USERS' GROUP

elia
| Elia Group

WG EMD-SO

Jun 17, 2022
10:00 – 12:30

Practicalities

Wifi Code

Your guest account details:

SSID:
Username: nathalie.verbeke@elia.be
Password: C37ccwmA
First Name: Nathalie
Last Name: Verbeke
Phone Number:+32478465985
Duration: 5 days From First Login
Person being visited:

If unused, this account will expire on: 06/20/2022 10:02

Agenda WG EMD-SO 17/06/2022

| Nr	Domain	Agenda topic	From - Till	Presenter	Time (min)
1	General	Welcome & intro	10:00 - 10:05	*Chairs*	5
2	General	Approval of MoM & status action points	10:05 10:15	*Secretary*	10
3	SO	Update of the low requency demand disconnection plan	10:15 - 11:05	*Peter Van Meirhaeghe*	50
4	SO	Update on status black-out proof communication SGU	11:05 - 11:20	*Thomas Leroy*	15
5	SO	Statistics on Nemo Link /ALEGrO Flows	11:20 - 11:30	*Bernard Malfliet / Filip Carton*	10
6	EMD	Core FB DA: status & first experiences after go live in June '22	11:30 - 12:00	*Steve Van Campenhout/ Benjamin Genet*	30
7	EMD	Core FB DA: local validation process	12:00 - 12:20	*Seve Van Campenhout / Koen Vandermot*	20
8	General	AOB	12:20 - 12:25	*Chairs/Secretary*	5
9	General	Conclusions	12:25 - 12:30	*Chairs/Secretary*	5
				Total	**2:30**

Approval of Minutes & Action points

- Approval of the Minutes of WG EMD-SO 31/03/2022

- Status of open Action points

| Action	Responsible	Date Raised	Due date	Status
Market parties present in the meeting/call to express their concerns on Core go live also formally in written form	Market Parties	31/03/2022	31/03/2022	**Closed**
Elia to present in next WG EM-SO meeting the slides on local validation process	Elia (Koen Vandermot)	31/03/2022	June 2022	**Closed**
Elia to share insights on grid stability / harmonics in a high RES world (no urgency, keep it on the radar)	Elia	31/03/2022	no urgency	Planned for WG EMD-SO Q3/Q4 2022
Elia to share statistics on flows on NLL and Alegro for Q1 2022 compared to 2021.	Elia (F. Carton)	31/03/2022	June 2022	**Closed**
Elia to see if the Intraday statistics, can also be shared publically	Elia (Jean-Michel Reghem)	31/03/2022	no exact due date	Ongoing
Elia to present an update of the black-out proof phones in next WG EMD-SO meeting	Elia	31/03/2022	June 2022	**Closed**

System Operations
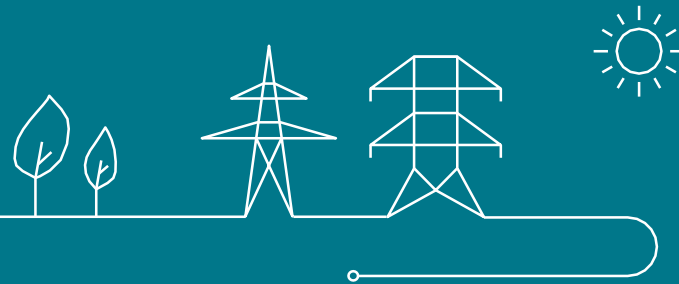
Low frequency demand disconnection plan (LFDD)

June 2022

LFDD plan - introduction

- Low-frequency demand disconnection relays are installed in 253 substations, geographically spread over the Belgian territory.

- Automatic defence measure of last resort to avoid total black-out
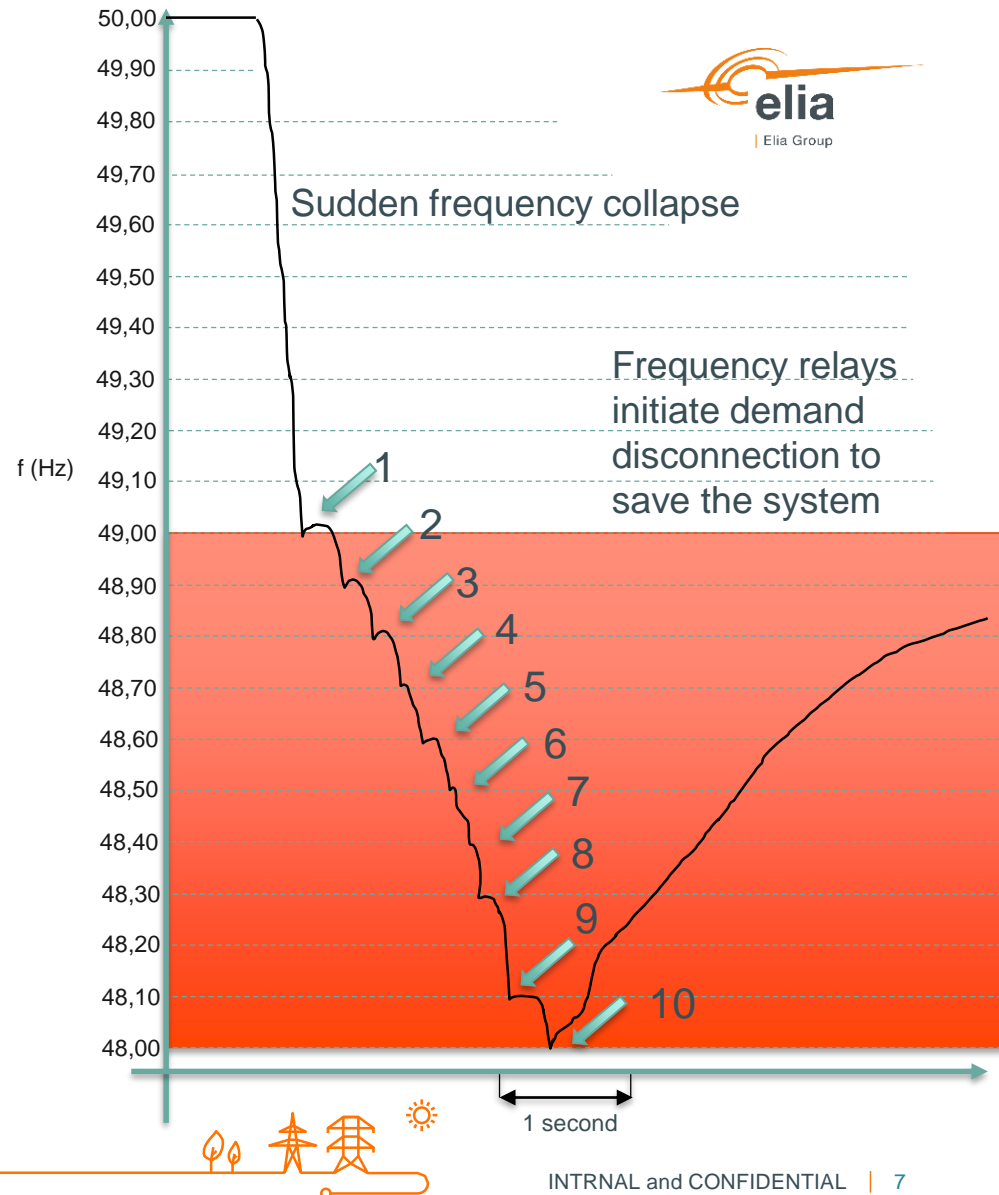
actual		As from sept 2022
49 Hz	Schijf 1	49 Hz
48,9 Hz	Schijf 2	48,9 Hz
48,8 Hz	Schijf 3	48,8 Hz
48,7 Hz	Schijf 4	48,7 Hz
48,6 Hz	Schijf 5	48,6 Hz
-	Schijf 6	48,5 Hz
-	Schijf 7	48,4 Hz
48,5 Hz	Schijf 8	48,3 Hz
	Nieuwe schijf 9	48,1 Hz
	Nieuwe schijf 10	48 Hz

Activatievolgorde

New frequency relays are being installed in steps 6,7,9,10

Sudden frequency collapse

Frequency relays initiate demand disconnection to save the system

f (Hz)

1 second

Trends impacting LFDD plan

- LFDD requirements in NCER* increased to 45% of total load, at all times.

- Massive increase in roof-top solar PV, connected behind the meter in DSO grids. 3 GW in 2017 → 6 GW now → maybe 13 GW by 2030

- Negative impact on netted demand that can be disconnected. Impossible to shed only load, while keeping PV running behind the meter.

- We are at the eve of a large electrification wave in industry

[FIGURE 3-19] — EVOLUTION OF INSTALLED SOLAR CAPACITY PER SCENARIO IN BELGIUM
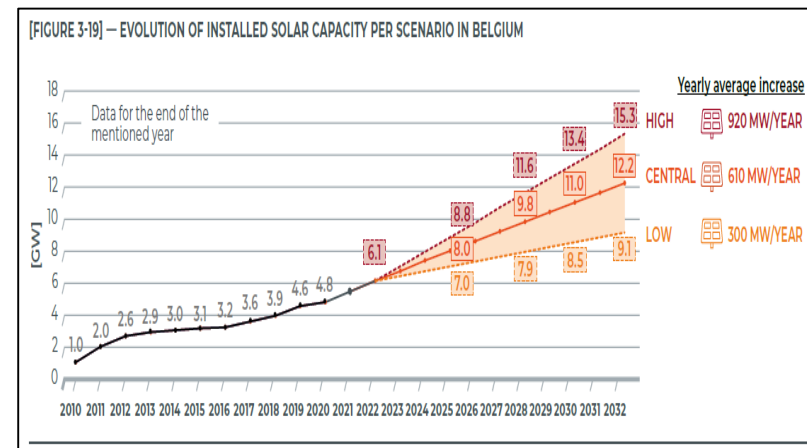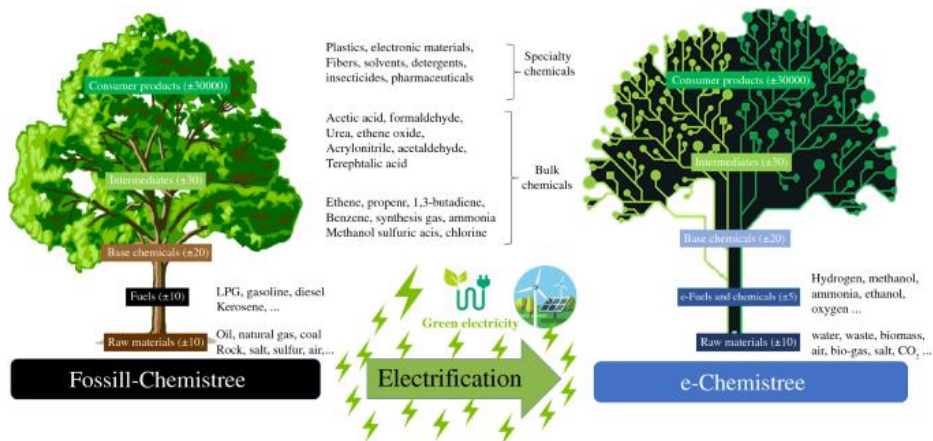
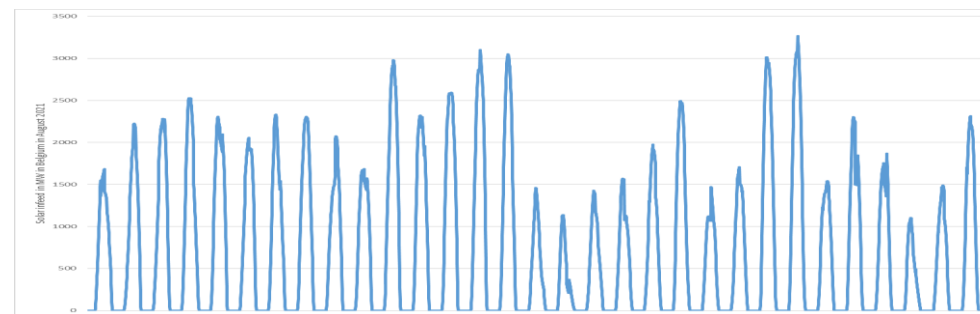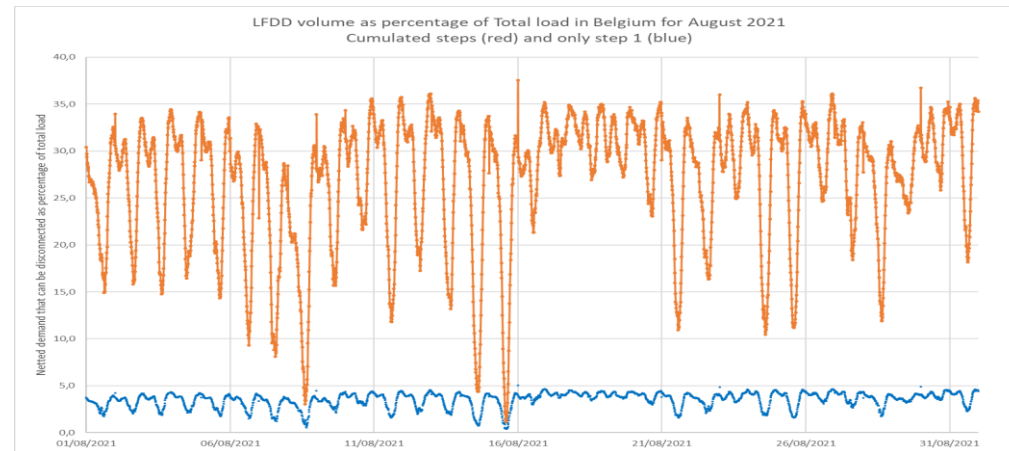* Network Code Emergency & Restoration

Impact of PV: illustration for August 2021

Cumulated netted demand that can be disconnected (steps 1-10) in percent of total load

Netted demand that can be disconnected only in step 1 in percent of total load

PV production

LFDD volume as percentage of Total load in Belgium for August 2021
Cumulated steps (red) and only step 1 (blue)

Actual LFDD plan after completion of ongoing expansion

- Mainly "rural" communities in DSO grids

- Centers of cities with more than 50 000 inhabitants and grid users directly connected to Elia grid are excluded

- Transformers towards DSO grids are interrupted by frequency relays.

- Selective load interruption of individual DSO feeders, with blocking in case of reverse flows is currently being introduced by DSOs
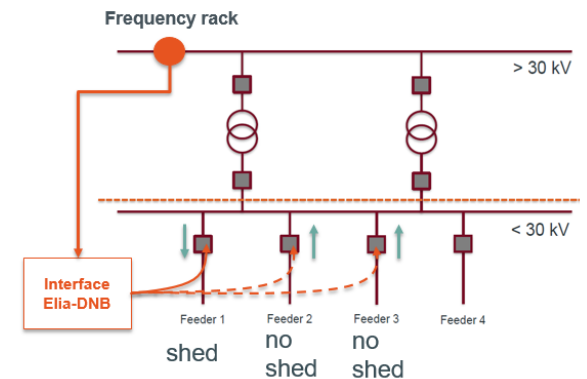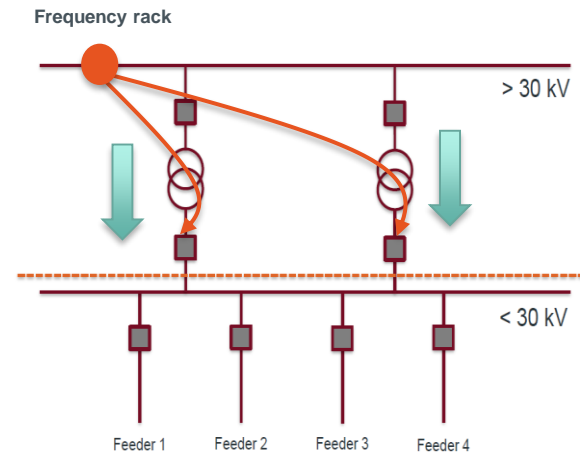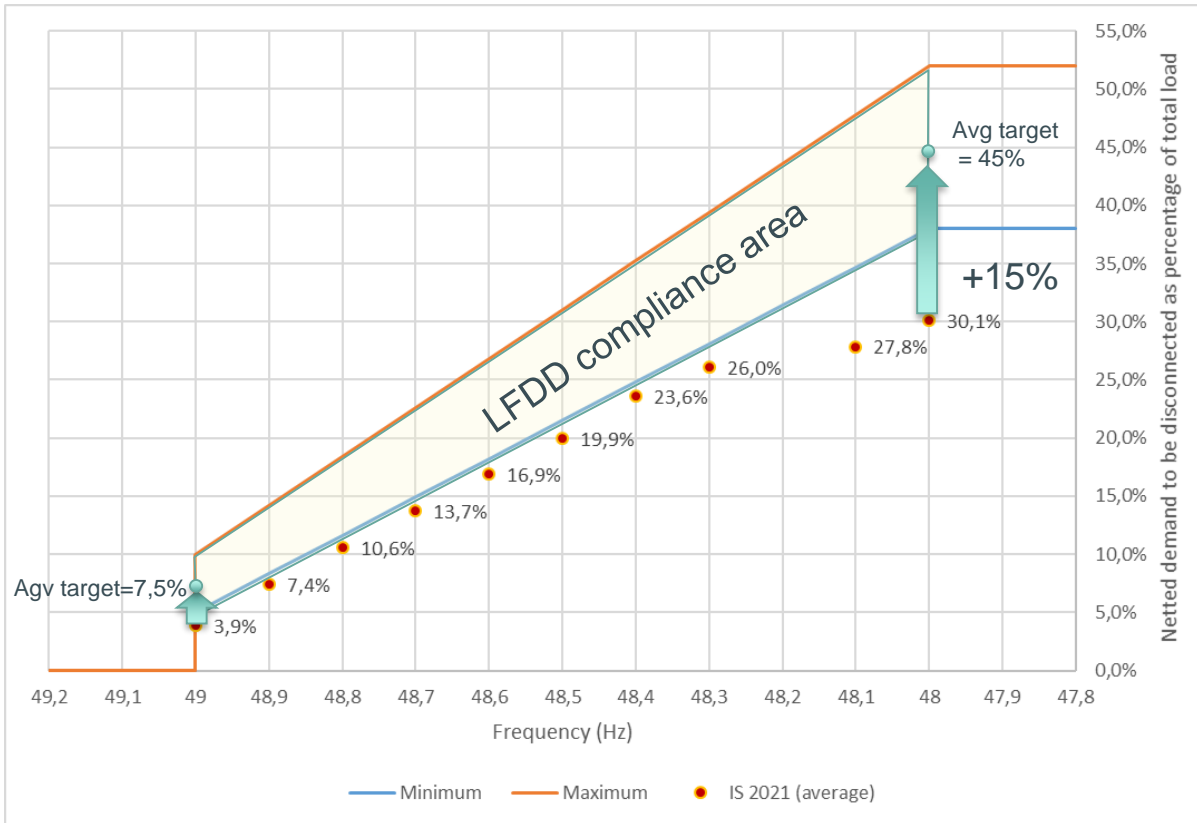
LFDD requirements in NC ER
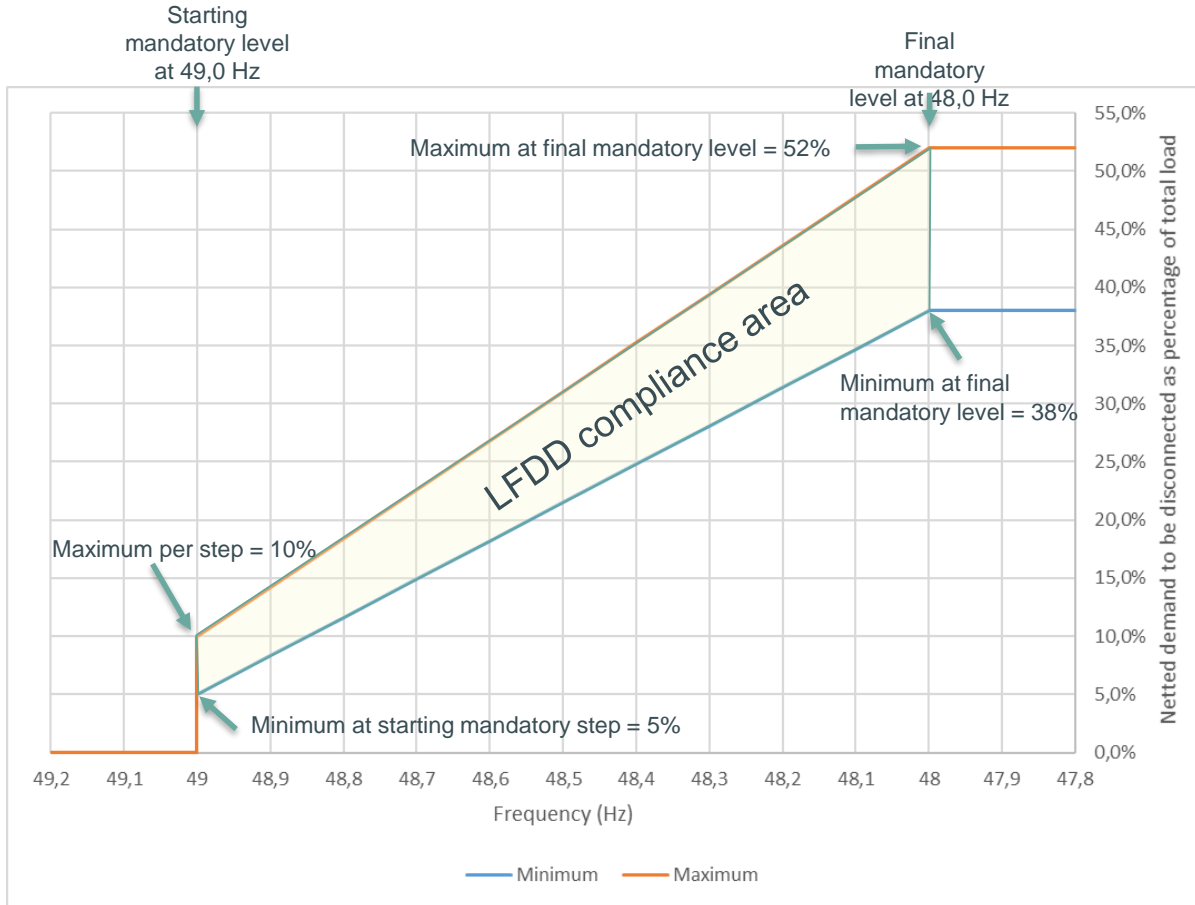
- Criteria LFDD in EU network code E&R art. 15(5) and ANNEX

- The target netted demand to be disconnected must be inside the compliance area at all times

Observed average LFDD values in 2021

Minimum — Maximum — • IS 2021 (average)

Objectives:

- increase the average LFDD volume of **step 1** from 3,9% to 7,5% of total load

- increase the **cumulated** average LFDD volume from 30% to 45% of total load

→ add ~**1500 MW** to LFDD plan

Call for action to improve our **defense** plan against a blackout.
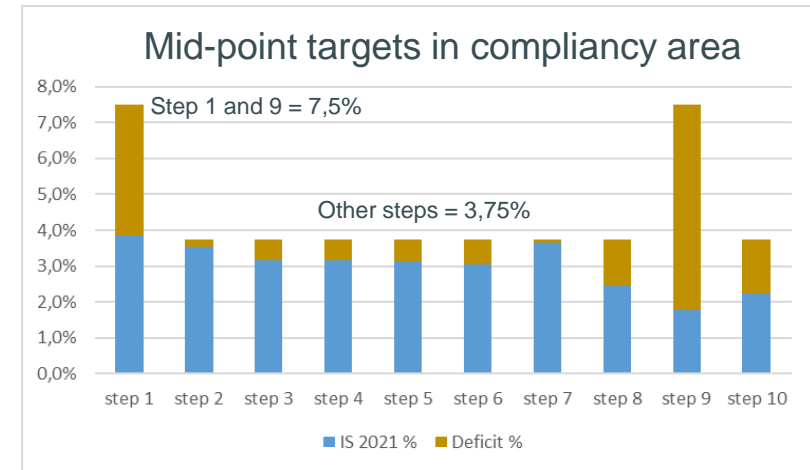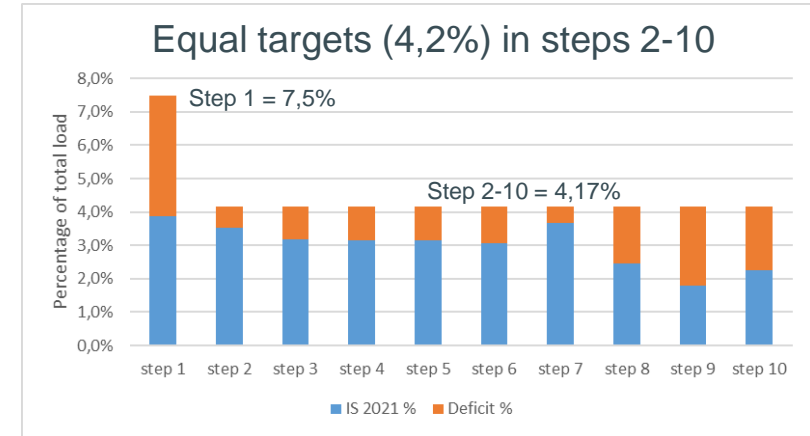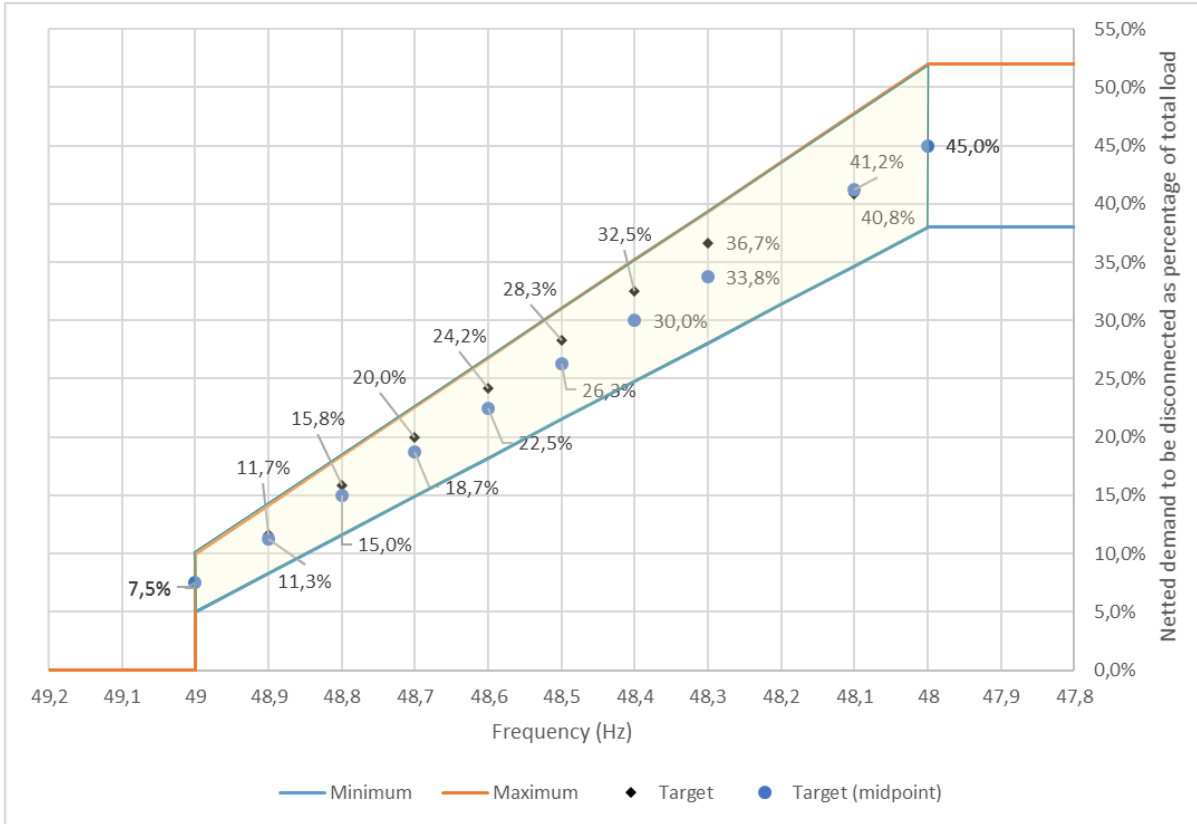
Call for reason

Call for responsibility of **all** grid users

Working Group LFDD to discuss how to make Belgian LFDD plan compliant with EU NCER

Two proposals for new LFDD target average volumes for each step

10 steps between 49,0Hz and 48,0 Hz → no load shedding at 48,2 Hz

We propose multiple actions in parallel

- Accelerate selective load shedding with flow sense detection and blocking of reverse flows in DSO grids.

- Add rural DSO substation, although remaining options are quasi exhausted: ~ 300 MW remaining

- Add industrial load and/or small cities → + 1200 MW

- Elimination of DSO substations with reverse flows during significant amount of time

- Call for reasonable targets in European netcode that take into account the positive effects of the energy transition

Working group LFDD is the platform to listen and align on how to fill the gap in the most optimal way.
Changes to be included in system defence plan. A revision is expected by end of 2022 and could include high level approach.

Benchmark on LFDD implementation in EU countries

– Survey conducted in May-June 2022 within Entso-e

– 24 countries participated

– In most countries the TSO is responsible for the design of the LFDD plan while the DSOs and SGUs implement the LFDD relays.

– Majority has industrial grid users included in LFDD plan. "Selected grid users" in most cases.

– Some countries already block LFDD relays in case of reversed flows

– Only a few countries already have <u>observed</u> negative impact of DER on LFDD targets now

– Large majority expect serious negative impact of DER on LFDD targets in the coming years

– There is no consensus to change LFDD requirements in EU netcode at this moment

Provisional timing tbc based on progress of WG LFDD
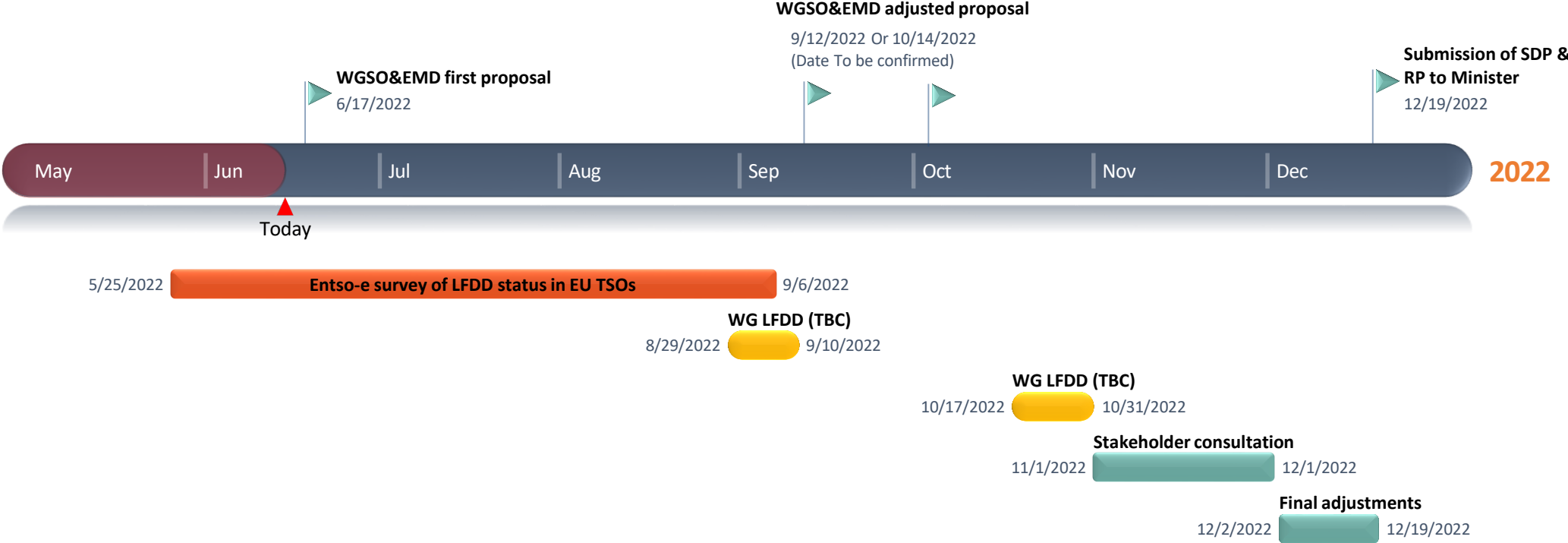
Blackout Proof Communciaton Significant Grid Users (SGUs)

June 2022

Elia and SGUs* should be able to communicate during and after a blackout with a reliable communication system, ultimately by 2022

A legal obligation with new requirements for communication systems to be implemented by 2022

- Article 41 of the EU Network Code Emergency & Restoration (NCER) gives requirements regarding to tools used for communication

- According to NCER, the communication system should have sufficient redundancy, a 24h autonomy and be able to work in absence of external electric power supply

- The implementation deadline foreseen in NCER is December 2022

Communication between Elia and the SGU is key to ensure the restoration process efficiency

- After a blackout, Elia should be able to provide clear instructions to SGUs to facilitate the restoration process

- Uncoordinated actions could degrade the fragile network stability during the first stage of the restoration process and lead to a system collapse

- Instructions provided by Elia could be to re-connect to the grid, increase or decrease the production, switch a load on or off,…

Elia will provide blackout proof phones that will be placed by the SGUs in a pertinent place

- Elia will provide blackout proof phones to the SGUs

- The SGU should install the blackout proof phone in a place where people are present 24/24h and could implement the instructions provided by Elia

- If no place respects all criteria provided by Elia, the emplacement of the Elia phone will be discussed with the SGU on a case-by-case basis

* SGU = Significant grid users

SGUs will be contacted by Elia's KAM to provide necessary information and define the technical solution together with its data communication experts

Approach proposed to SGUs

KAM of Elia contacts the SGU to provide details and request additional technical information

The SGU and Elia agree on a technical solution taking into account the constraints and the legal framework

The SGU and Elia agree on a deadline and plan the necessary works together

The SGU acts its commitment in the connection contract

Elia delivers the blackout proof phone to the SGU

SGUs expected contribution

Communicate the necessary information to Elia such that the best technical solution can be chosen

Finance the work and equipment necessary for a blackout proof connection within their own battery limits

Realize the adaptations and works on their site within the agreed deadlines

Elia proposes to use its optical fiber network and that the SGU places a connection from the blackout proof phone to its interface cubicle

Elia will use its optical fiber network to communicate up to the interface with the SGU and will provide a phone and a switch.

Interface cubicle — Blackout-proof line — UPS — Switch — Phone
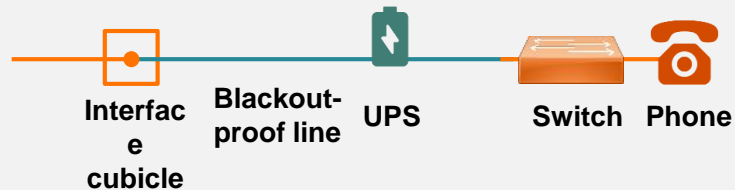
- A VOIP phone and a switch will be provided by Elia to all SGUs.

- The communication occur though the optical fiber network of Elia to ensure communication remains possible during a blackout

- The SGU will have to install a blackout proof line supported by a 24h autonomy UPS from the interface cubicle to the switch

■ Provided by Elia   ■ Provided by the SGU

Blackout-proof line
The blackout-proof line has to be installed by the SGU.
Elia recommends the following elements:
- Optical fiber
- Copper line for distance < 100m

UPS
The UPS should be installed by the SGU and ensure a 24h autonomy

Switch
A switch will be provided by Elia in order to provide and monitor the connection; it allows also to switch on/off the telephone remotely.
The following switches are proposed:
- 220 VAC: Cisco Catalyst 3560CX-12PC-S (30 W + 15 W POE VOIP Phone)
- 48 VDC/110 VDC: Cisco CGS-2520-16S-8PC (45 W + 15 W POE VOIP Phone)

Project Implementation Status

- Implementation needs to be phased due several reasons
  - Limited resources at Elia; not possible to launch and follow up all SGU sites at the same time
  - Not all client sites are connected to the Elia Datacom network or contain Elia Datacom equipment yet

- In a first phase, priority is given to SGUs with high injection or offtake power (> 25 MW)
  - Solution for about 20 sites have been discussed between Elia and SGUs and are in implementation
  - We often observe long implementation lead times for "last mile" on SGU site

- For new SGU sites and projects, blackout proof communication is included in the scope of the project

- It will require many more years to achieve full implementation

- Communication is vital in crisis situations: let us continue working together on this topic
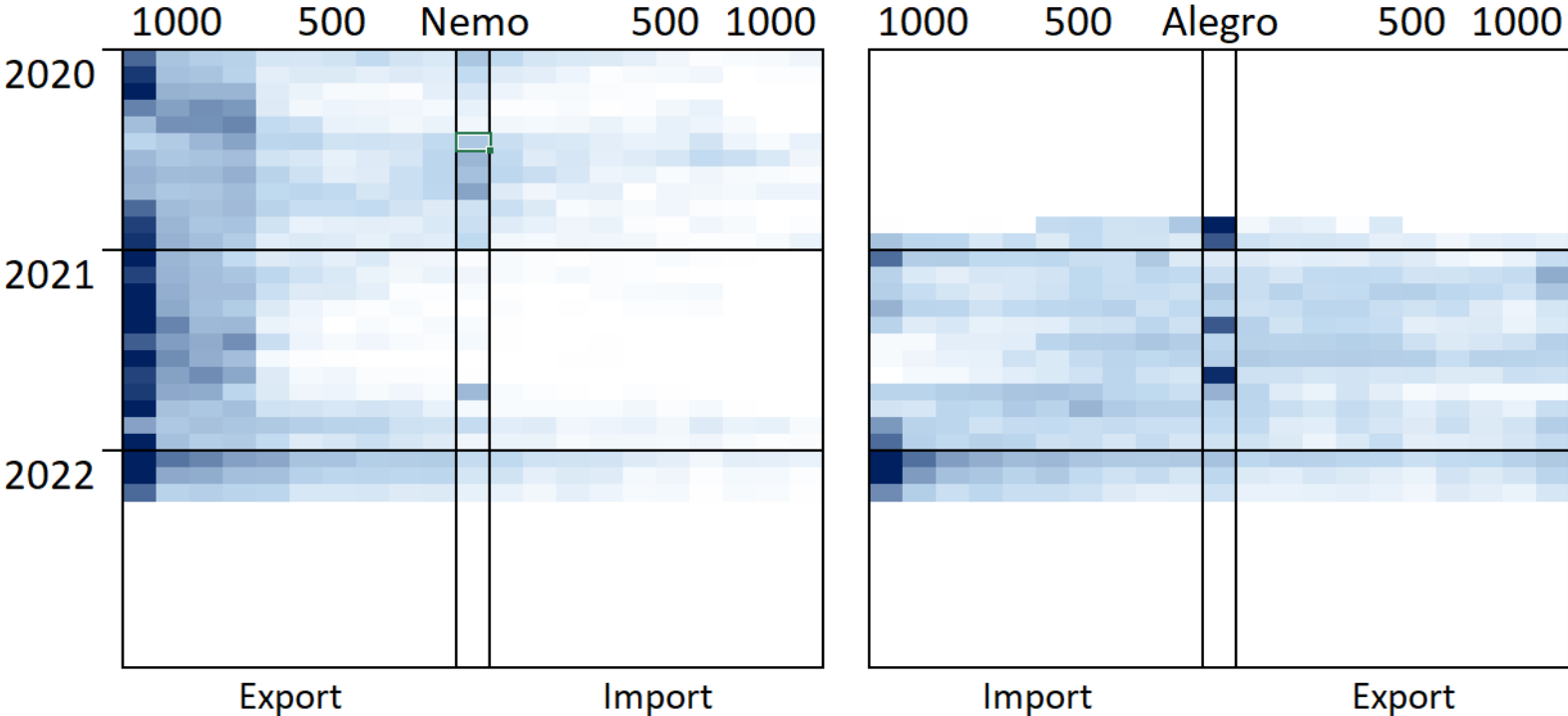
Flows ALEGrO & Nemo Link

SO – Flows ALEGrO & Nemo Link (1/2)

- Figure below provides the overview of the actual flows on Alegro & Nemo Link for period 2020-Q1 2022
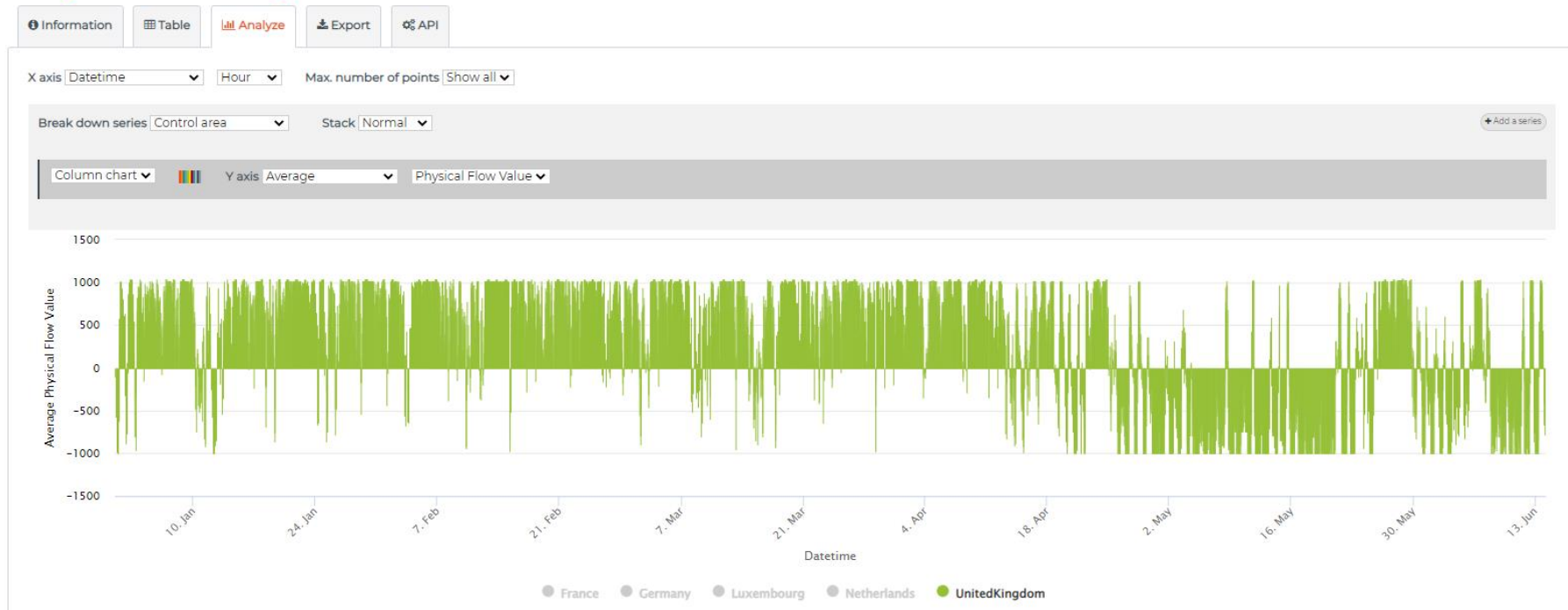
SO – Flows ALEGrO & Nemo Link (2/2)

- However as from Q2 flows on Nemo Link show different trends

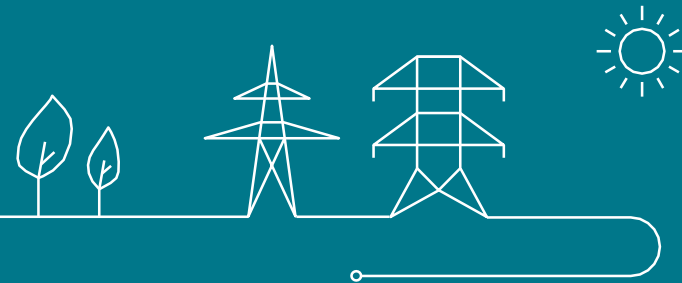- Data publically available on following link: [Explore — Elia Open Data Portal](#)

European Market Design

Core FB DA: status
& first experience after go-live

SDAC Net Positions (MW)

BZ ● AT ● BE ● CZ ● DE-LU ● FR ● HR ● HU ● NL ● PL ● RO ● SI ● SK

MW

5K

0K

-5K

-10K

12:00 AM   3:00 AM   6:00 AM   9:00 AM   12:00 PM   3:00 PM   6:00 PM   9:00 PM

Time (CET/CEST)
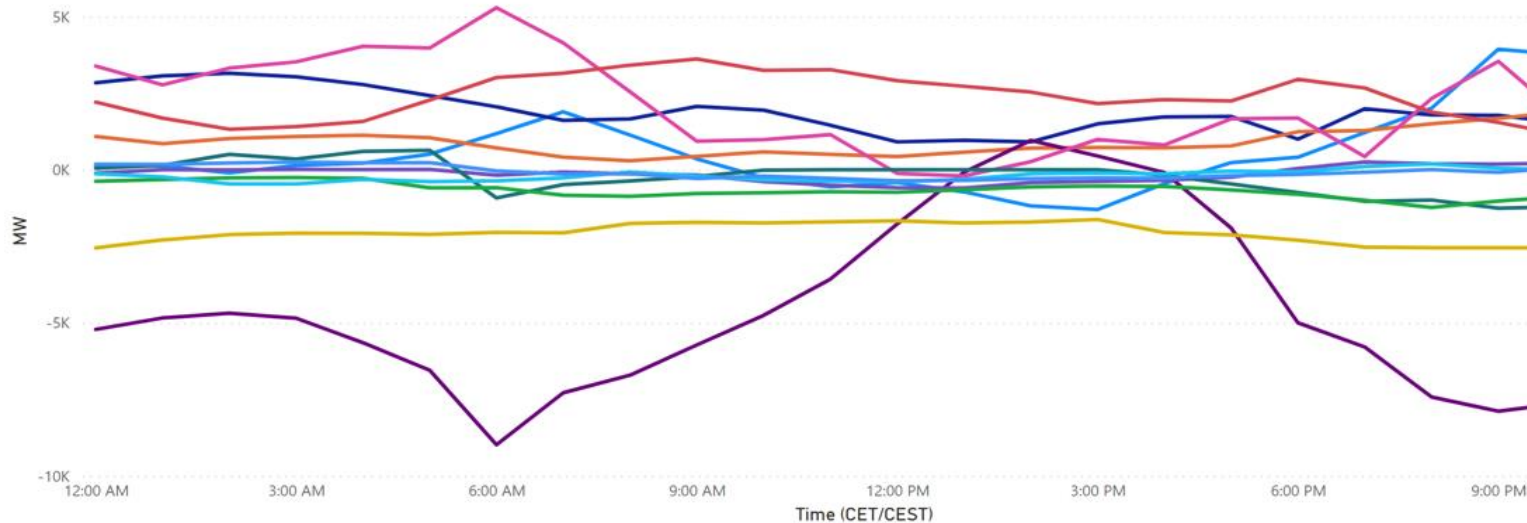
DA Price by MTU (CET/CEST) and BZ

BZ ● AT ● BE ● CZ ● DE-LU ● FR ● HR ● HU ● NL ● PL ● RO ● SI ● SK

€/MWh

300

250

200

150

100

50

0

12:00 AM   3:00 AM   6:00 AM   9:00 AM   12:00 PM   3:00 PM   6:00 PM   9:00 PM

MTU (CET/CEST)
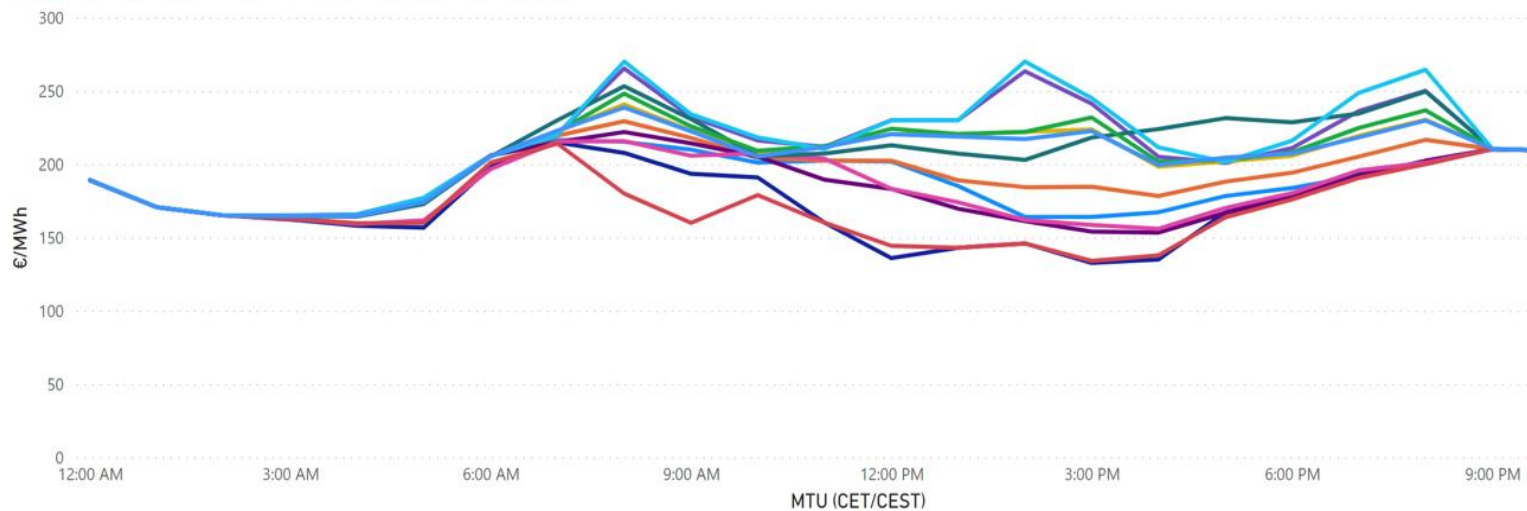
Core Net Position for BE and neighboring countries

Core Net Position in MW
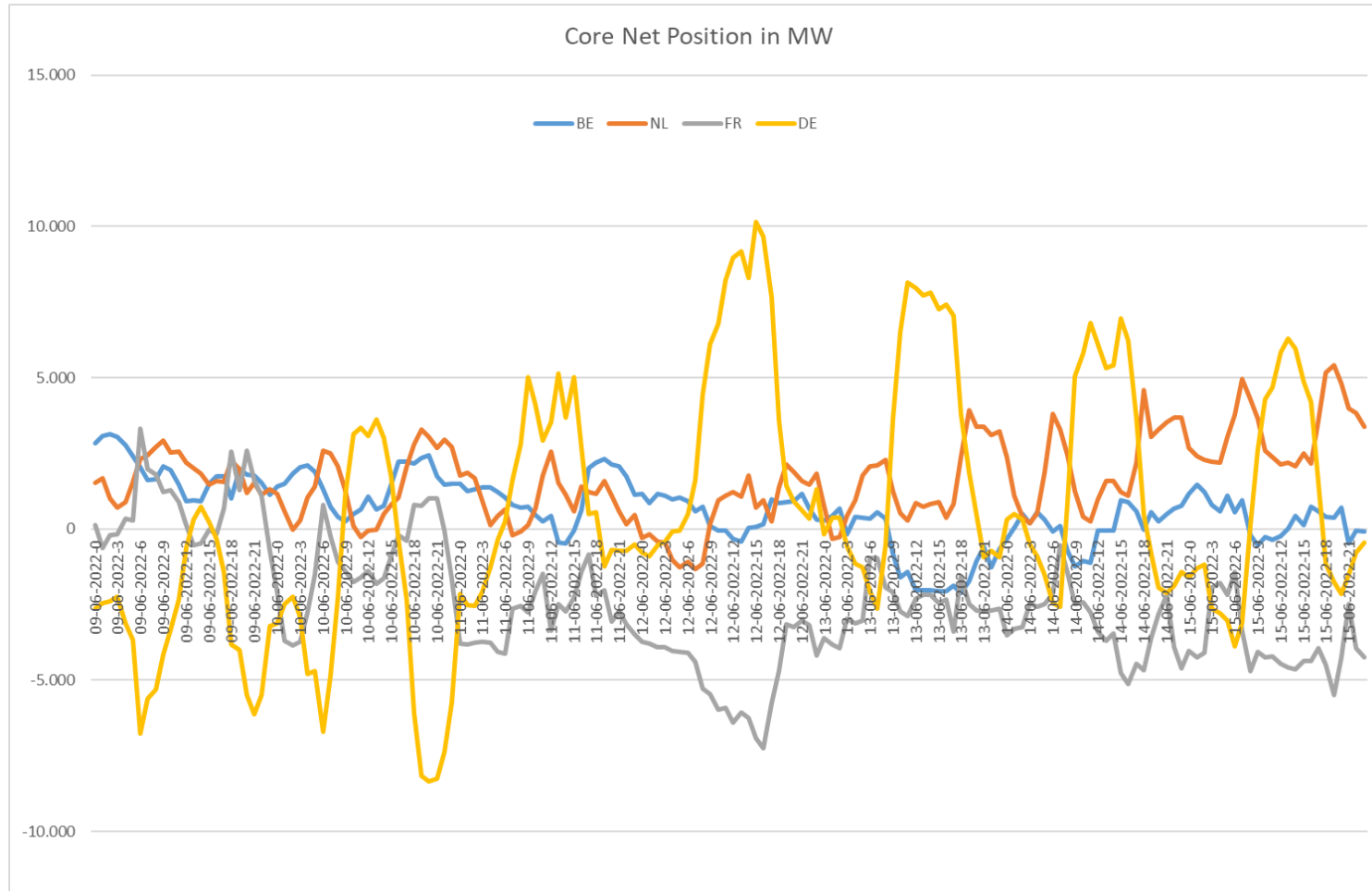
SDAC prices for BE and neighboring countries

DA price in €/MWh
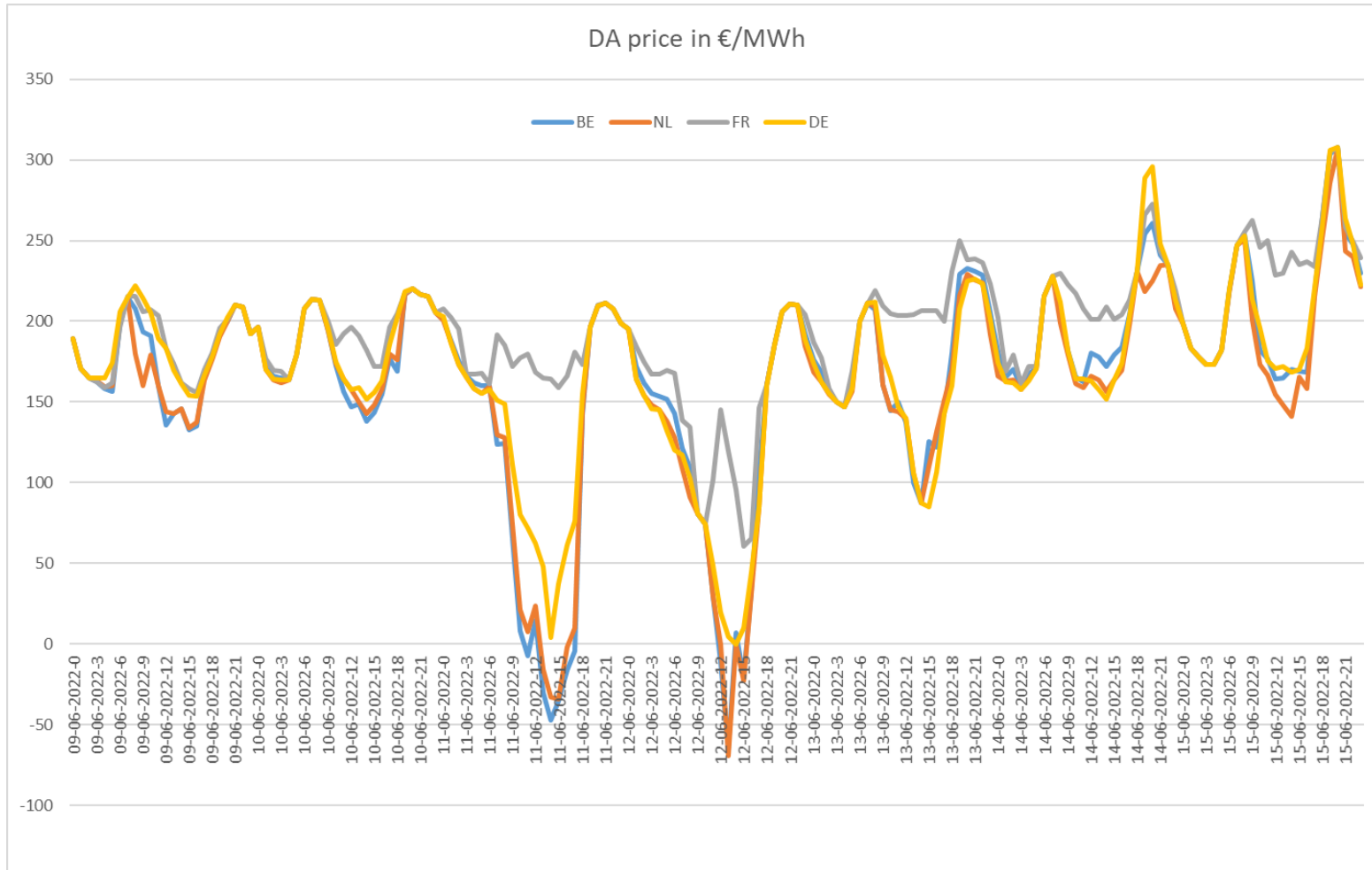
Elia was in position to support Jun 8th as the new go-live date since the key concerns Elia raised have been properly mitigated by the action plan that Core TSOs put in place

Elia identified 3 concerns that led to a shift of go-live from Apr to Jun to accommodate an action plan:

1. **Stability concern:** there were evidences that the success rate of the capacity calculation process was not in line with current operational practice, with fallback processes triggered several times per month instead of very seldom occurrences per year in operations.

   - ➜ **STATUS:** targets defined and met in the build up to new go-live date

2. **Intraday capacity concern:** how the intraday market would have been affected (and balancing markets relying on the left-over of the same capacities), and what would have been the trajectory of improvements after go-live was widely unknown for TSOs, NEMOs and market participants.

   - ➜ **STATUS**: algorithmic improvements have been implemented, and some higher ambition on use of virtual capacities for left-overs resulted from the discussions. Observations from the first week of operation are positive.

3. **Undue discrimination concern:** it was observed that several TSOs recurrently rely on reduction of RAM below the "absolute minimum" of RAM of 20%. This is observed beyond the cases of fallbacks for individual validation

   - ➜ **STATUS**: the Core DA CCM does allow Core TSOs to reduce the RAM below the "absolute minimum" of RAM of 20% of Fmax, but this is to be monitored and where feasible to be avoided. To create transparency on this aspect, a targeted monthly reporting on the occurrence of RAM below 20% is put forward by Core TSOs.

ID ATC statistics: frequency zero

Border	Initial value [% of MTUs]	After increase/decrease [% of MTUs]
BE > DE	32%	32%
DE > BE	36%	29%
BE > NL	9%	9%
NL > BE	42%	35%
BE > FR	55%	53%
FR > BE	2%	2%
Import across 3 borders	0%	0%
Export across 3 borders	6%	6%

- This is in line with the trends shown in Core CG Jun 1st where the experimentation on the EXT // run results was debriefed
- Frequency of zero can expected to be lower in the opposite direction of the DA market

ID ATC statistics: average size of capacity

| Border	Initial value [MW]	Delta increase/decrease [MW]
BE > DE	244	+12
DE > BE	323	+117
BE > NL	843	+41
NL > BE	163	+33
BE > FR	66	+18
FR > BE	2111	+39

- Highest capacities can be expected in the opposite direction of the DA market
- Increase can maximally be 300 MW. Currently the CWE multilateral validation approach is still in place – implementation track to switch to bilateral validation approach ongoing yet subject to regulatory discussions
- In 2 MTUs a decrease was observed on BE>DE

Core FB DA:
local validation proces
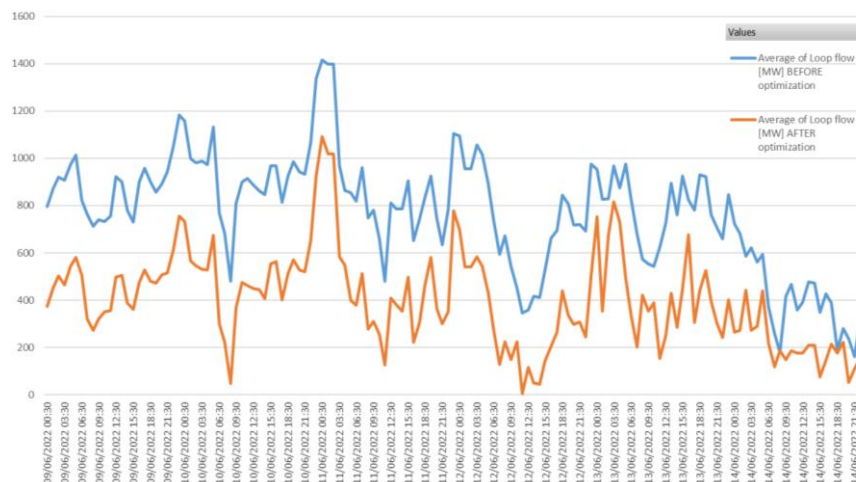
How Elia determines capacities on its CNECs
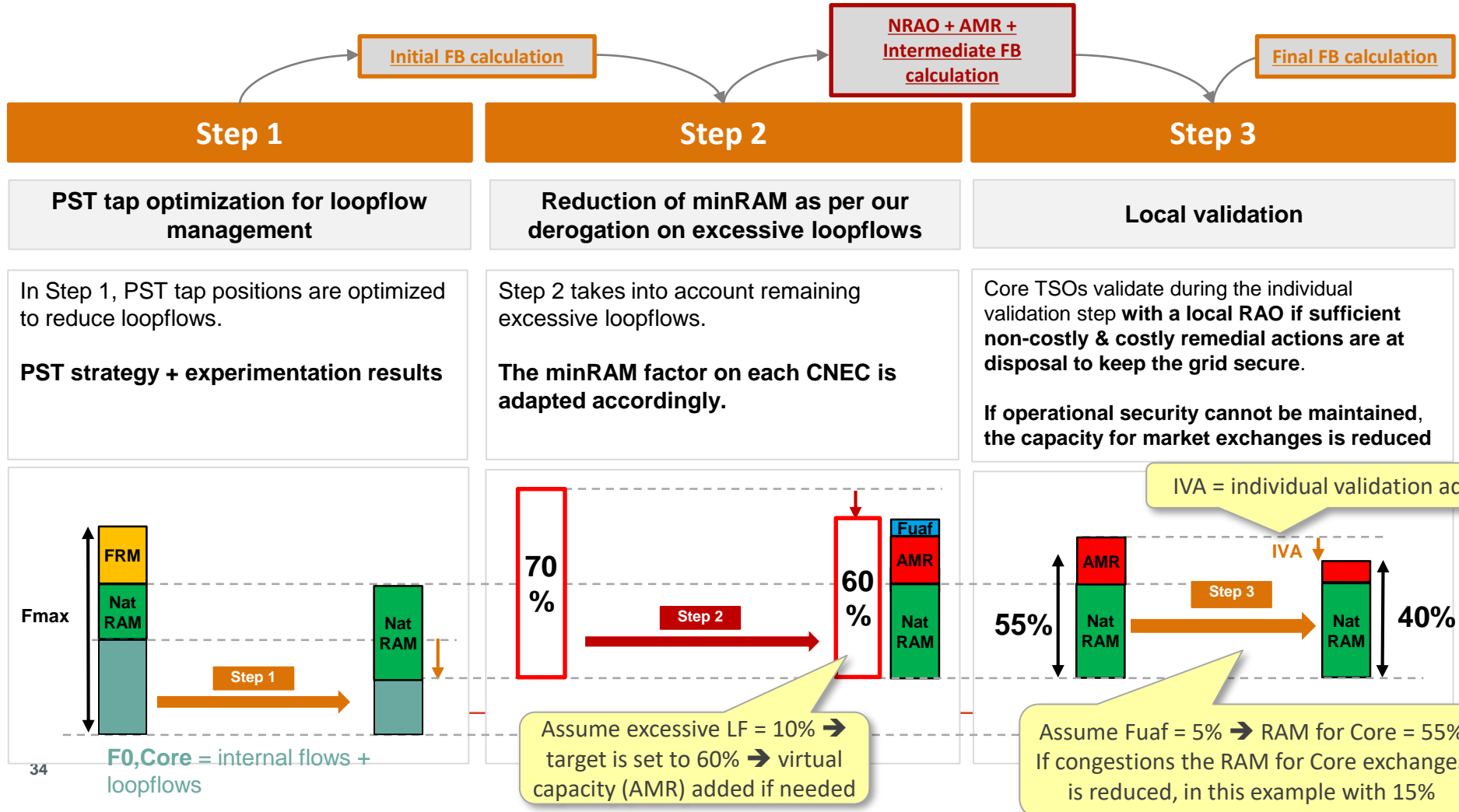
PST strategy: approach

- Core DA CCM Art 10(5): each Core TSO may individually define the initial setting of its own non-costly and costly RAs, based on the best forecast of their application and with the aim to reduce the total loop flows on its cross-zonal CNECs
  ➔ **Elia is frontrunner in using PSTs to reduce LFs**

- Approach

  - Reduce and balance of the loop flows on all the cross-borders element using the associated 380kV PSTs (Zandvliet, Van Eyck) & 220kV PSTs (Aubange, Monceau)

  - 380kV lines and PSTs: part of capacity calculation meaning that the PSTs are used

    - Locally: tap range for LF reduction [-8 +8] <=> *CWE: fixed tap at -3*

    - By the NRAO: tap range for preventive optimization [-8 +8] and additional 2 steps for curative <=> *CWE: [-6 +6]*

  - 220kV lines and PSTs: Elia removed the 220kV lines from the capacity calculation so they can't block the market

    - Taps on 220kV PSTs are set locally during loop flow optimisation, and passed on to the Core CGM

    - NRAO cannot change these taps as the PSTs are kept outside of Core capacity calculation (coherence with keeping the 220kV lines out)

PST strategy: results BD Jun 9 – Jun 14

Positive value = loopflow north to south direction

PSTs	%MTUs at -8
Zandvliet 1	**74**
Zandvliet 2	**72**
Van Eyck 1	69
Van Eyck 2	46
Monceau	0
Aubange	**10**

Highest LF in % of Fmax across the 380kV lines: **~10% reduction**

Percentile	Before optimization	After optimization
25%	0	0
50%	0	0
75%	10	7
90%	18	12
95%	24	15

- Most loopflows pass through Zandvliet. To balance between Zandvliet and VanEyck, the optimizer will use more often the extreme position of Zandvliet

Local validation: approach

LTA domain
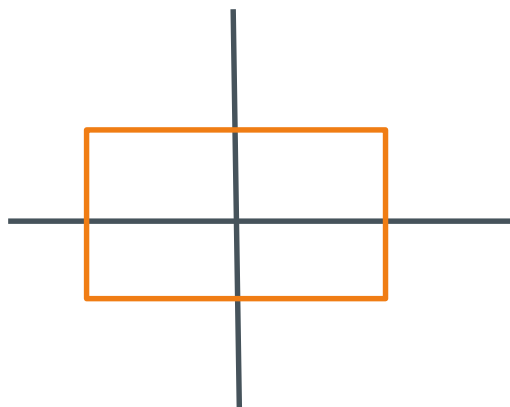
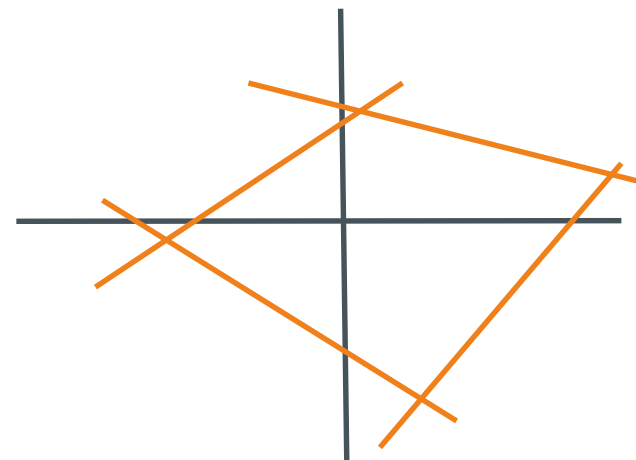No signals we should revise our approach of keeping the LTA domain untouched: LTA curtailment remains an extraordinary measure
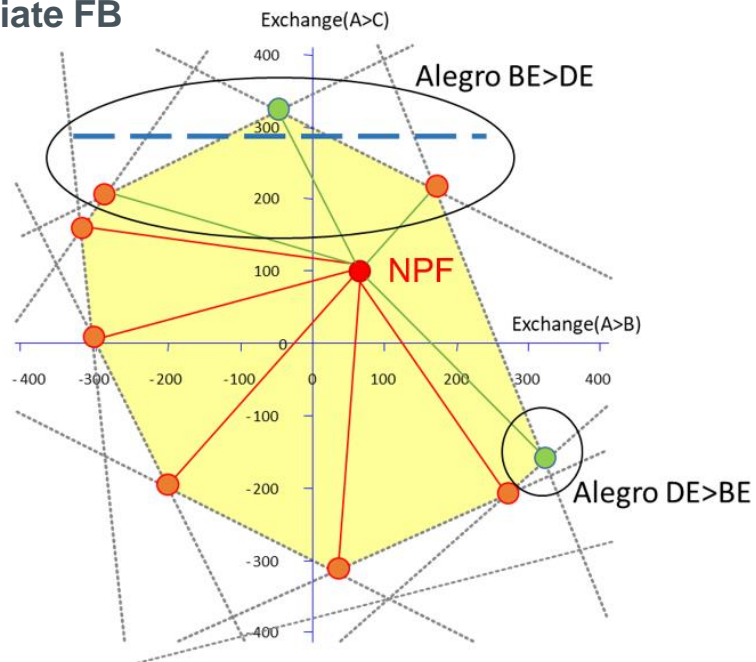
Intermediate FB domain

Feasibility of the intermediate FB domain is evaluated with a local RAO

Local validation: step A – vertices selection based on Net Position Forecast

Intermediate FB domain

- **Pre-filtering:** filter from all vertices those closest to NPF with uncertainty interval P99. Closest = weighted Euclidian distance based on representative PTDFs.

$$d = \sqrt{\sum_{i=1}^{N} PTDF_i * (Vertex_i - NPF_i)^2}$$

- **ALEGrO:** create 2 groups in the pre-filtered vertices, using Min and Max NP of ALEGrO as key parameter

- **Adaptable scenario framework:** select from these 2 groups the vertices corresponding to the scenario's chosen for validation
  - Closest to NPF
  - Maximum import FR+BE (winter)
  - Maximum south > north exchanges (summer)

Local validation: step B – evaluation of vertices with local RAO

- **Perform an AC loadflow in PowerFactory software on the selected vertices. In case of congestions, attempt to solve with remedial actions:**

  - PST taps: 8 taps in preventive, 2 more in curative thus 10 in total

  - National RD potential: STEGs & offshore wind

  - Topological: currently not supported by PowerFactory

  - Cross-border RD potential: not applied as this is for the full coordinated validation phase

- **Local RAO minimizes the highest amount of congestion. In case of remaining congestion, capacity reduction (IVA: individual validation adjustment) is applied. To minimize congestion, the RAO can shift congestion around and therefore:**

  - IVA can occur on non pre-solved BE CNECs from the intermediate domain

  - IVA can occur on CNECs with no virtual RAM

Local validation: root cause analysis of higher than expected frequency of capacity reduction during EXT // run led to improvements

Local: bug on HVDC	Core: merging issue	Core : redistribution DC imbalance
• It was expected that in the CGM the HVDCs were represented by a load • This load value is used in our local tool to set the value of the HVDC generator in the detailed grid model • Cases were identified where the HVDC in the CGM were represented by a generator ➔ wrong scenario was hence assessed	• Core TSOs discovered an inconsistency in the CGM impacting the Net Positions of Germany, Belgium and Poland in the CGM. • As a consequence, the zero-balanced flows, RAMs and other relevant parameters of the capacity calculation are affected, especially for CNECs in and close to the affected bidding zones.	• Local validation is performed in AC load flow • Capacity calculation process applies a DCLF approach, where the DC imbalance is proportionally redistributed over all loads of the main island. • This distorts the flows and overloads as seen on the CNECs during local validation.
Solved as of BD 14/03/2022	**Solved as of BD 9/4/2022**	**DC imbalance threshold is set to 5% to trigger DFPs if surpassed. After summer 2022: implement improved DC imbalance distribution**

Local validation: results BD Jun 9 – Jun 14

Row Labels	Average of IVA [MW]	Max of IVA [MW]	# MTUs with IVA	% MTUs where all CNECs are meeting target
Amprion	1036	2537	6	96%
Apg	218	1791	6	96%
Eles	8	90	16	89%
Elia	50	189	37	74%
Hops	2	5	26	82%
Pse	10	24	10	93%
Rte	366	780	111	23%
Seps	61	132	2	99%
TennetBv	1265	1686	2	99%
TennetGmbh	1583	1583	1	99%
Transelectrica	21	103	14	90%
TransnetBw	661	1411	3	98%

When a TSO is not in the list it implies there was no capacity reduction observed.

Data source: Publication Tool (jao.eu)

# Local validation: application of IVA by Elia happens mostly on Doel-Mercator axis

Explanation: 3 GW nuclear production close to the border, in combination with north to south market exchanges

Validation Reductions

Download

ORE_SEARCH

CORE_TOTAL ROWS: 109
CORE_SEARCH ROWS: 109
CORE_SHOWN ROWS: 100

Date	CNEC Name	TSO Name	Returned Branch	CVA (MW)	IVA (MW)	Justification
	DJERDAP					
2022-06-14 15:00:00	Y-DOEL (-LILLO - MERCATOR) 380.52 / DOEL - MERCATOR 380.54	Elia	✗		186	IVA applied due to unsolvable overloads; RO = 1241 ; FR = -4509 ; NL = 1851 ; HU = -7054 ; BE = 1354 ; AT = -1845 ; CZ = 1887 ; SK = 3764 ; DE = 4623 ; HR = 625 ; SI = -1281 ; DE_AL = -1000 ; BE_AL = 1000 ; PL = -656

AOB & Conclusions
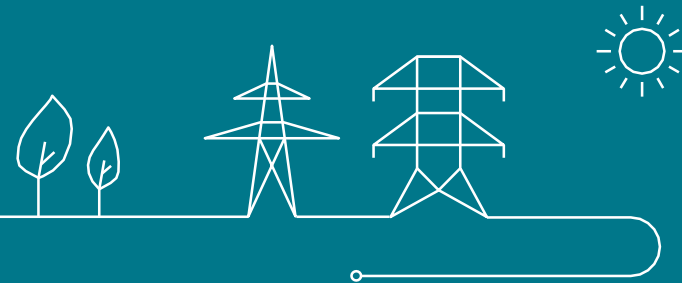
AOB

Next WG EMD-SO meeting:

- Elia proposed following two slots for the next WG EMD-SO meeting after summer. Elia will share a doodle to select the most suitable slot & final meeting invite will be sent out shortly after

  - Monday 12/09/22   14:00-17:00

  - Friday 14/10/22   14:00-17:00

Change of secratary role

- Thomas Van Den Broucke replaces Steve Van Campenhout as secretary for the WG EMD-SO

Other AOB?

Conclusions & next steps

Recap of main conclusions, actions & defined next steps after todays WG EMD-SO

- …

ANNEX