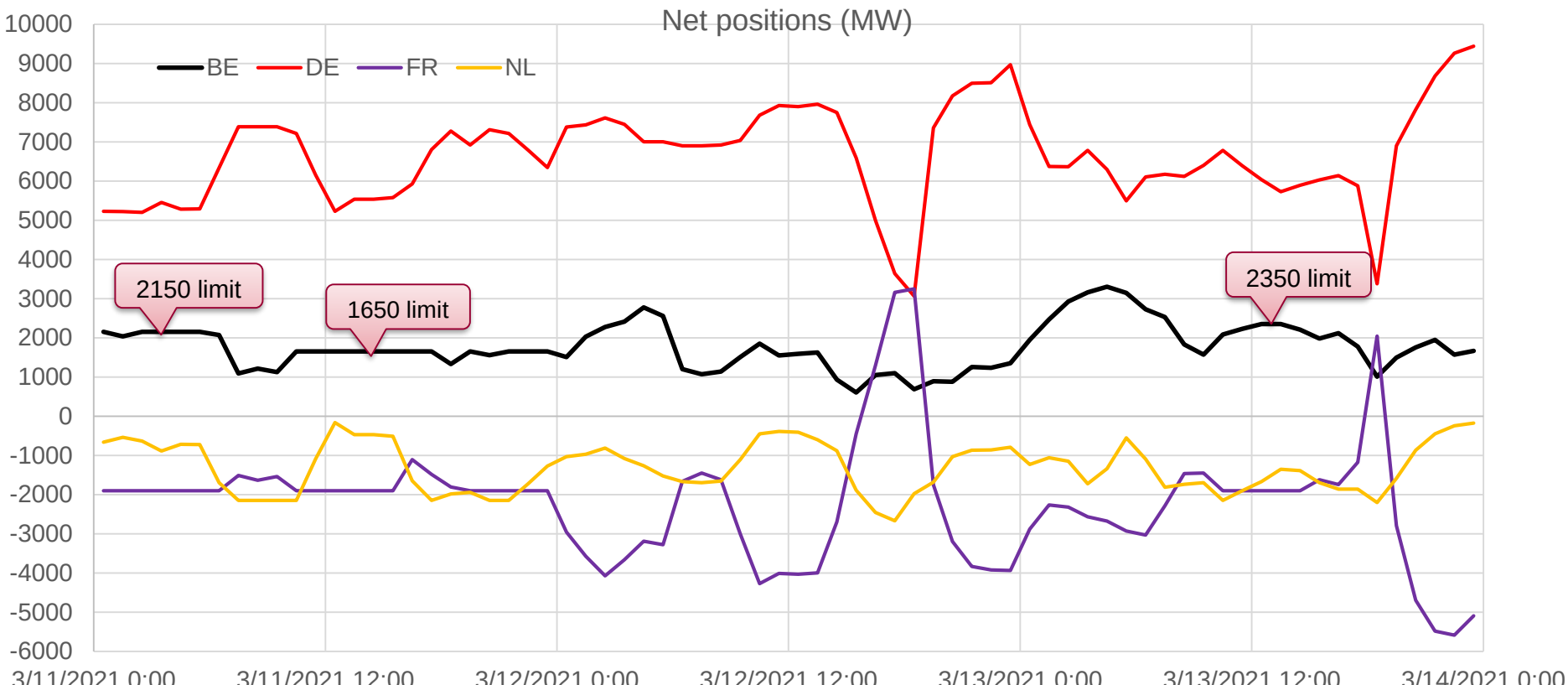


- Very high wind in Belgium (reaching + 4000MW = a record infeed of wind) and also in Germany
- Sum of generation in Belgium – consumption created a surplus of energy = a need to export towards neighboring countries

CWE Prices on 11/03 and 13/03



CWE Net positions of 11/03 and 13/03



Issues and mitigations

The fallback to default flow based parameters was duly investigated with following conclusions:

Default FB Parameters for business day 11/03

- For BD 11/03 an IT (server) issue triggered the DFP to be applied
- This issue was mitigated for the following days, and shouldn't happen again

Default FB Parameters for 5 hours of business day 13/03

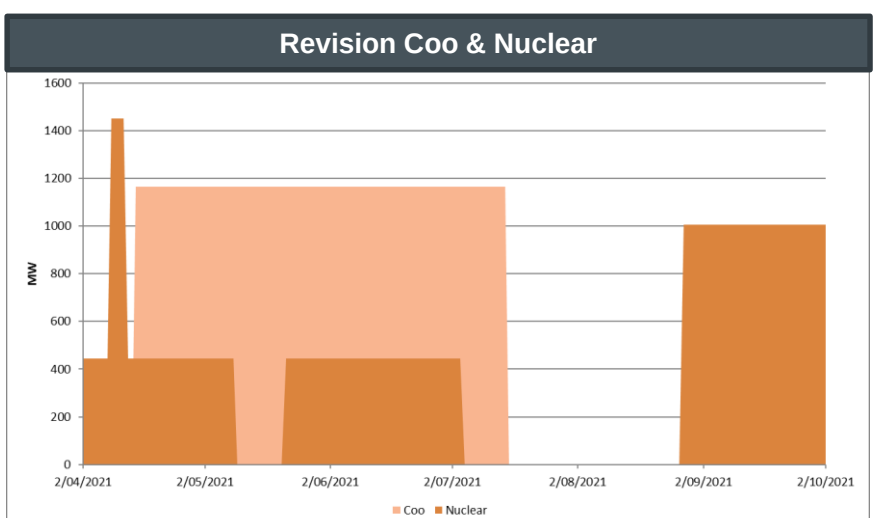
- During exceptional weather conditions, a challenge in the merging is arising from significantly different situations between the business day and the related reference day (e.g. low wind vs. very high wind)
- The massive shift of net positions which is required to move from the reference day to the new market situation leads to discrepancies in the DC load flow computation – a threshold of error is accepted and has recently be increased
- The solution is structurally solved in Core methodology: the logic of reference day does not apply anymore, but a net position forecast logic is applied instead
- In the short term a work around has been put into operation to avoid the same issue occurring again. Further investigations are ongoing to further decrease the risks in CWE.

Elia summer outlook 2021 <=> risks for incompressibility

Goal

Assessment of export needs/incompressibility issues during the next months

- Full revision of Coo from 15 April until 15 July
- Nuclear high availability during the coming months
- Lower offtake during the summer months (impact COVID limited)
- Increasing installed capacity of renewables



Hypotheses 2021

Summary hypotheses for P50 and P75 analysis

	P50	P75
Nuclear	Revision	
Solar	P50 (profile)	P75 (profile)
Wind	P50 (fix)	P75 (fix)
RoR	P50 (fix)	
CHP & bio non-CIPU	P50 (fix)	
CHP & bio CIPU	Revision & forced outage	
Reserves	2 running units @ Pmin	
Demand	P50 (profile)	

Normal day

Sunny & windy day!

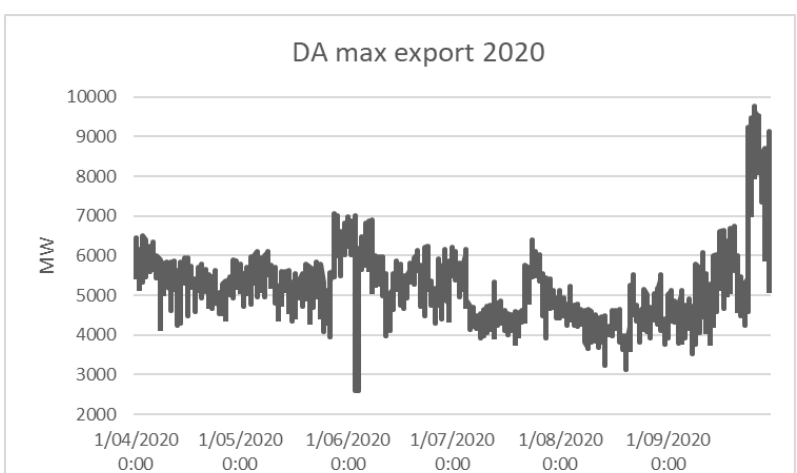
Pumped storage and export are not taken into account in the assessment and will be used in the post-processing of the results!

Export

Estimation based on 2020 DA data

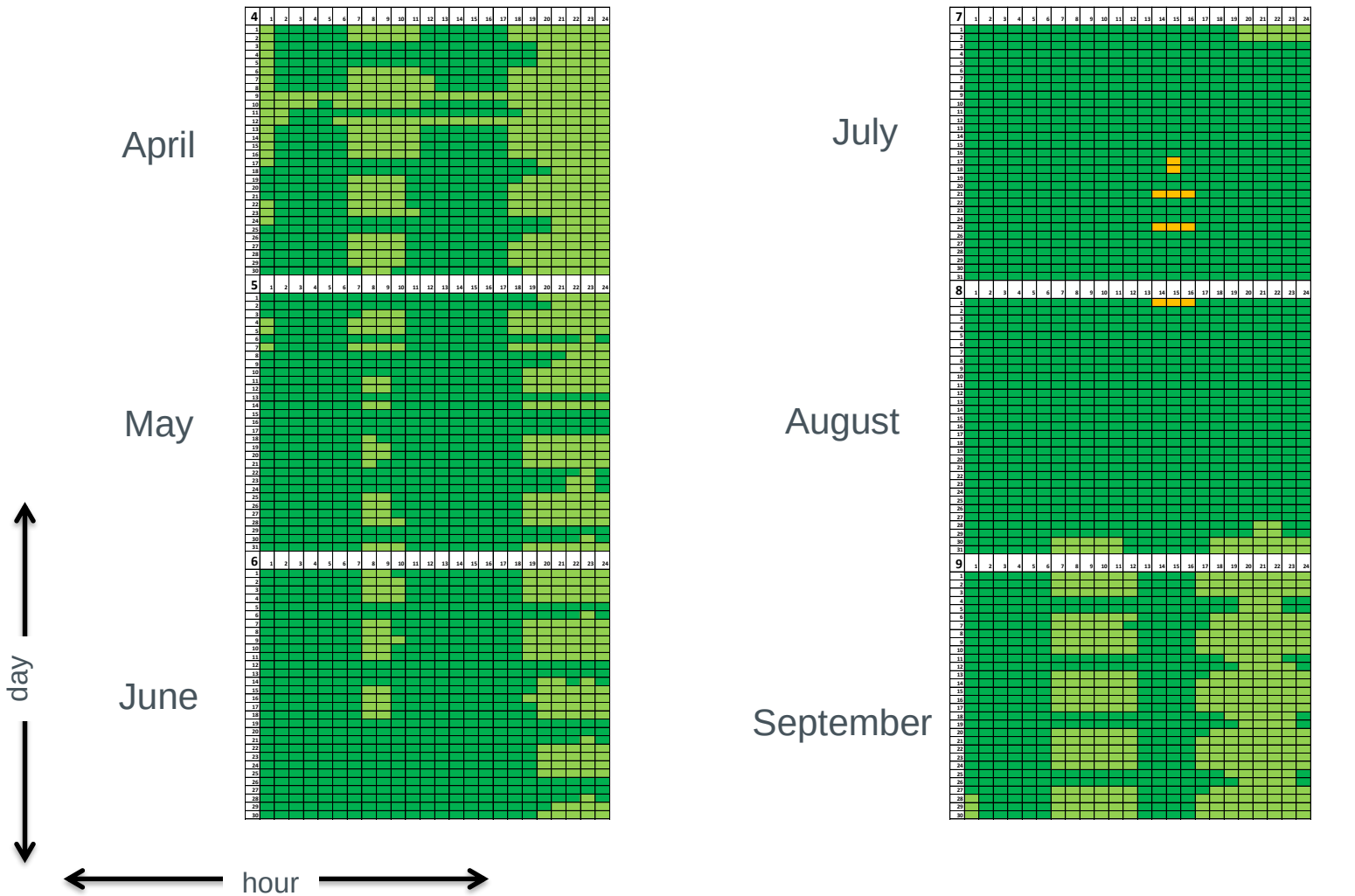
	Summer
P50	5100MW
P90	4200MW

Threshold used in graphs

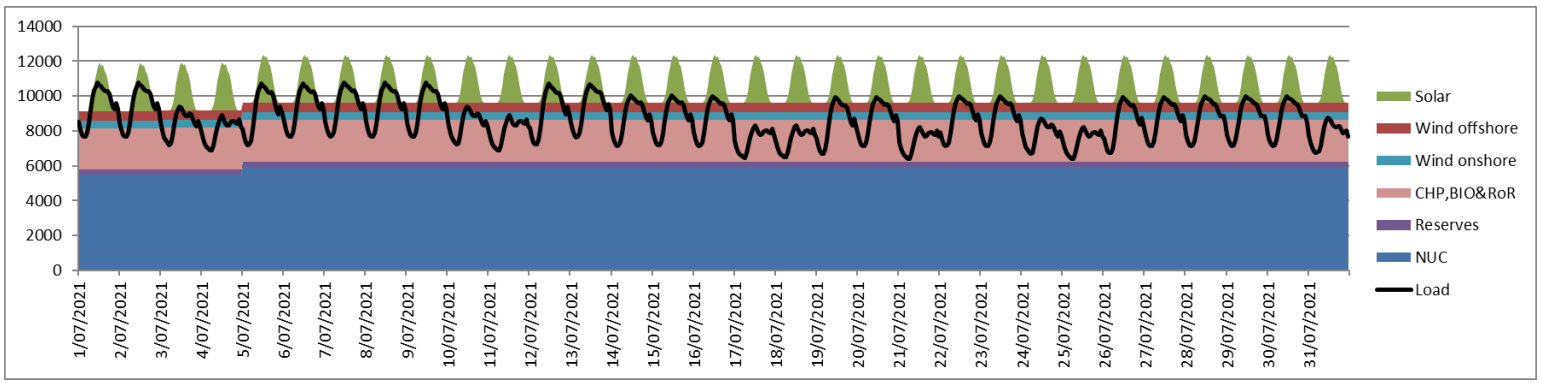


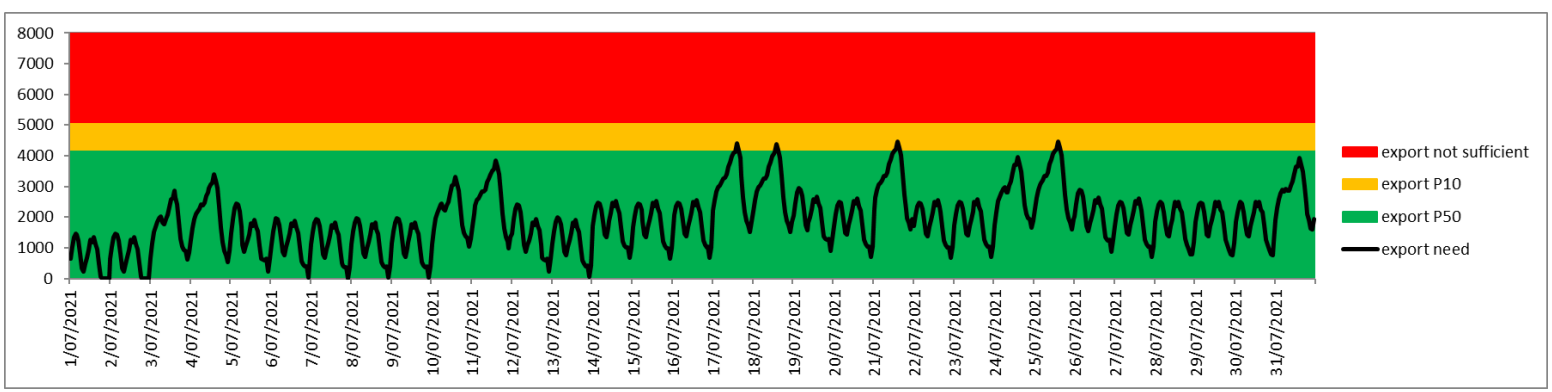
Results P50

P50 – need for export



P50 - Need for export: details July

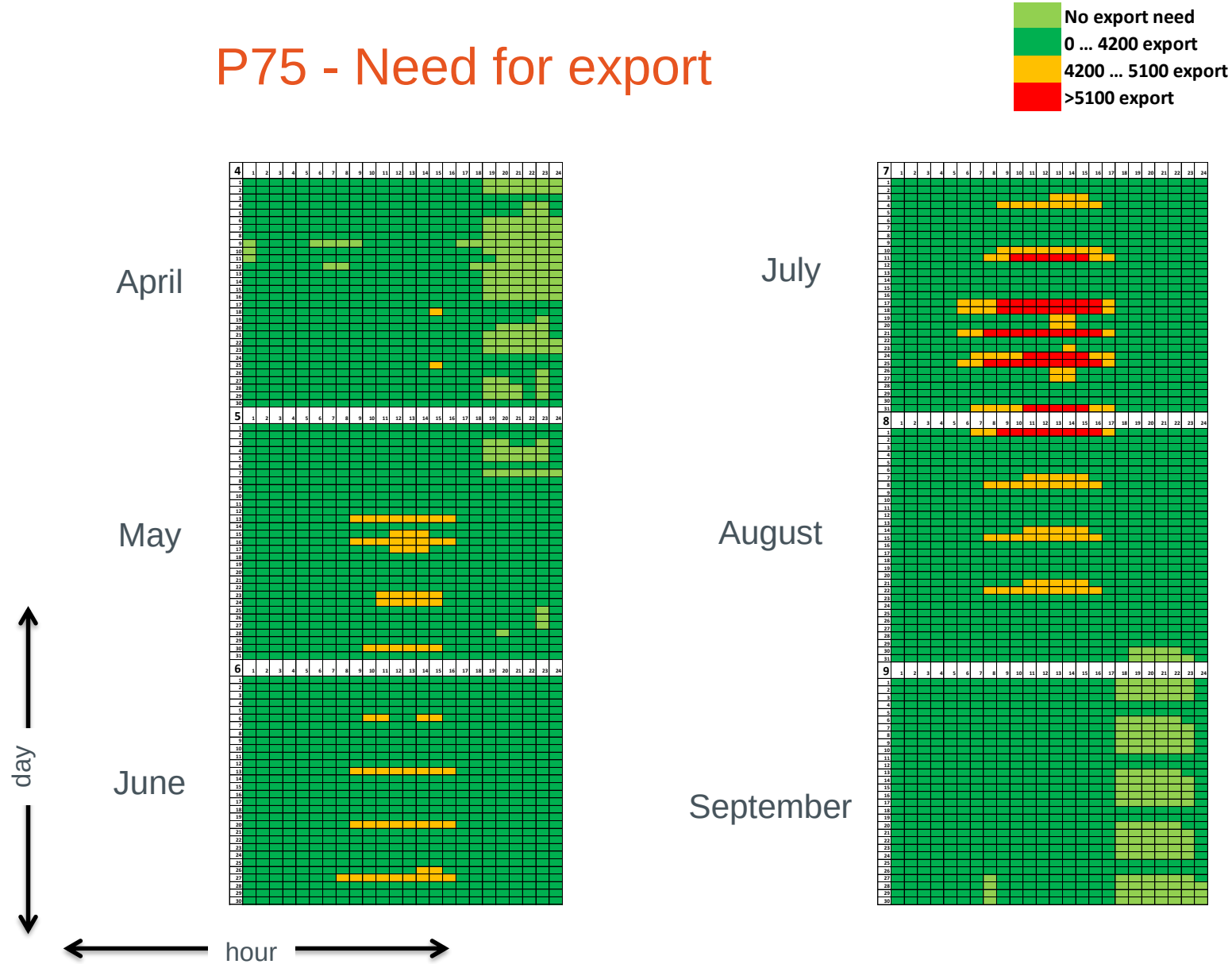




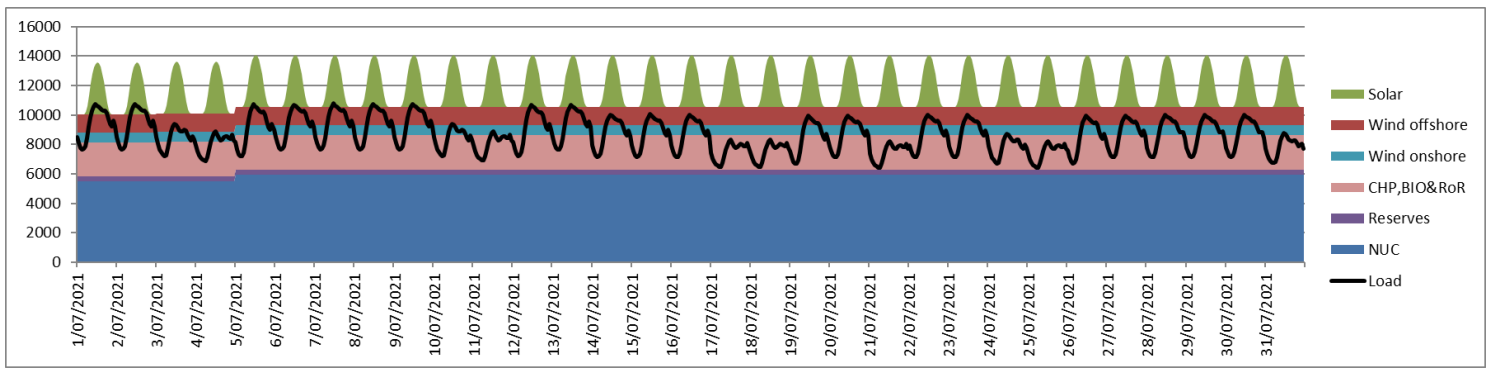
- Limited number of hours with increased export need > P50
- Structural dependent of export

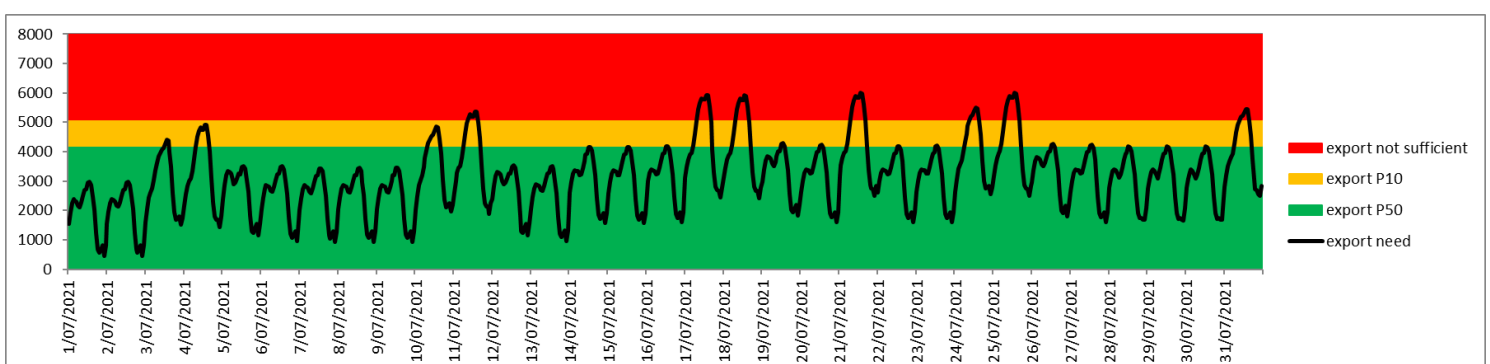
Results P75

P75 - Need for export



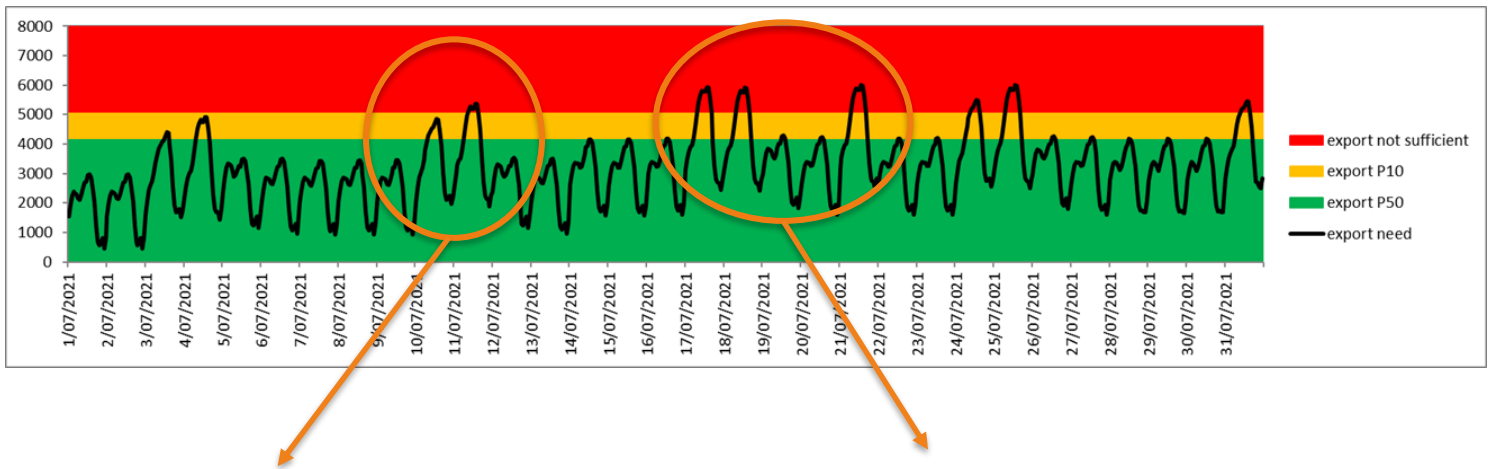
P75 - Need for export: details July





- High number of hours with increased export need > P50 (all weekends)
- Structural dependent of export, up to high levels (>P90)

P75 - Need for export: details July



Max: 5400MW
In case not enough export possibilities nuclear modulation/wind curtailment/CHP reduction on top of export will be needed!

Max: 6400MW
Availability of Coo will bring us to the same level as early July

Conclusions

Analysis of incompressibility

- Main **drivers** for incompressibility: reduced load (weekend, holiday) in combination with increased wind & solar production, low revision on nuclear and full revision of Coo

→ **May – August: increased risk of incompressibility, where export may not be sufficient for 1 out of 4 weekends**

- **Mitigating factors: combination of**
  - **Optimal use of pumped storage (in case no revision):** pumping can provide a buffer during night / WE hours (limitation in capacity & energy)
  - **Export :** surplus energy could be evacuated if there is no pan-EU energy surplus
    - Importance of DA forecast of ARPs (ID limited actions) -> DA call for downward volume
    - Optimization of export during FB qualification (for the moment focus on import) & ID capacity
  - **Nuclear modulation, wind curtailment, CHP reduction**
  - Surplus of energy on the market can trigger **negative prices** which incentivizes actions from ARPs (hard to predict)
  - Possibilities in procedure imbalance ('**afregelacties**')

European Market Design

ALEGrO: monitoring of market usage

ALEGrO: performance indicators (2021 – until March 10th)

KPI	Evaluation	
Mean day-ahead flow ALEGrO	All situations: In case of price divergence BE-DE: In case of price convergence BE-DE:	610 MW 790 MW 427 MW
Share of situations with full utilization (1000 MW)	1000 MW DE→BE: 1000 MW BE→DE:	18% 9%
Mean physical flow ALEGrO		602 MW
Direction of DA flow ALEGrO	DE→BE: BE→DE: No flow:	55,5% 44,4% 0.1%
Direction of physical flow ALEGrO	DE→BE: BE→DE: No flow:	58,7% 40,8% 0.5%
Share of situations in DA coupling	Intuitive DA flows BE-DE: Non-zero price-spread BE-DE:	87,3 % 50,4 %
Mean initial ID ATCs (extracted from DA FB domain)	ID ATC DE→BE: ID ATC BE→DE: Range both directions:	262 MW 470 MW 731 MW
ID allocation	Average ID allocation after ID Go-live: Average ID allocation when ID ATC != 0:	111 MW 136 MW

- High utilization, both in DA allocation and physical flow
- Particularly high in situations with congestion (price divergence)
- Currently 59% of hours usage in direction DE→BE

- Mostly intuitive flows, 12% non-intuitive

- Current ID allocation has on average a limited impact on flows (but can have impact in particular hours)

Brexit: loose volume coupling

EU-UK Trade and Cooperation Agreement - Energy

Trade and Cooperation Agreement

Energy

Electricity Trading over Interconnectors

Regulation Fundamentals

- No Discrimination
- No Transmission Charges

New Trade Arrangements

- TSOs to develop
- Day Ahead to apply from Apr 2022

TSO and Regulatory Cooperation

TSOs

- Replace ENTSO's
- Security of Supply

Regulators

- Replace ACER
- Market Transparency (REMIT)

North Sea Grid Cooperation

- Restore North Sea Energy Cooperation Group
- Multipurpose projects
- Maritime planning
- Support framework and finance

Other Areas

- Tariff & Quota Free Trade in Goods
- Transport
- Fisheries
- Union Programmes
- Social Security
- Law enforcement & Judicial cooperation
- Movement of People

New EU-UK Governance

- Partnership Council (Ministerial Level)
- Specialised Committee for Energy (TBC)
- Replacements for ACER and ENTSOe/g

New Cross-Border Trading Arrangements

Electricity Trading over Interconnectors

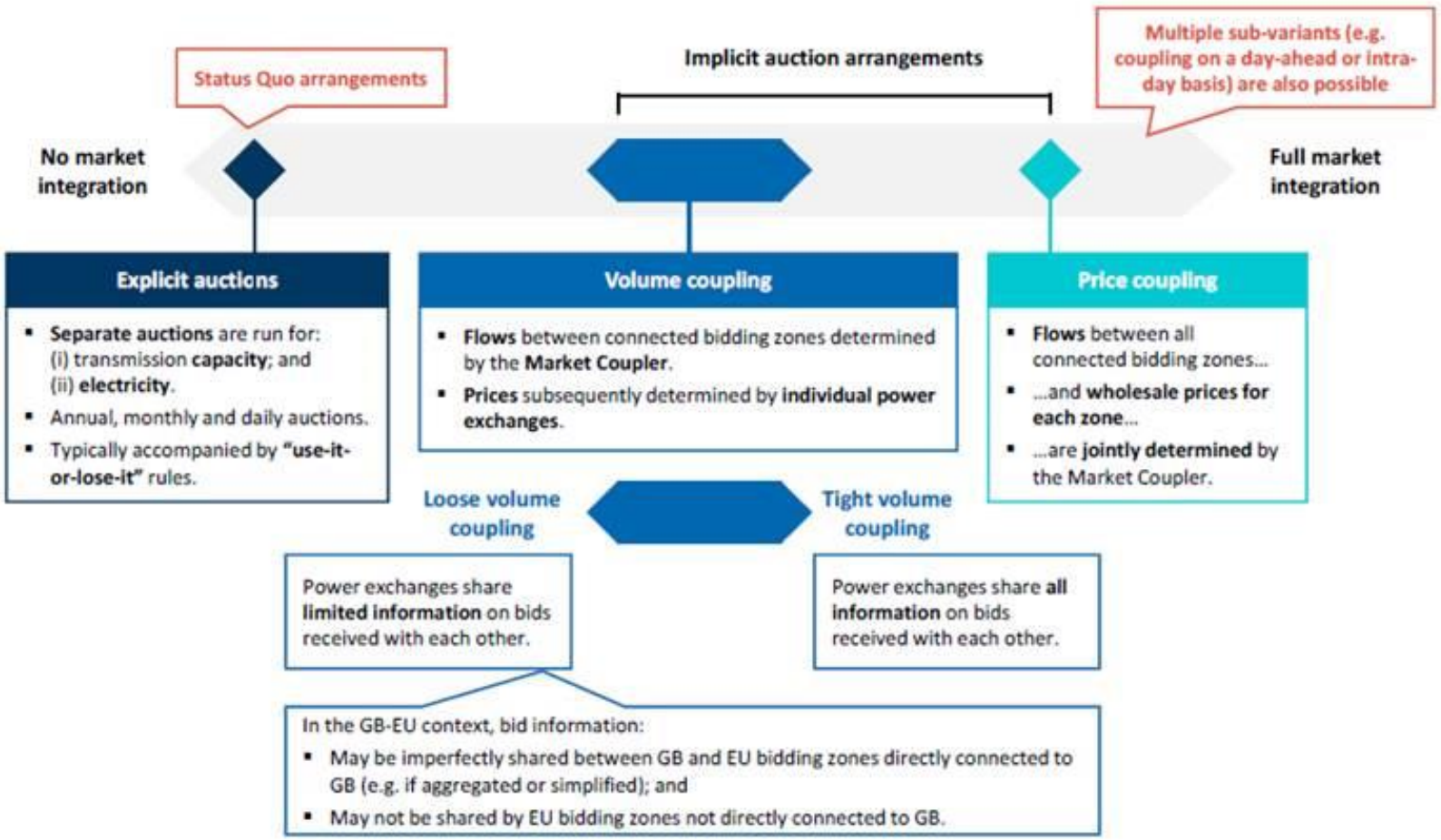
New Trade Arrangements

- TSOs to develop
- Day Ahead to apply from Apr 2022

- On the first of these three the EU and UK have agreed that the new set of arrangements must be more efficient, but not the same as the EU's Single Day Ahead Coupling (SDAC) process

- Annex ENER-4 requires
  - The new day-ahead procedure shall be based on the concept of "Multi-region loose volume coupling".
  - The overall objective of the new procedure shall be to maximise the benefits of trade.
- It states that "The net energy positions over electricity interconnectors shall be calculated via an implicit allocation process by applying a specific algorithm to:"
  - commercial bids and offers for the day-ahead market timeframe from EU Bidding Zones directly connected to GB and from relevant day-ahead markets in the United Kingdom
  - network capacity data and system capabilities via procedures agreed between TSOs
  - data on expected commercial flows of electricity interconnections between bidding zones connected to the United Kingdom and other bidding zones in the Union, as determined by Union transmission system operators using robust methodologies

What is Loose Volume Coupling?



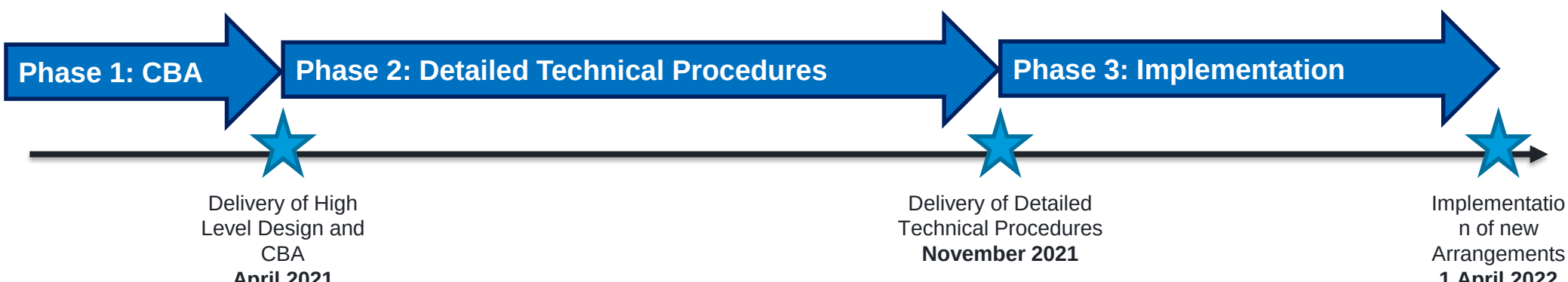
New Cross-Border Trading Arrangements

Electricity Trading over Interconnectors

New Trade Arrangements

- TSOs to develop
- Day Ahead to apply from Apr 2022

- UK and EU TSOs have been given the responsibility to develop these arrangements:
- Three parts to the work:
  1. Develop a High Level Design (from the Annex ENER-4 outline) and Cost Benefit Analysis of the High Level Design
  2. Develop Detailed Technical Procedures to implement the High Level Design and seek regulatory opinions
  3. Following approval from the Specialised Technical Committee for Energy, to implement the approved mechanism



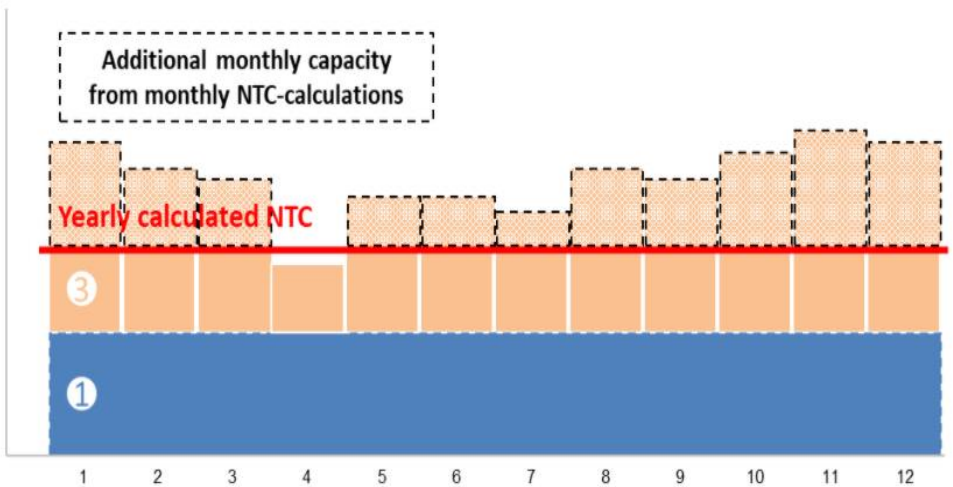
Cost Benefit Assessment (CBA) - Latest

- TSOs asked by BEIS and European Commission to complete the CBA:
  - EU: EirGrid, Elia, Energinet, RTE, Statnett, TenneT
  - UK: BritNed, EirGrid Interconnector DAC, Mutual Energy; National Grid Interconnectors, NemoLink, ElecLink
- Consultant has been appointed to help deliver a High Level Design and a Cost-Benefit Analysis
  - This will be published in April 2021
- Thereafter TSOs plan to regularly engage all stakeholders on the CBA and the development of Detailed Technical Procedures

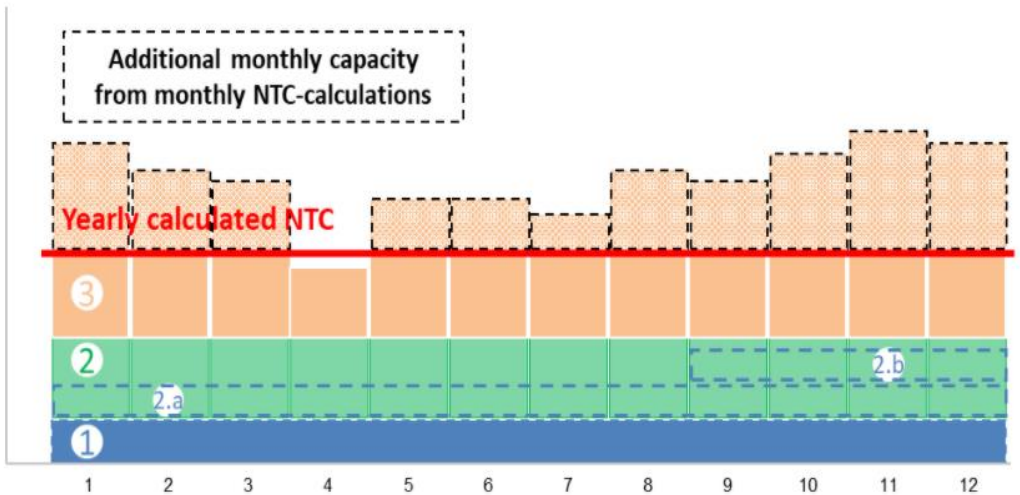
ENTSO-E consultations: block bids, shadow auctions

Consultation on the added value of “Block bids”

Current allocation structure of LTTRs



Block bids within the current structure of LTTRs



Yearly NTC split into

- Year-ahead annual product (1) and 12 year-ahead monthly products (2) – NEW: Market participants can bid for single monthly blocks separately in advance to form custom-made hedging
- A part which is not allocated on yearly basis (3). The NTC is re-evaluated on monthly basis to feed monthly auctions
- Core CCR: 80/20 split

Consultation on the added value of “Block bids”

Benefits

- Market parties would have additional flexibility to hedge specific needs
- TSOs potentially are able to immediately put on the market a large share of the long-term NTC profile (if regional Capacity Calculation enables such possibility) that they have calculated for the year to come. This would depend on implementing the regional Splitting Rules

Limitations and challenges

- The 12 year-ahead monthly auctions are simultaneous yet independent i.e. obtaining the desired custom capacity profile likely requires a more complex bidding strategy
- Capacity allocated through block bids cannot be allocated to yearly products, and vice-versa – liquidity (interest/demand of market participants and offer of products) can be limited
- This is not a quick win. Additional design questions and a lengthy implementation trajectory can be expected
    - Interaction between FB allocation and block bid features has not yet been scrutinized
    - Adaptations could be needed in certain methodologies: Splitting Rules, LTTR design, HAR, LT CCM, etc.
    - Adaptations in the SAP’s, TSO’s and market participants’ IT systems

LTTRs and shadow auctions

The latest decoupling events have had very strong impact on TSOs and tariff payers

Decoupling	LTTR CI	SA CI	LTTR to MPs
07/06/2019	*1,9 M€*	*716 k€*	***19,6 M€***
04/02/2020	*62 k€*	*26 k€*	***208 k€***
13/01/2021	*526 k€*	*268 k€*	***4,0 M€***
Total	***2,5 M€***	***1,0 M€***	***23,9 M€***

MPs indicate a low interest in shadow auctions

LTTRs and shadow auctions

Structural solution – requires change in FCA

All TSOs have proposed an improvement to the market design **i.e. compensate LTTRs with shadow auction price instead of market spread**

- **Secures hedging in a physical way**
- Solves the aberration of undue money transfers from tariff payers to market parties

Alternative solutions being explored

Short term

- Introduce a cap in HAR
- Remunerate in function of participation to SAs

Long term

- IDA at 3 pm takes over role from SA
- Stop with LTTRs, resort to other financial products for hedging

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Thank you.