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POWER THROUGH COOPERATION

Wholesale & Transmission Seminar 2025

NORWAY – 20.11.2025

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NordREG Wholesale & Transmission Seminar Opening remarks

Inger Bugge

Chair of NordREG Wholesale and Transmission
Norwegian Energy Regulatory Authority (RME)

NORWAY – 20.11.2025

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25 years of:

- Knowledge sharing
- Collaboration
- Coordination

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NordREG – Nordic NRAs

NordREG vision:

"Efficient and advanced energy markets, for the benefit of consumers towards a decarbonized society"

- Wholesale & Transmission (W & T)
- Retail Markets (RM)
- Network Regulation (NR)

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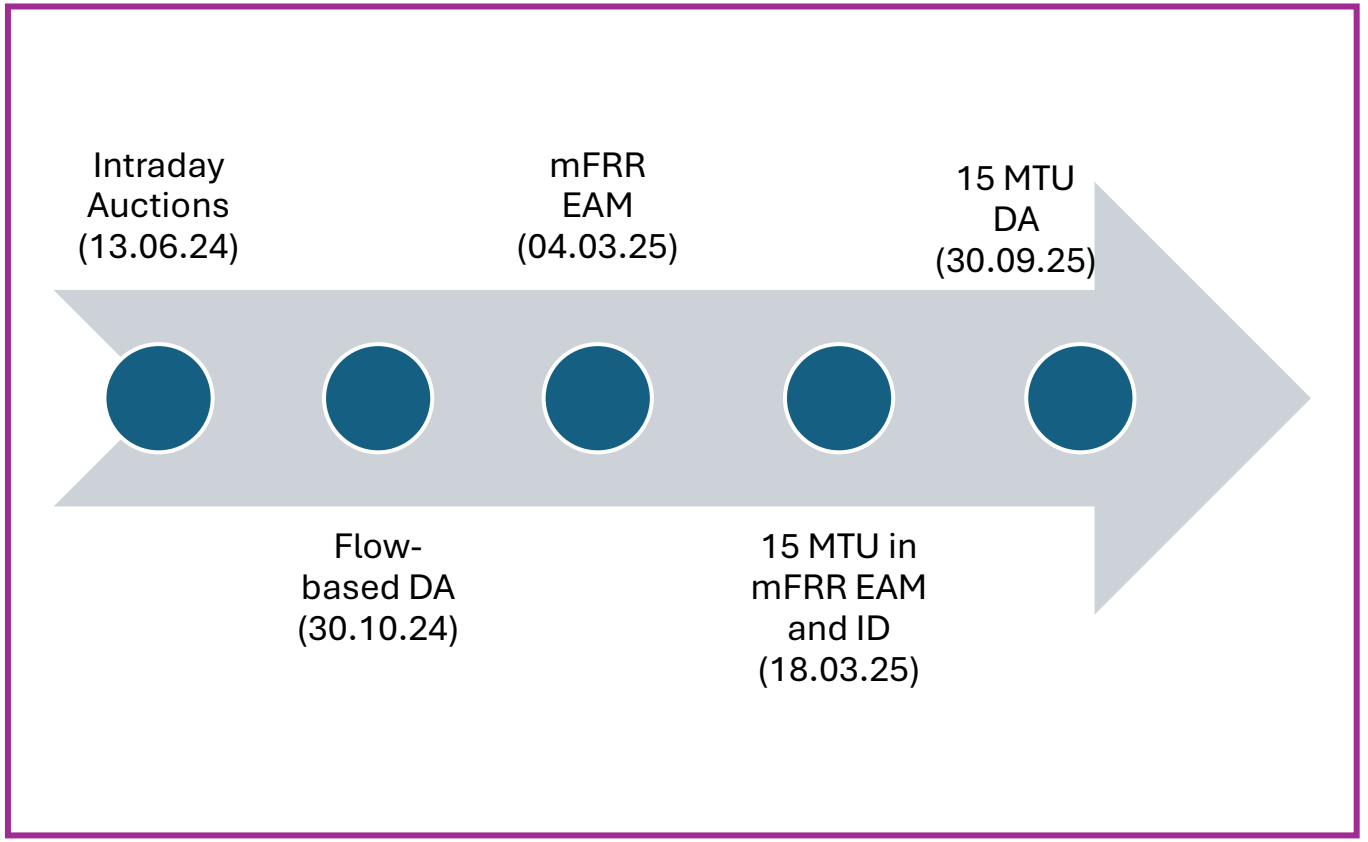
Nordic electricity markets should evolve

- Increase in renewable energy
- Growing demand from electrification
- Data-driven and integrated

Last year's development of the electricity markets

- Several TSO/NEMO projects have been implemented
- Structural changes to the market design and system operations



Wholesale market topics going forward

- Several TSO/NEMO projects to come
  - Balancing platforms (MARI & PICASSO)
  - 30 min IDCZGCT
  - Flow-based in Intraday Auctions (IDA)
  - Co-optimisation
- Upcoming regulatory updates
  - CACM 2.0, NC DR
  - FCA 2.0, EB 2.0, SO GL 2.0
- Follow-up of methodologies
  - Implementation
  - Revision

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Comment or question?

- Please raise your hand

Block 1: Update on regulatory processes from the NordREG task forces	
10:40 – 11:10	Updates from all NordREG task forces (TF) – status and recent developments
11:10 – 11:40	Presentation from ACER
11:40 – 12:30	**Lunch**
Block 2: Discussion on well-functioning future Nordic markets	
12:30 -13:20	Flowbased capacity calculation - TSOs and Market participants experiences
13:20 – 13:40	**Coffee break**
13:40 -14:55	mFRR EAM and 15 MTU - TSO, market participants, producers and consumers experience - Panel discussion
14:55 – 15:15	**Coffee break**
Block 3: Discussion on future EU regulation and upcoming network code	
15:15 – 15:45	CACM 2.0 TSO, NordPool and EPEX share their perspectives on CACM 2.0
15:45-16:15	Presentation about the upcoming network code on demand response (NC DR)
16:15 – 16:30	Wrap up and close of seminar

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Updates from all NordREG Task Forces

NordREG Wholesale & Transmission Task Forces

Capacity TF Jori Säntti	Single Market TF Taryn Galloway	Electricity Balancing TF Bjørn Denninger
System Operation GL TF Anne Marthe ter Woerds Christensen	Remit TF Jonas Lindström	NRCC Sarah Bernadette Stage High

Capacity TF

Objectives

Responsible for the NRA cooperation concerning:

Capacity Calculation

Redispatching & Countertrading

BZ configuration

Coordinating national decisions concerning **amending** and **approving** of methodologies - in dialogue with the TSOs

Following the implementation of approved methodologies

The biggest task during the past years: Introduction of the **Flow-based capacity calculation**

2026 key tasks for Capacity TF:

- Monitoring and assessing the flow-based capacity calculation methodology in practice
  - Making sure the methodology works as intended
  - Understanding the effects of F-B
    - including other market timeframes (TSO reports)
  - Trying to find solutions to identified problems
- Coordinating NRA -views on CACM 2.0
  - Establishing and expressing a Nordic view
- 70 % -rule
  - Monitoring is a national task. Coordination on a common approach if possible?
- Capacity Calculation Methodology update

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SM TF

Objectives

Exchange knowledge and insights on market design and the functioning of day-ahead and intraday markets under CACM and FCA
(excluding areas covered by Cap TF)

Coordinate views and share experiences related to the development, adoption and implementation of relevant EU methodologies

- Work in 2025:
  - Following comitology process for CACM 2.0
  - Preparations for introducing a shorter Intraday Cross-Zonal Gate Closure Time
  - Follow-up on delay in implementation of 15 minute MTU in day ahead market
- Upcoming:
  - Adoption and implementation of methodologies prescribed in CACM 2.0
  - FCA 2.0

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EB TF

Objectives

Support implementation of terms and conditions pursuant to the Electricity Balancing Guideline (EBGL)*

Coordinate and share experiences from implementation of terms and conditions

- Work in 2025:
  - Monitoring implementation of the Nordic Balancing Model milestones
  - Reaction to Nordic TSOs delay in connection to MARI and PICASSO
  - Coordination regarding possible solutions to high prices on Nordic mFRR EAM

*Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing

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SO TF

Objectives

Support implementation of rules set out in the System Operation Guide Line (SOGL)*

Coordinate and share experiences from implementation of the Grid Connection Codes**

- Work in 2025:
  - Focus on implementation of the CGM methodology
  - Discussions regarding dimensioning of reserves and transmission capacity for sharing reserves.
- Upcoming:
  - SOGL 2.0
  - Updated methodologies

*Commission Regulation (EU) 2017/1475 of 2 August 2017 establishing a guideline on Electricity Transmission System Operation
**Commission Regulation (EU) 2016/631, 2016/1388, 2016/1447

Remit TF

Objectives

Sharing of experiences and to coordinate work with REMIT regulation* in the NordREG countries.

Status updates and coordinate work with Remit cases involving multiple NRAs.

*Regulation (EU) No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency

- Work in 2025:
  - Remit 2 implementation
  - How to handle mFRR cases
  - Justification of bidding behaviours
- Upcoming:
  - Justification of bidding behaviours
  - Potential Remit issues from development of the energy markets

NRCC TF

Objectives

Plan and execute a coordinated annual oversight of the Nordic Regional Coordination Centre (NRCC).

NordREG will issue a report on the oversight. The report will be sent to the NRCC, Board, and ACER after Midlevel approval.

- Work in 2025:
  - Implementation of remaining mandatory services of the Nordic RCC.
  - The role of NRCC TF in relation to handling of cybersecurity risks.
- Upcoming:
  - Enforcement when services are not implemented on time.

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Experiences with flowbased capacity calculation for one year

Wholesale & Transmission

20 November 2025

Erik Ek

erik.ek@svk.se

ENERGINET SVENSKA KRAFTNÄT FINGRID Statnett

Contents

- **One-year experience with DA FB**
- Experience with ID capacities (ATCE)
- Amendment of the DA/ID CCM

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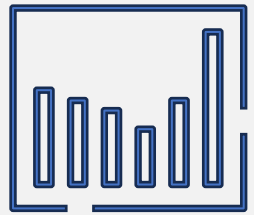
One-year experience with DA FB

- DA FB does what it is supposed to do: it increases the market capacity in the Nordic power system.

- In the slides following, we perform a data comparison to demonstrate
  - ✓ **Comparison post go-live, flows (Nov 2024 – Oct 2025)** vs. same periods (Nov-Oct) of the two years prior to go-live.
  - ✓ **Comparison post go-live, price, ATC, non-intuitive** vs. same period prior to go-live.



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DA market outcome comparison: NTC vs. FB: changes in flows

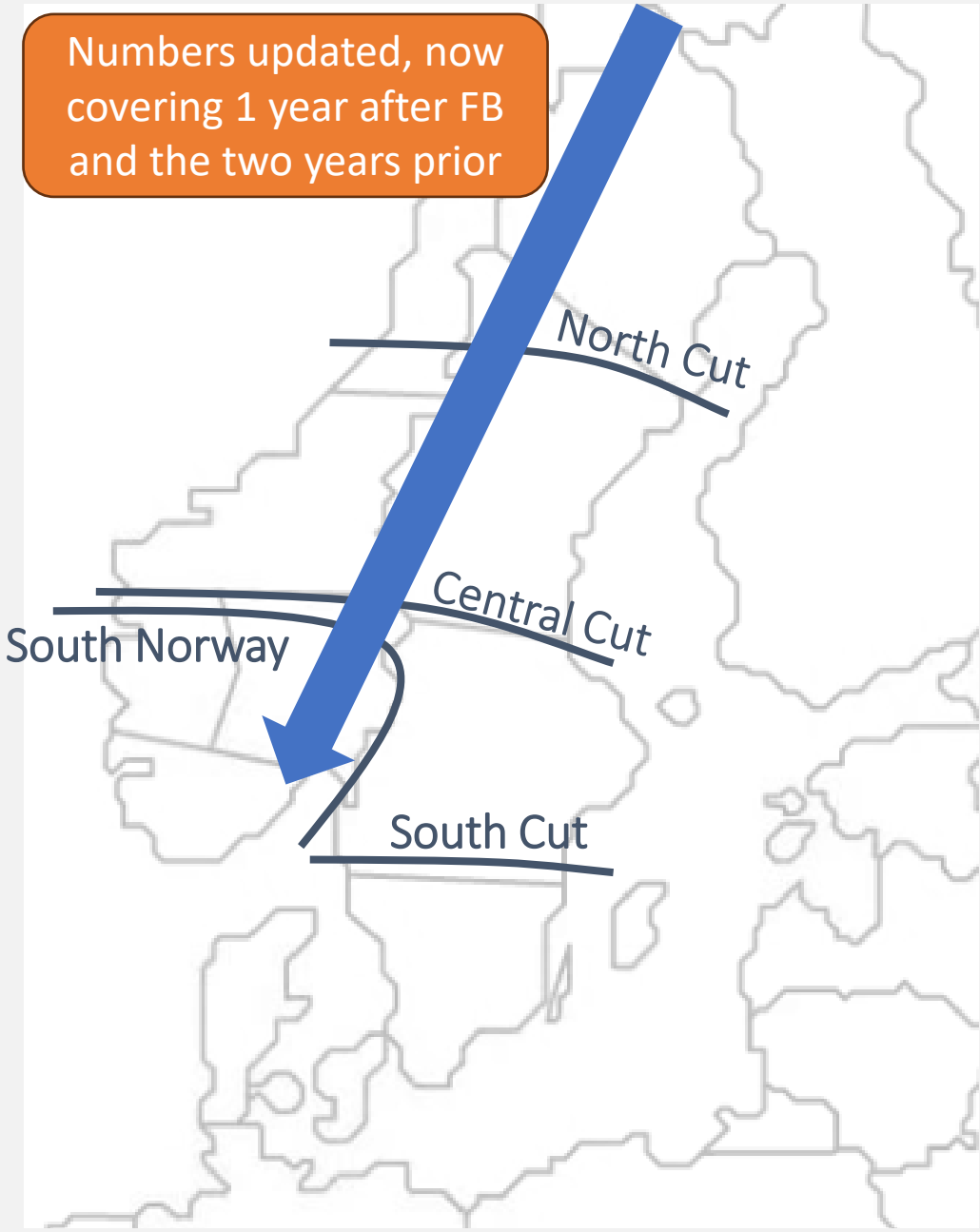
Flow-based enabled more DA flow through the Nordic system during the investigated periods.

North Cut:
Average flow is increased by 32%
Maximum flow decreased by 6% 4320 → 4074 MWh

Central Cut:
Average flow is increased by 31%
Maximum flow increased by 9% 8023 → 8711 MWh

South Cut:
Average flow is increased by 0,2%
Maximum flow increased by 9% 5336 → 5790 MWh

South Norway:
Average flow is increased by 243%
Maximum flow increased by 23% 2564 → 3156 MWh



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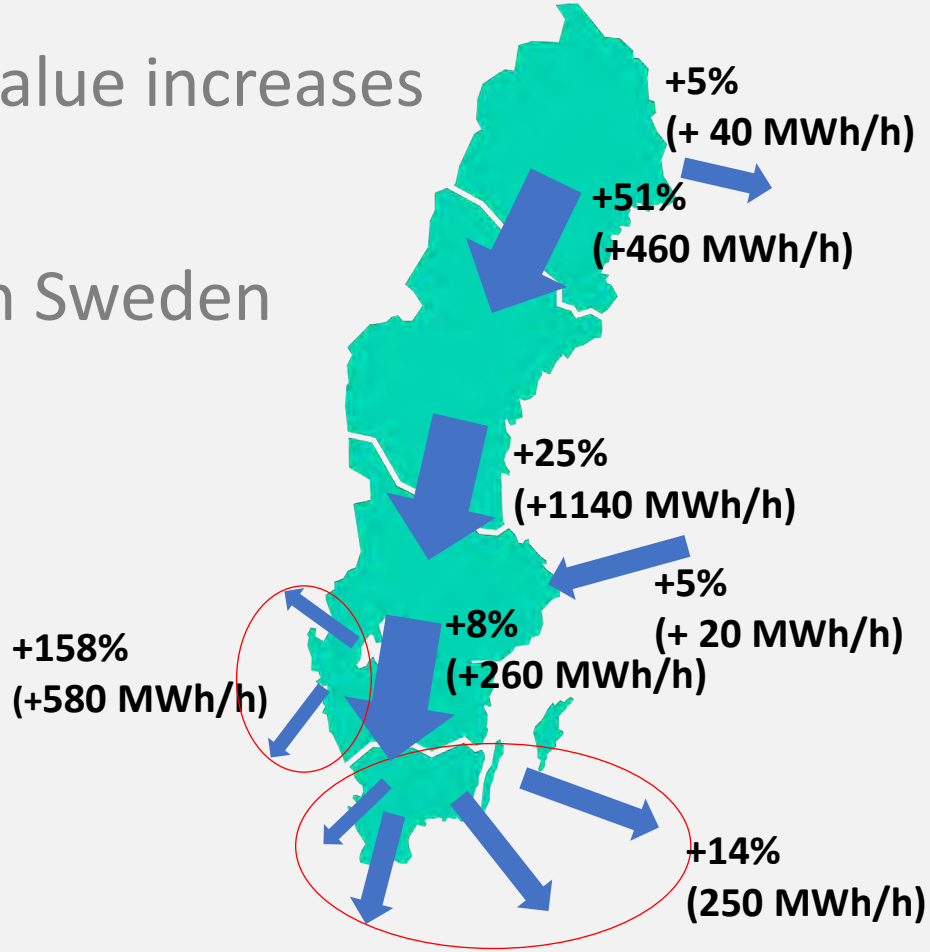
Mean value changes,Sweden compared with the year before

- Hydro situation→ high mean value increases
- Nuclear maintenance O3
- Highest shadow CNECs often in Sweden



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DA market outcome comparison: NTC vs. FB data: changes in average prices

- Price changes per bidding zone after FB
- Unusually high reservoir level in the northern regions after FB go-live

Bidding zone	Average price per bidding zone		
	1.nov 23 - 31 okt 24	1.nov 24 - 31 okt 25	difference
NO1	47,7	54,6	6,9
NO2	54,2	62,8	8,7
NO3	35,7	15,9	-19,9
NO4	31,4	5,2	-26,2
NO5	48,1	42,2	-5,9
SE1	32,2	14,2	-18,0
SE2	32,3	13,6	-18,8
SE3	38,6	46,0	7,5
SE4	50,7	60,5	9,8
FI	50,7	40,5	-10,3
DK1	68,1	82,2	14,0
DK2	67,9	83,5	15,7
GER	73,3	91,6	18,3

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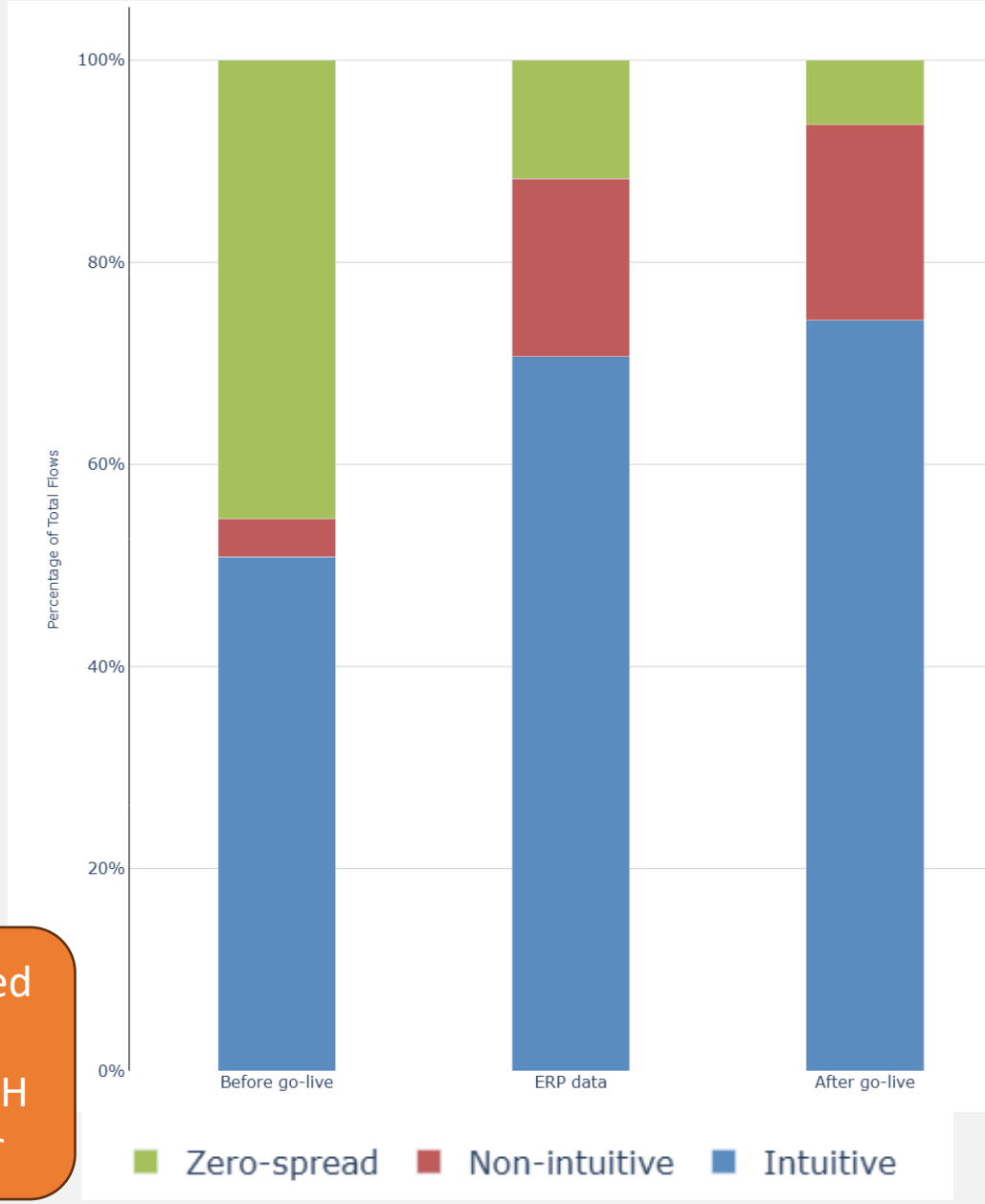
DA market outcome comparison: Non-intuitive flows

Non-intuitive flows occur from the market coupling and are flows that go from higher-priced to lower-price bidding zones.

- ❖Allows more flow on another border, thereby leading to increased socioeconomic welfare
- ❖Integrated part of the flow-based capacity calculation method and maximizing market benefits

Post flow-based go-live, the non-intuitive flows in the Nordics match the expected results, similar to those seen in EPR



Numbers will be updated with similar periods, being scrutinized for STH meeting 11 December

ENERGINET SVENSKA KRAFTNÄT FINGRID Statnett

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- One-year experience with DA FB
- **Experience with ID capacities (ATCE)**
- Amendment of the DA/ID CCM

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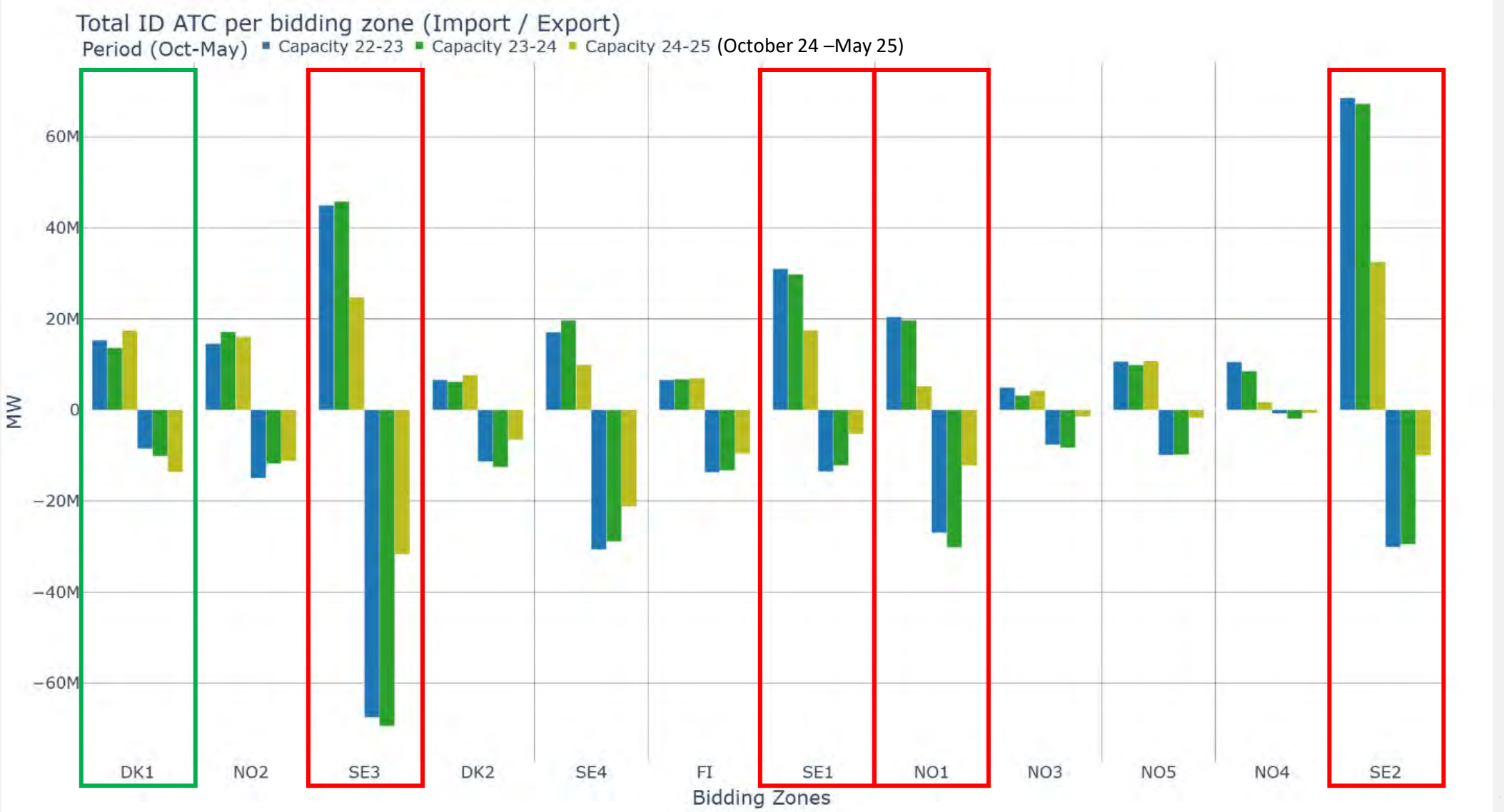
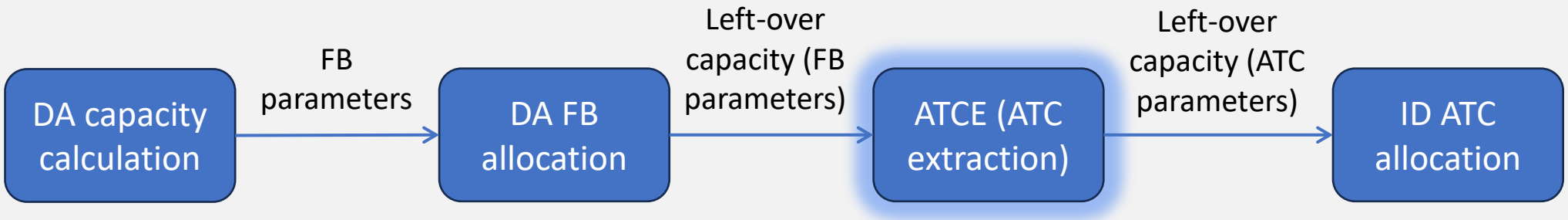
Total ID ATC per bidding zone in import and export directions
Import with '+' sign and Export with '-' sign

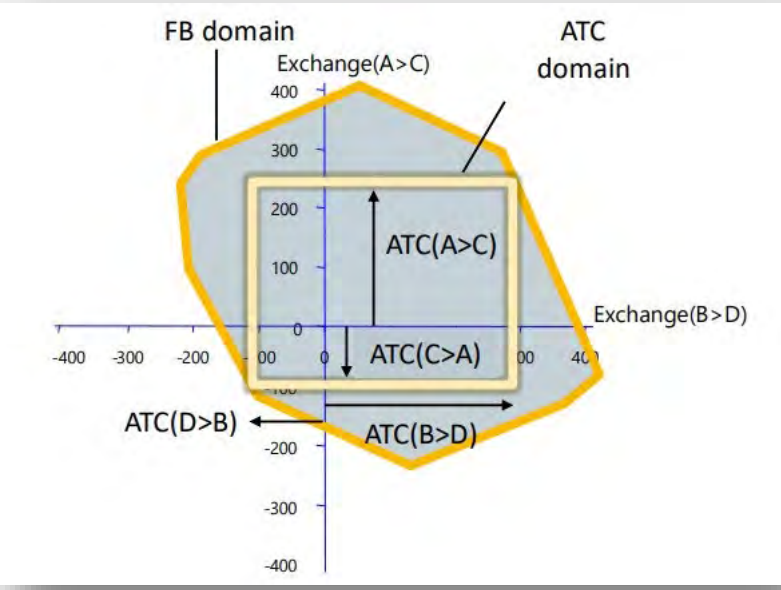
Oct-May



Short reminder of ID capacity and ATCE



- The transition from NTC to FB follows a stepwise implementation as it cannot be realized in one big bang for all market timeframes, and this goes along with some inefficiencies.
- One being that ATC is a rudimentary translation from physics to market capacities, and the translation from FB to ATC needs to cope with and respect those shortcomings.
- As a result, we can observe that the **order of magnitude of the ID capacities after the DA FB go live are much lower** than what we observed in the same period before the DA FB go-live.



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NordREG's Response to Nordic CCR TSOs Concerning the Report on Flow-Based implementation and ID ATCE

- NordREG shared a letter on September 26, 2025, and states (among others):

> *'The Nordic regulatory authorities acknowledge that flow-based capacity calculation cannot be introduced in all market time frames at the same time. On the other hand, the introduction of flow-based in intra-day-markets is targeted for 2027 and still subject to uncertainties regarding continuous trading as well as the schedule. Furthermore, introducing flow-based in intra-day auctions will not address all the consequences that we are currently experiencing from reduced capacities in the balancing timeframe. The Nordic regulatory authorities therefore consider it important that the Nordic TSOs swiftly assess and present viable measures that could help alleviate the situation prior to the implementation of flow-based capacity calculation in the other time frames.'*

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TSOs' continue their efforts to improve the ID capacities (as presented in the September 2 stakeholder meeting)

- The Nordic TSOs already took note of the concerns, and the stakeholders' request to have more capacity in the ID timeframe. Though the starting point cannot be altered – i.e., the ID gate-opening capacity is the leftover capacity from the DA timeframe – the TSOs successfully tested in production whether more additional capacity can be released to the ID market, while monitoring the impact on real-time operations.
- Furthermore, the Nordic TSOs are (amongst others) investigating whether the ATCE algorithm and process can be finetuned, until the next FB implementation step, being the introduction of FB ID auctions, can be made.
- **This is work ongoing and in progress; an update will be provided in the Dec 11 stakeholder meeting**

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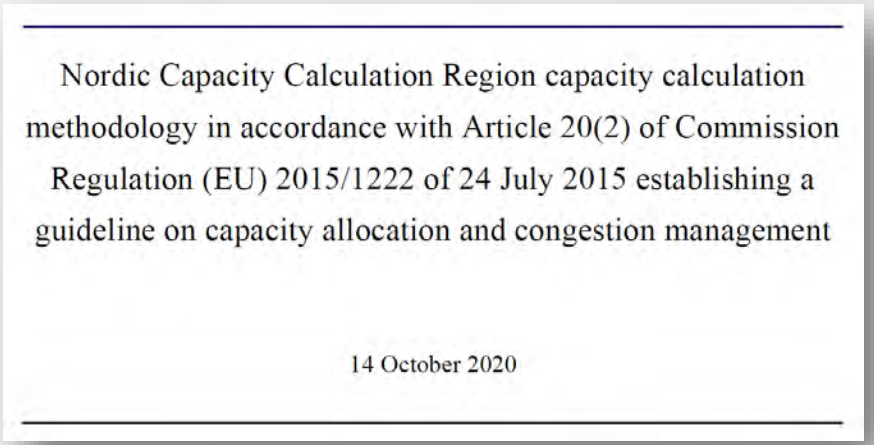
Amendment of the DA/ID CCM

- FB is an iterative process that requires continuous improvements and adjustments to its input data, such to strike the right balance between the market facilitation, operational security and legal development
- Not all the current text in the DA/ID CCM is 'supportive' in this respect, and the Nordic TSOs are currently in the process to amend the DA/ID CCM
- The TSOs will keep you posted on the amendment process and the consultation



Nordic Capacity Calculation Region capacity calculation methodology in accordance with Article 20(2) of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management

14 October 2020

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Amendment of the DA/ID CCM
Example of forthcoming amendment: CNEC list

- CCM Article 24(2):
  - ✓ *If any of the day-ahead and intraday calculation inputs pursuant to Articles 3, 4, 5, 6, 7 and 9 need to be updated based on this review, the TSOs shall publish the changes at least 1 month before their implementation.*
  - ✓ Article 5: Determination of CNEC list
- The notification of CNECs are not in line with practical circumstances and legal CACM:
  - ✓ Practical: Weather dependency, forced outage etc. require a dynamic approach in terms of which grid components that can be expected to be critical
  - ✓ Legal: CACM article 14(3) reads:
    - *For the day-ahead market time-frame, the capacity calculation shall be based on the latest available information. The information update for the day-ahead market time-frame shall not start before 15:00 market time two days before the day of delivery.*

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Questions?

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VATTENFALL

Expectations and reality

- FB is just another way to represent the electricity network.
- Net transfer capacities (NTC) will be replaced by the FB domain.
- The FB domain is a matrix that describes the network.

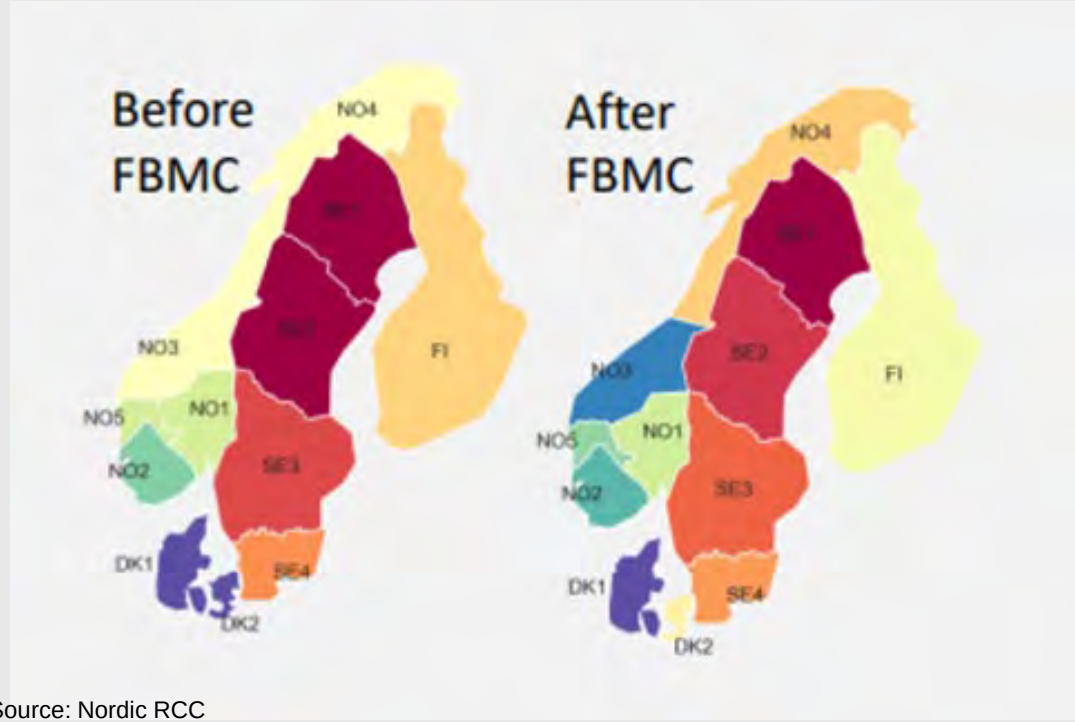
- **Fact:** FB allows for better utilization of the network D-1.
- **Fact:** FB (ideally) produces more secure solutions.
- **Fact:** FB allows for higher price convergence (lowest areas come up, highest areas come down).

- **Fact:** Understanding prices outcome will be less intuitive.
- **Fact:** Reduced forecastability → Reduced flexibility of hydro assets.
- **Fact:** Reduced intraday capacities → Increased balancing needs.

New dynamics and more fragmented market

Market structure

From 9 areas in practice with NTC, to 12 areas after GoLive of FBMC



Non-intuitive flows

Flows from high-price to low-price bidding zones, allowed in order to increase flow on other borders

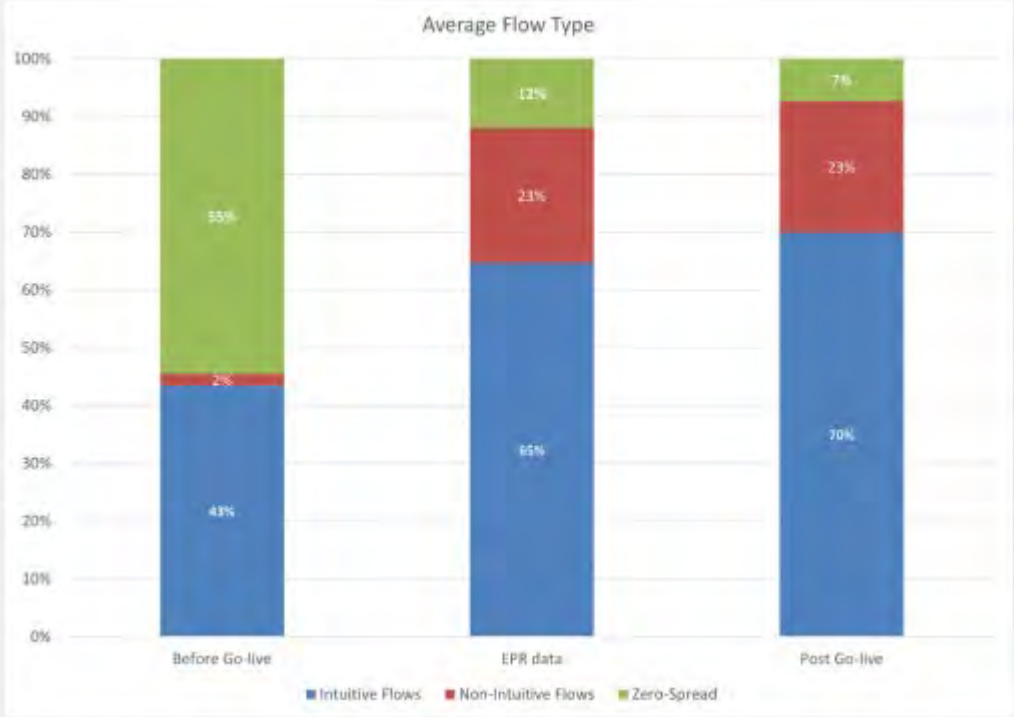
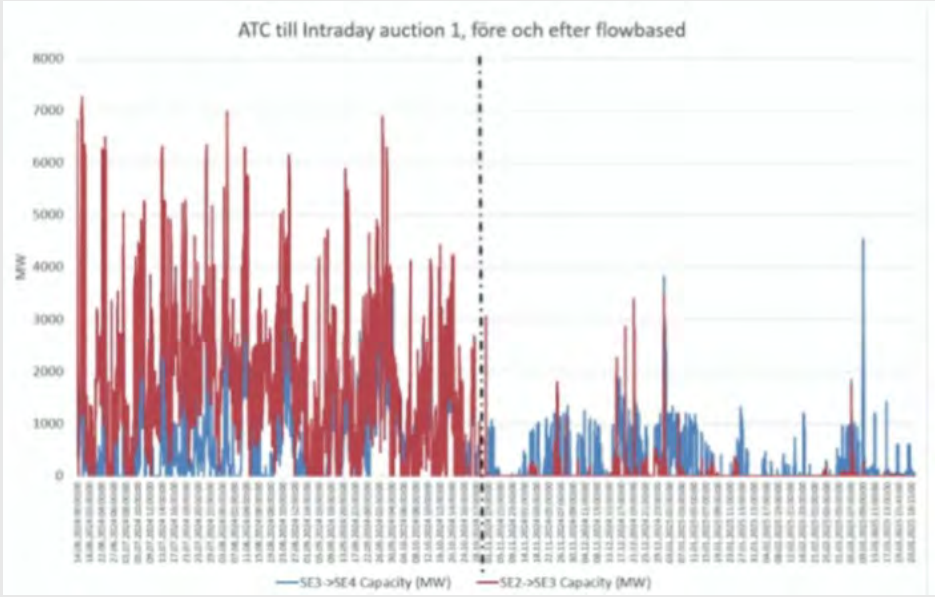


Figure: Average type of flow in the nordics before and after go-live and during EPR[1]

1. Source: Nordic RCC

Main concern - impact on intraday market

- **The model for calculating starting capacities** for ID-market (ATCE) **is too conservative.** Doesn't allow for *any* scenario where ID-trading/re-planning may lead to overload of a CNEC, which has caused a **significant reduction of ID-capacities** compared to before FBMC
- **The extreme price volatility** and lack of predictability that followed in the imbalance market during 2025 has made ID trading extremely difficult and risky, which unfortunately **has had an enforced negative impact on liquidity**



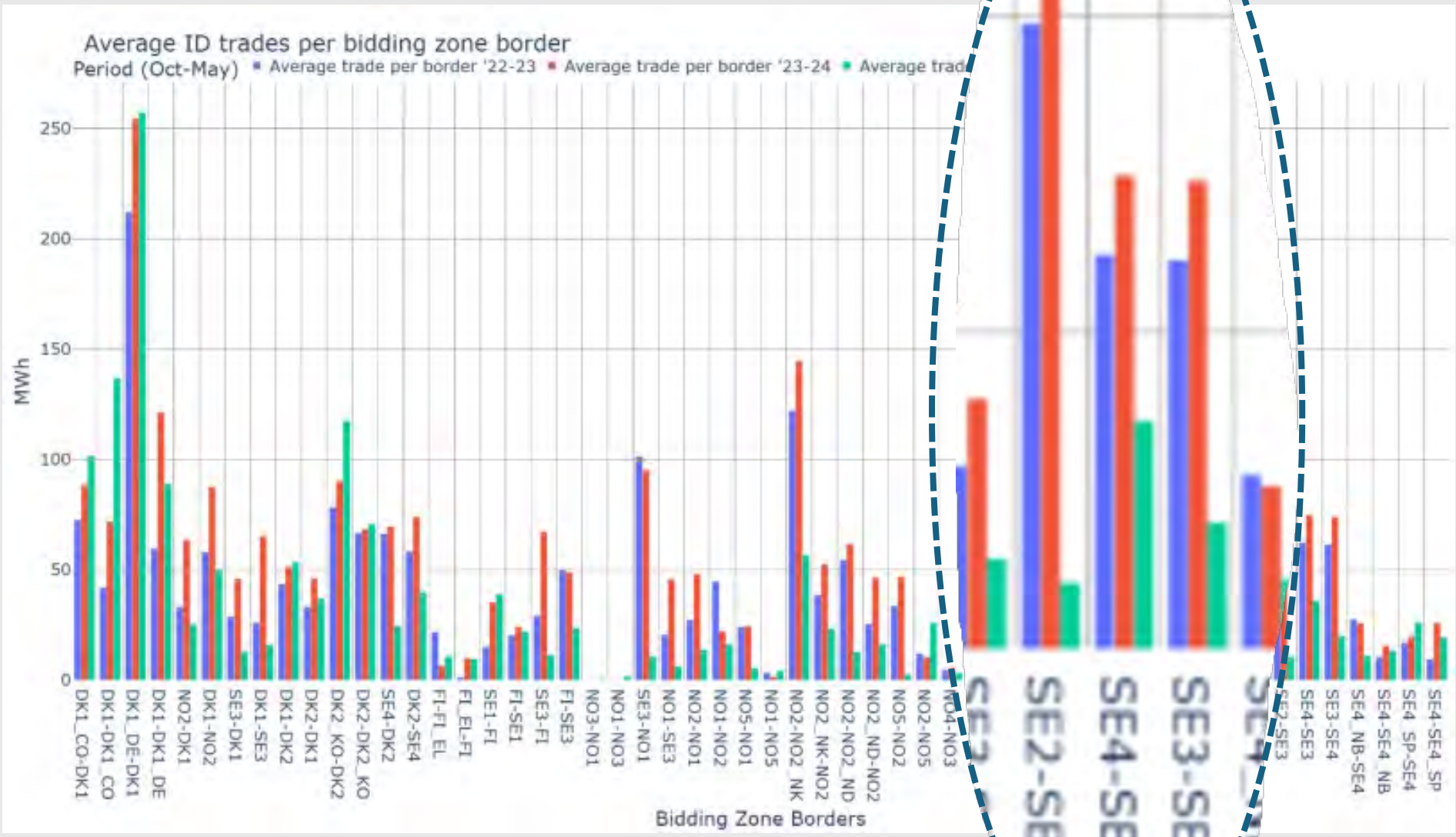
ID-capacities before & after FBMC (source: Svk)

This development is alarming

A strike right at the heart of Nordic market!

Significant decrease in intraday volumes:

- DK1-SE3
- DK1-NO2
- DK2-SE4
- SE3-FIN
- SE3-NO1
- SE1-SE2
- SE2-SE3
- SE3-SE4
- …



Choices need to reflect Nordic conditions

Vattenfall support FBMC ID auctions, but **it cannot be the sole solution** due to high risk of delay and limited impact on current issues.

We urge TSOs to also develop a complementary approach NOW with focus on:

- more dynamic capacity calculation (closer to delivery) and
- review the AOF algorithm to minimize unnecessary volatility.

In addition, we propose:

- Publication of PTDF and RAM values for the next 10 days, on a rolling basis.
- Publication of a static grid model for the market.
- Improved NUCS messages linked to the grid model.

How to move on (Our wish):

- adopt a customer-focused and holistic approach;
- ensure contingency planning beyond optimism;
- demand clear NRA requirements;
- act now to restore trust and define fallback if ID auctions underperform.

Hafslund

Flow based market coupling

Marius Slette, Hafslund Kraft

Hafslund is an energy and infrastructure group with of 3 companies

Hafslund Kraft

Norway's second largest hydropower company

Hafslund Celsio

Norway's largest district heating company

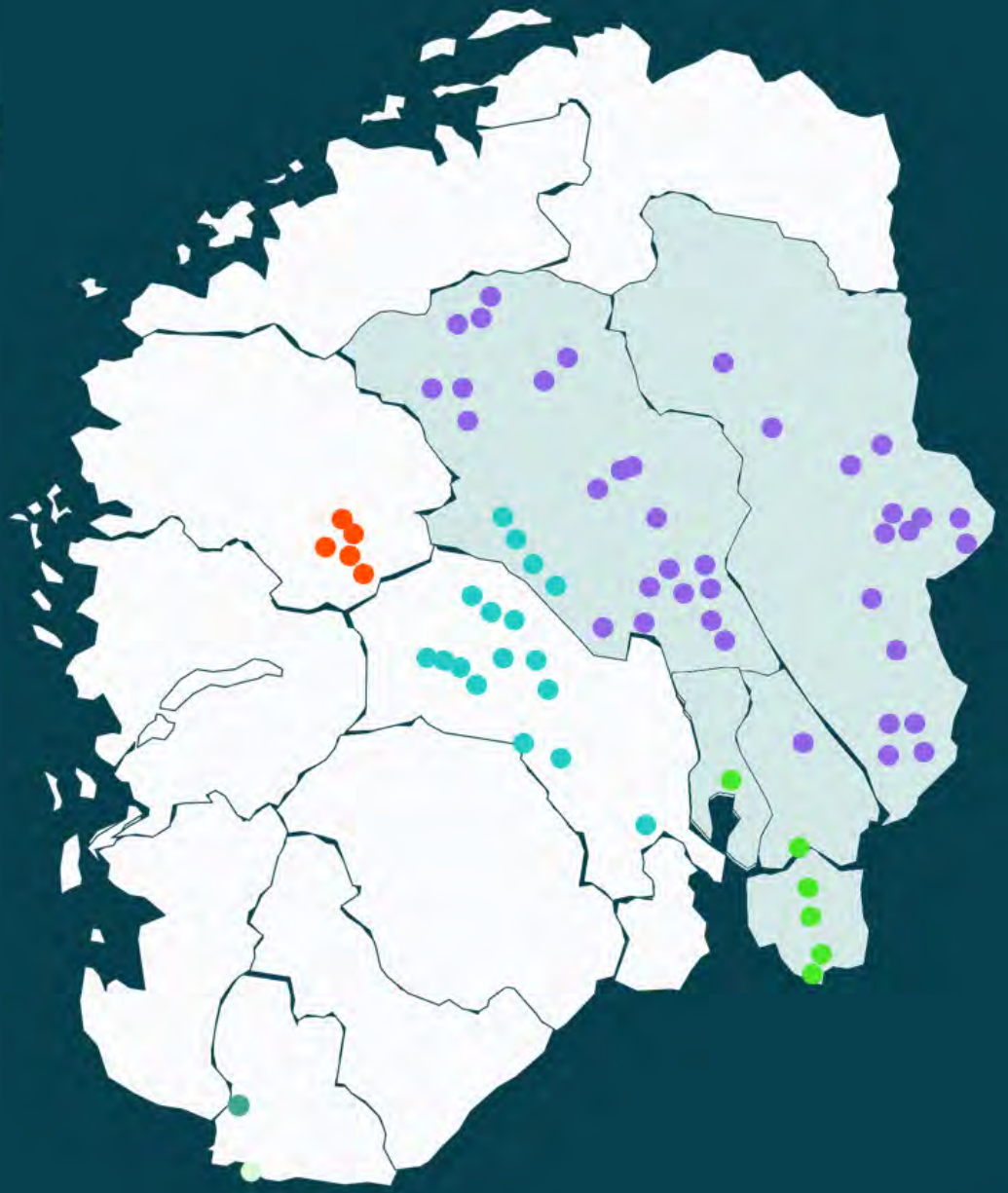
Hafslund Vekst

Elvia (50% through Eidsiva)
Solar and wind
New investments in electrification
Hafslund Rådgivning (consulting)
Eidsiva (50%)
Fredrikstad Energi (49%)

83 hydropower plants and 3 wind power plant

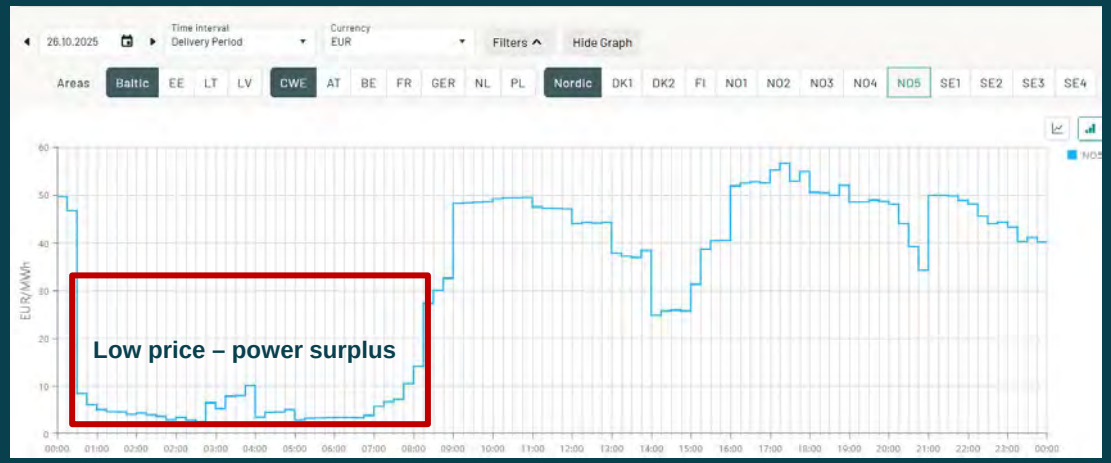
22 TWh of power production

- Power plant area Aurland (3,3 TWh)
- Power plant area Hallingdal and Valdres (5,3 TWh)
- Power plant area Innlandet (8,0 TWh)
- Power plant area Glomma (4,8 TWh)
- Tonstad wind power plant (0,7 TWh)



Our goal as a hydro producer

- Make the most of the scarce resource at our disposal – water for hydro production
- How? Price signals!



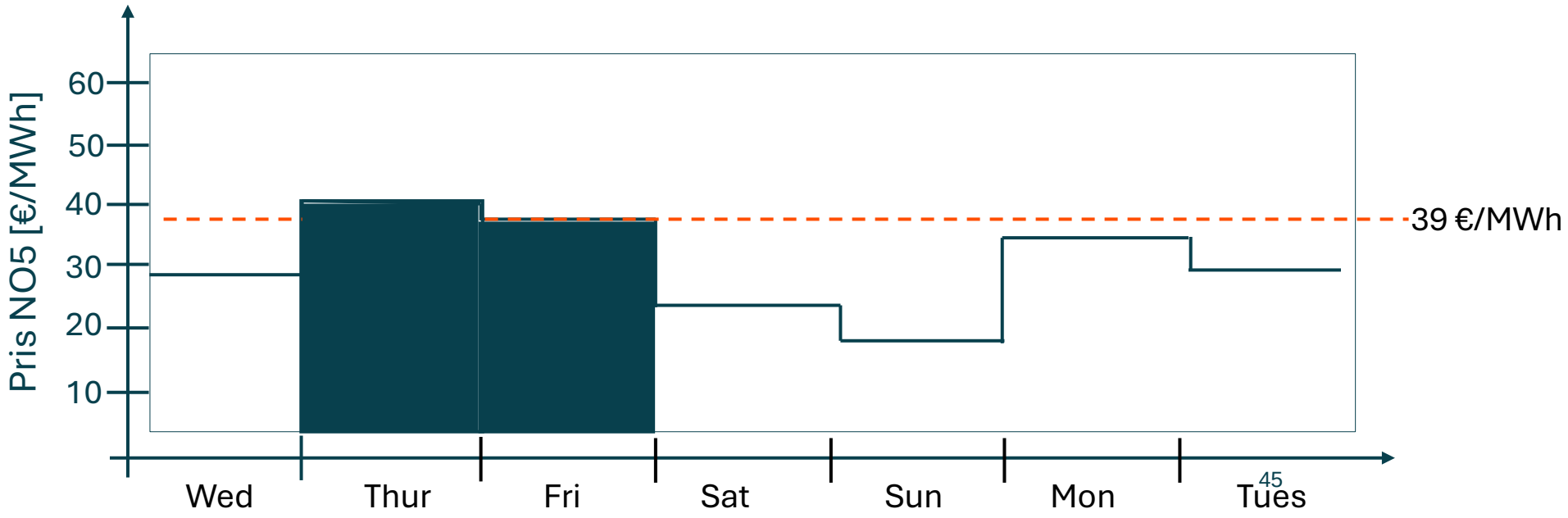
Price forecasts without fresh PTDF are worth less

- Poor forecasts equals poor optimization
- If future forecasted price signals are wrong, meeting demand becomes harder

«This plan seemed like a good idea yesterday.
Today, it is not.»

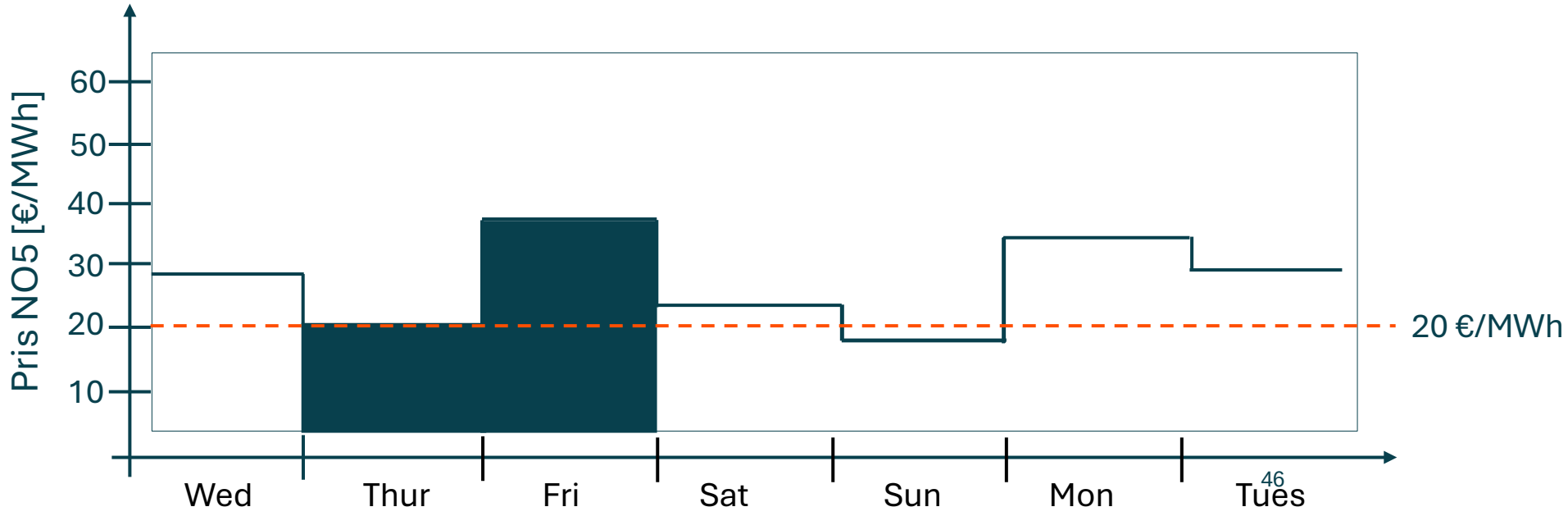
Short term – how a forecast error can affect water values

- A plant with a reservoir equivalent to 48 hours of full production
- Starting magazine Wednesday is half full, but inflow is rising
- My conclusion on Tuesday: wait until Thursday to produce – price is forecasted higher



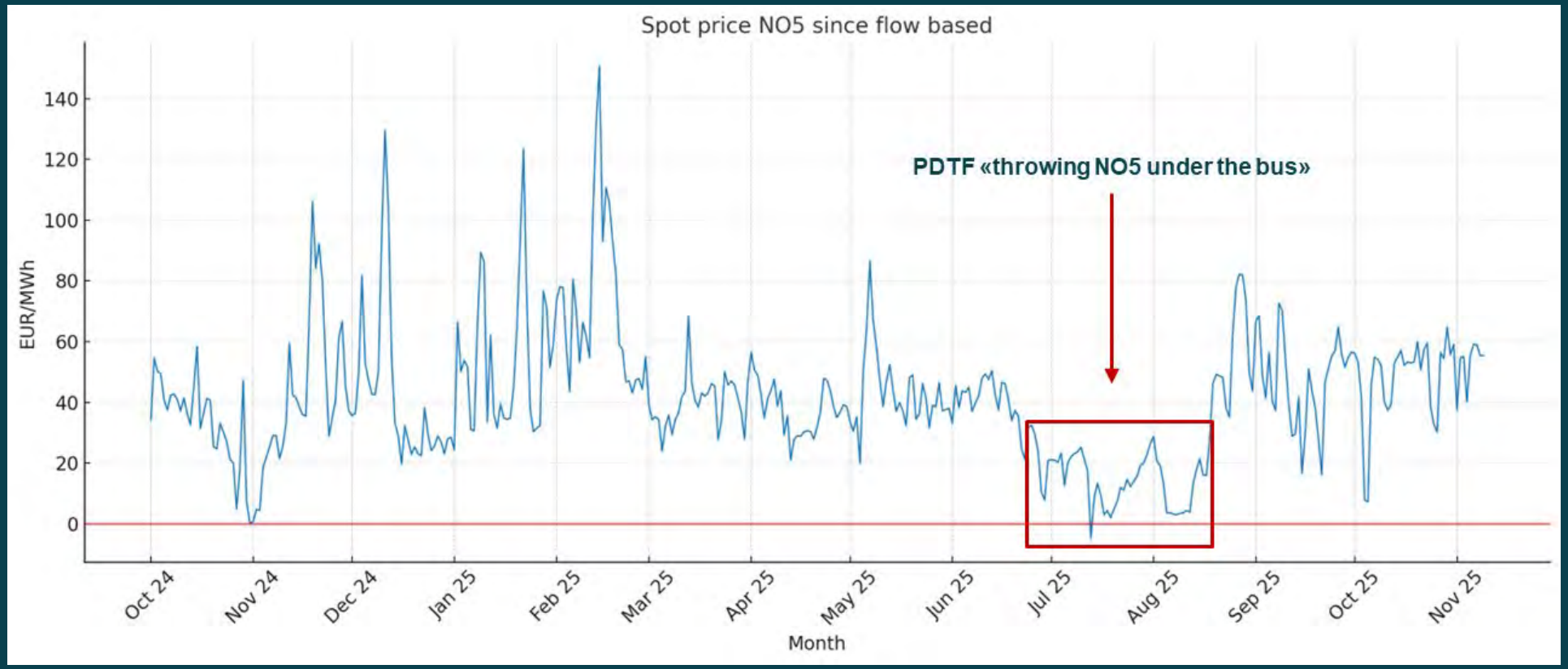
Short term – how a forecast error can affect water values

- PTDF for Thursday results in lower spot prices
- Buffer reservoir is full Wednesday evening, and all inflow must be produced to avoid loss of water
- These mistakes are costly and accumulate «loss» over time



Flow based optimizes D+1 – we plan weeks and months ahead

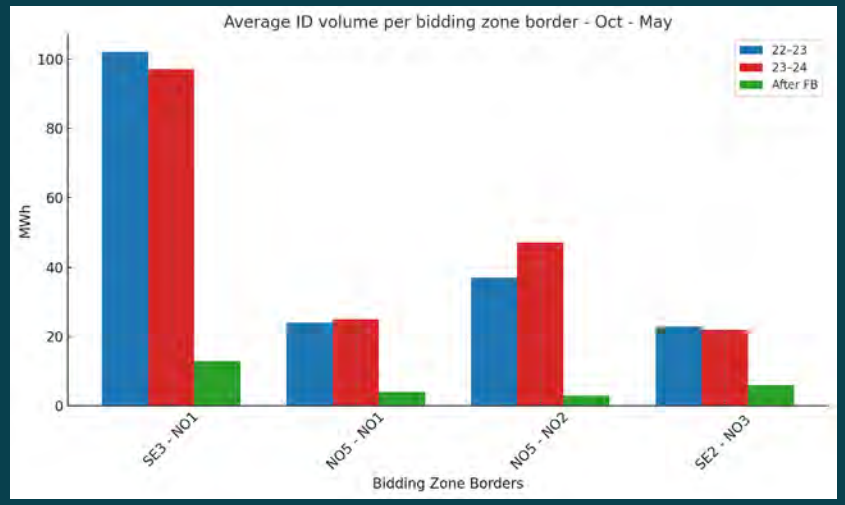
Optimizing future outcomes is a game of probabilities and uncertainty.
Flow based introduces an extra layer of uncertainty.



Flow based optimizes Day Ahead – less capacity for ID and balancing

Flow based allocates more cross zonal capacity to Day Ahead over other markets – is this rational?

- Intraday and balancing markets are important for system costs



Relationship between imbalance volume / price with ID ATCs

The ID ATC determines how much cross-border transmission capacity is available to the intraday trades. When sufficient ID capacity is available, market participants can use it to respond to updated forecasts, thereby reducing their expected imbalance volumes.

Furthermore, reduced imbalanced volume decreases the need for costly balancing actions by the TSOs, such as the activation of the manual frequency restoration reserves (mFRR).[3] Therefore, a more balanced system – achieved through effective use of ID ATC – results in more stable and often lower imbalance prices. On the contrary, if ID ATC is constrained or allocated inefficiently, market participants may be unable to correct their schedules, leading to increased imbalances, greater reliance on expensive balancing resources, and more volatile imbalance prices.

Source: Follow-up report concerning FlowBased implementation and ID ATCE – response from Nordic TSOs

Where do we go from here?

Christmas wish list:

- Week ahead PTDF – **minimum** D-2
- Preliminary year ahead/seasonal PTDF
  - Simplified PTDF better than NTC domain?
- Continued dialogue between all stakeholders – we are eager to share, learn and discuss!

NordREG
Nordic Energy Regulators
POWER THROUGH COOPERATION

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mFRR EAM & 15-Minute MTU: Half-Year Review

Nordic CCM Stakeholder Meeting

20 November 2025

Kjerstin Bakke

kjerstin.bakke@statnett.no

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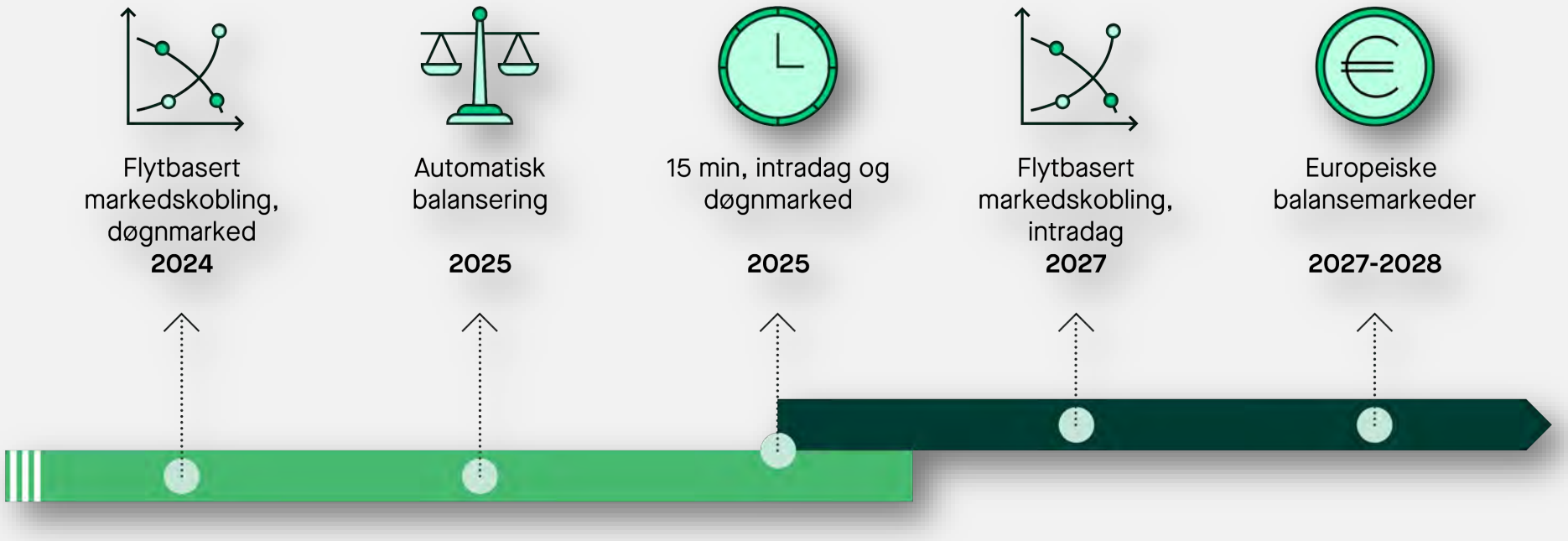
Extensive changes in system operations and markets – key milestones still ahead



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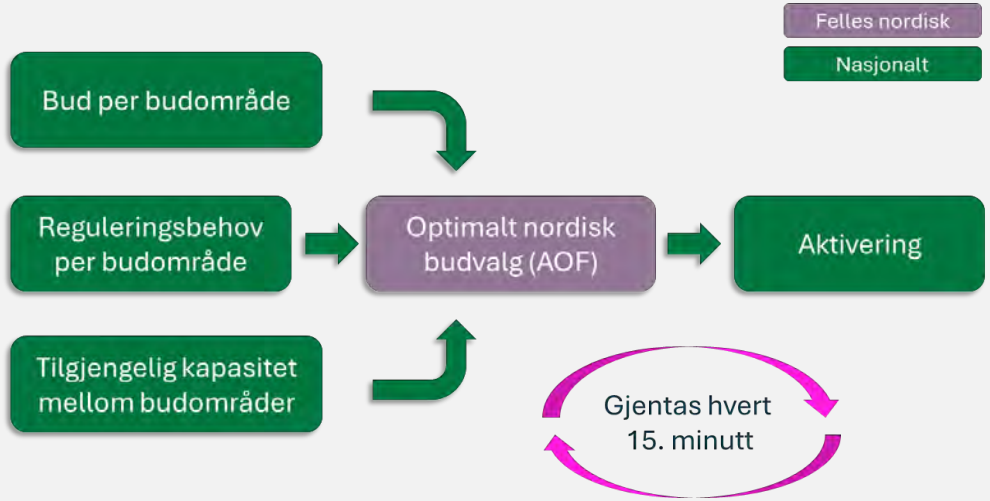
Transition to a new automated balancing process in March – impacted the entire industry

NBM
Nordic Balancing Model

- New dimensioning method with increased reserve requirements
- Automation of bottleneck management
- Estimation of needs, automatic bid selection and activation
- Standardized response from participants
- Less time for assessments and operator intervention

→ Prepare for transition to MARI and PICASSO



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Experiences after go-live balancing

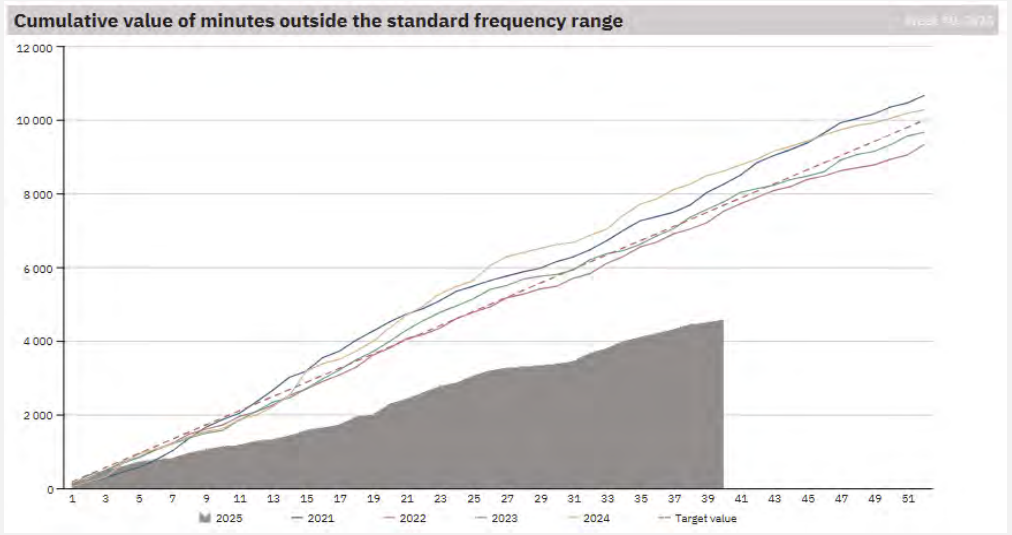
We have solutions with high uptime, contributing to better balancing management and increased operational reliability

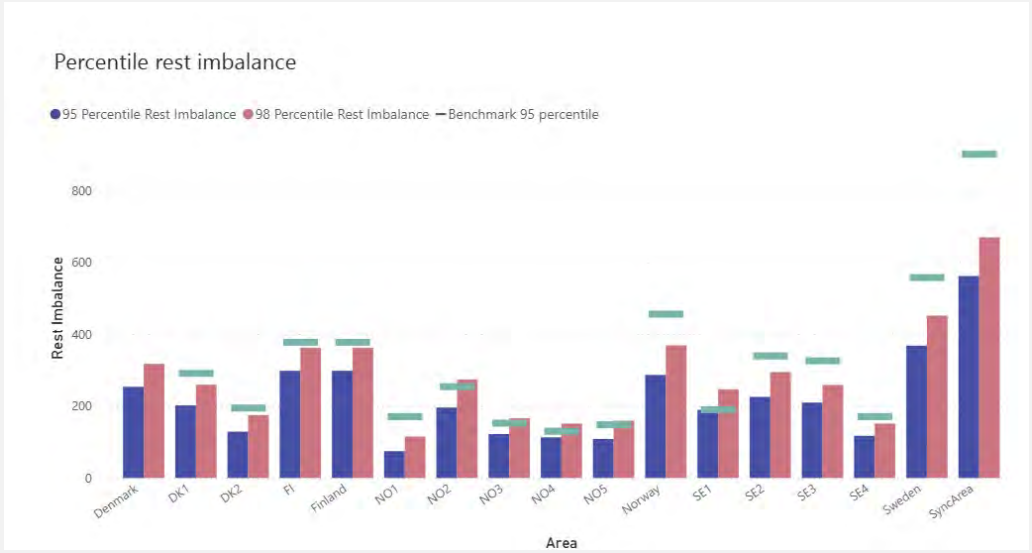

Marked

Nå er det nye markedet endelig i gang – og det virker

Kraftmarked

I dag skjer den store omleggingen: Dette tenker aktørene





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Experiences after go-live 15 min MTU in day ahead

Smoothtransition with very few errors across all European bidding zones and borders

SDAC PRESS RELEASE

01 10 2025

15-Minute MTU in SDAC Was Implemented

The 15-minute Market Time Unit (MTU) in the Single Day-Ahead Coupling (SDAC) has been implemented across all European bidding zones and bidding zone borders on trading day 30 September 2025 for delivery day 1 October 2025.

In line with the agreed go-live process, project parties will closely monitor the stability and robustness of system performance over the coming days of operations. Market participants will be promptly informed of any relevant developments.

About SDAC

SDAC allocates scarce cross-border transmission capacity in the most efficient way by coupling wholesale electricity markets from different regions through a common algorithm, simultaneously taking into account cross-border transmission constraints, thereby maximizing social welfare. The aim of SDAC is to create a single pan European cross zonal day-ahead electricity market. An integrated day-ahead market increases the overall efficiency of trading by promoting effective competition, increasing liquidity, and enabling a more efficient utilization of generation resources across Europe.

For additional information on SDAC go to:

SDAC

Morning ramp-up in NO1: September 30 (top) vs October 1 (bottom)

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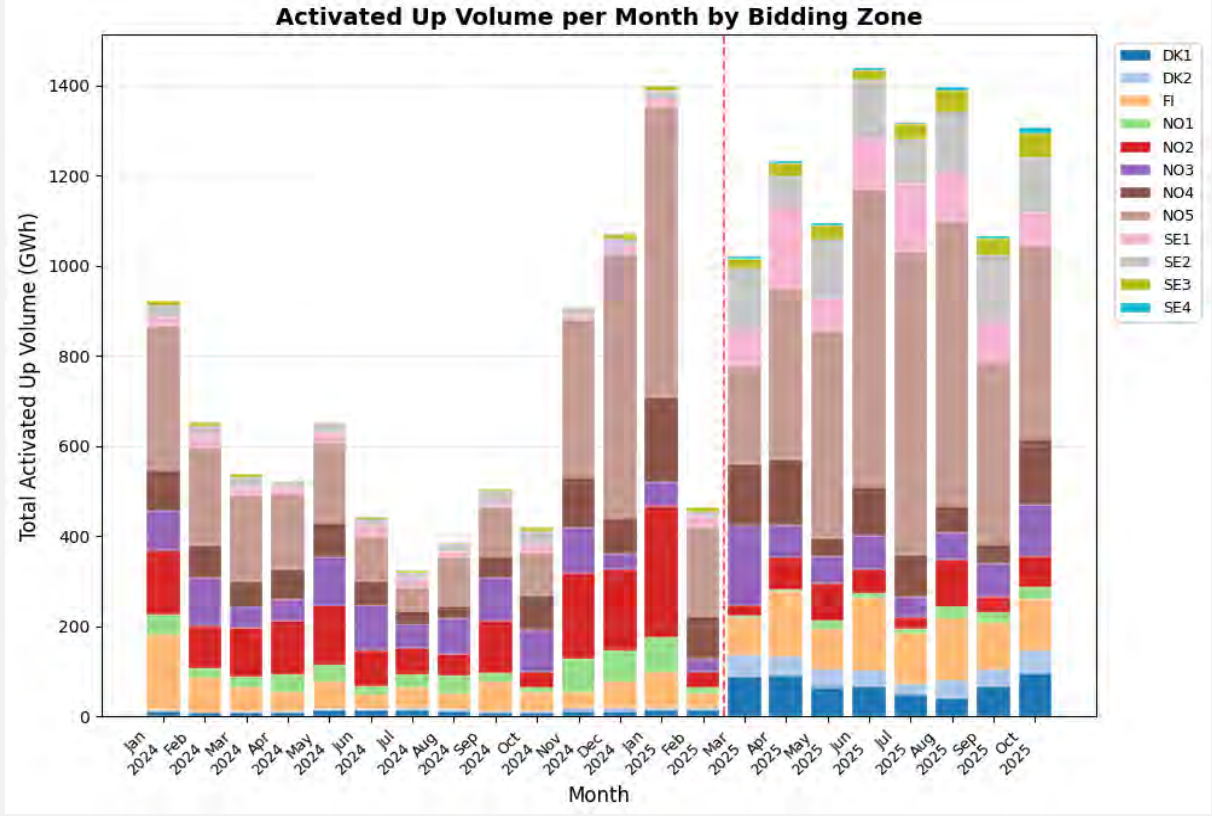
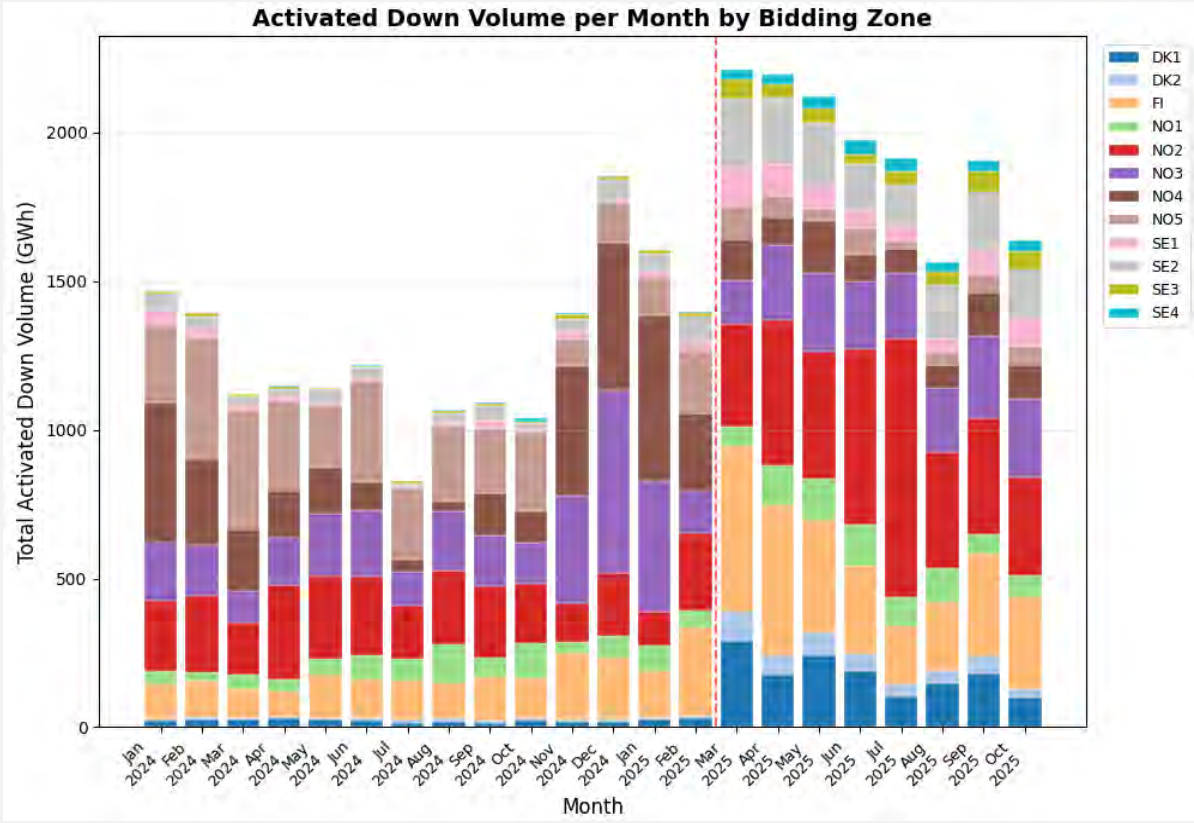
Activation Market: Volumes Activated





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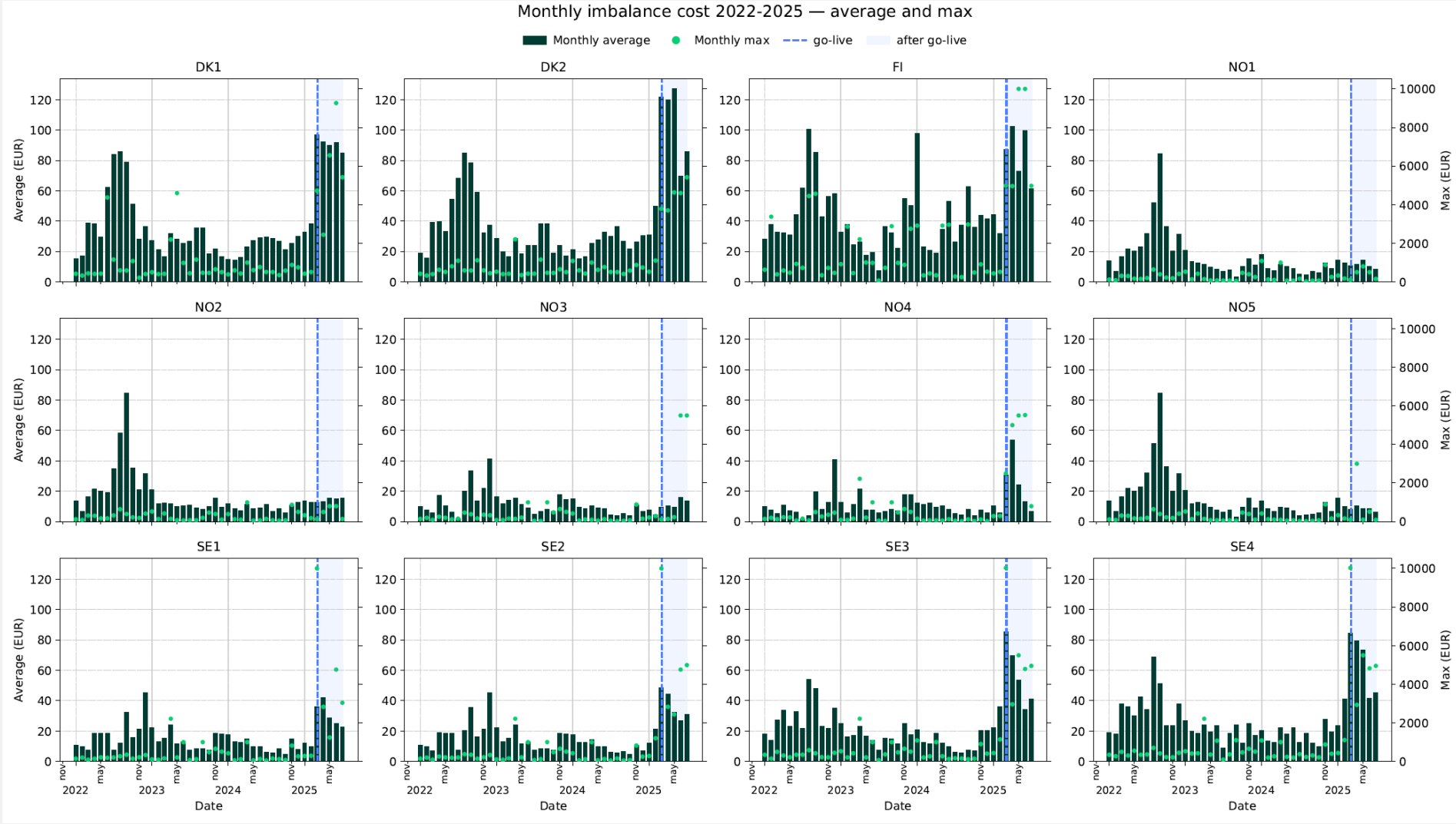
The changes also present certain challenges



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Automation also presents certain challenges

- Physical wear on power plants. In the past, operators had more flexibility to make real-time assessments to prevent unnecessary ramping and significant price swings and start/stop
- Automated Balancing – Strict Rules
  - No flexibility in interpreting capacities and bids
  - Operators cannot make pragmatic decisions
- Combined with lower capacities after flow-based, this leads to more volatile activations and prices in the mFRR market
- Error in pricing algorithm has caused delayed publication of prices.

Daviktoss vannkraftverk i Modum kommune i Buskerud. Foto: Å Energi

VANNKRAFT

Slitasje på vannkraftverk øker prisene i balansemarkedet

(Montel) Automatiseringen av balansemarkedet (mFRR) fører til større belastning på kraftverkene som aktiveres, ifølge flere produsenter. Det har bidratt til å øke prisene i markedet.

En fysikk-leksjon der hvor kraftmarkedene møter den virkelige verden

Statkraft ønsker automatiserte balansemarkeder og høyere tidsoppløsning velkommen. Samtidig sender de et varsko til Statnett om at digitaliseringen har sin pris ute i kraftverkene.

Statnetts algoritme setter kraftkjempen i skvis – balansebud slettes og kostnadene stiger

Analyser viste at en fjerdedel av budene i reguleringskraftmarkedet i NO4 har blitt stoppet av Statnetts nye og strenge algoritme. Dette vil påvirke investeringsbeslutninger, advarer kraftselskapet.

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Nordic mitigation measures

Already implemented:

- Improvements in the Nordic Libra algorithm, resulting in fewer unexplainable clearings.
- Encouraged market participants to submit fully divisible bids.

Work in progress:

- Analysing elastic demand and overall demand strategy.
- Changing the Nordic Libra algorithm regarding illogical price spread – this month
- In addition there are som local mitigation measures due to local differences, but we are working towards common alignment.
- Increased liquidity and good dialog and cooperation with market participants in the balancing markets is important going forward

The Nordic TSO's are sharing these experiences and lessons learned with the European TSO's, aiming for similar improvements in the European balancing platform Mari

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VATTENFALL

Recommendations and the Way Forward

#1 ATCE methodology for calculating initial capacity for the intraday and balancing market:

- Develop a new procedure for transmission system operators to recalculate and update ATC capacities before the balancing timeframe (based on the latest plans and updated forecasts).
- Run the ATC calculation on an hourly basis 1–3 hours before the delivery hour (exact timing TBD), where additional capacity is either released directly to the Balancing market/AOF or also during the last 1–2 hours of the intraday market.

AND Be realistic about implementation both timeline and efficiency on flowbased at the intraday auctions

- **The announced measures** concerning the AOF algorithm (deadband, functionality for direct activations, price sensitivity, special regulation etc.) **are most welcome but,** will have limited impact on price volatility as long the above remain unresolved.

Holistic view, customers in focus and act fast

Hafslund

15 minutes at a time – how flexible is hydropower?

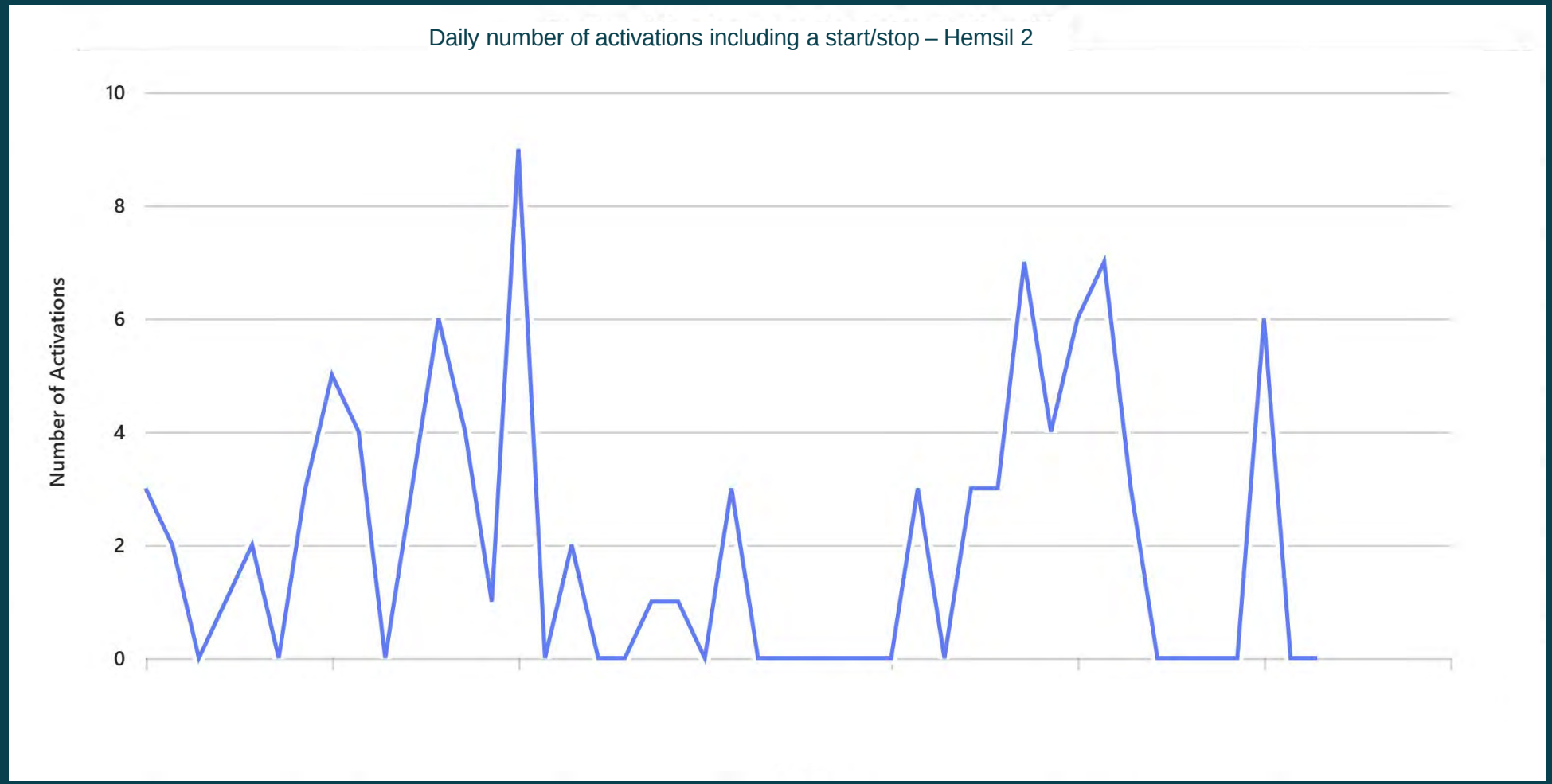
Marius Slette, Hafslund Kraft

Development recent years is more software than hardware

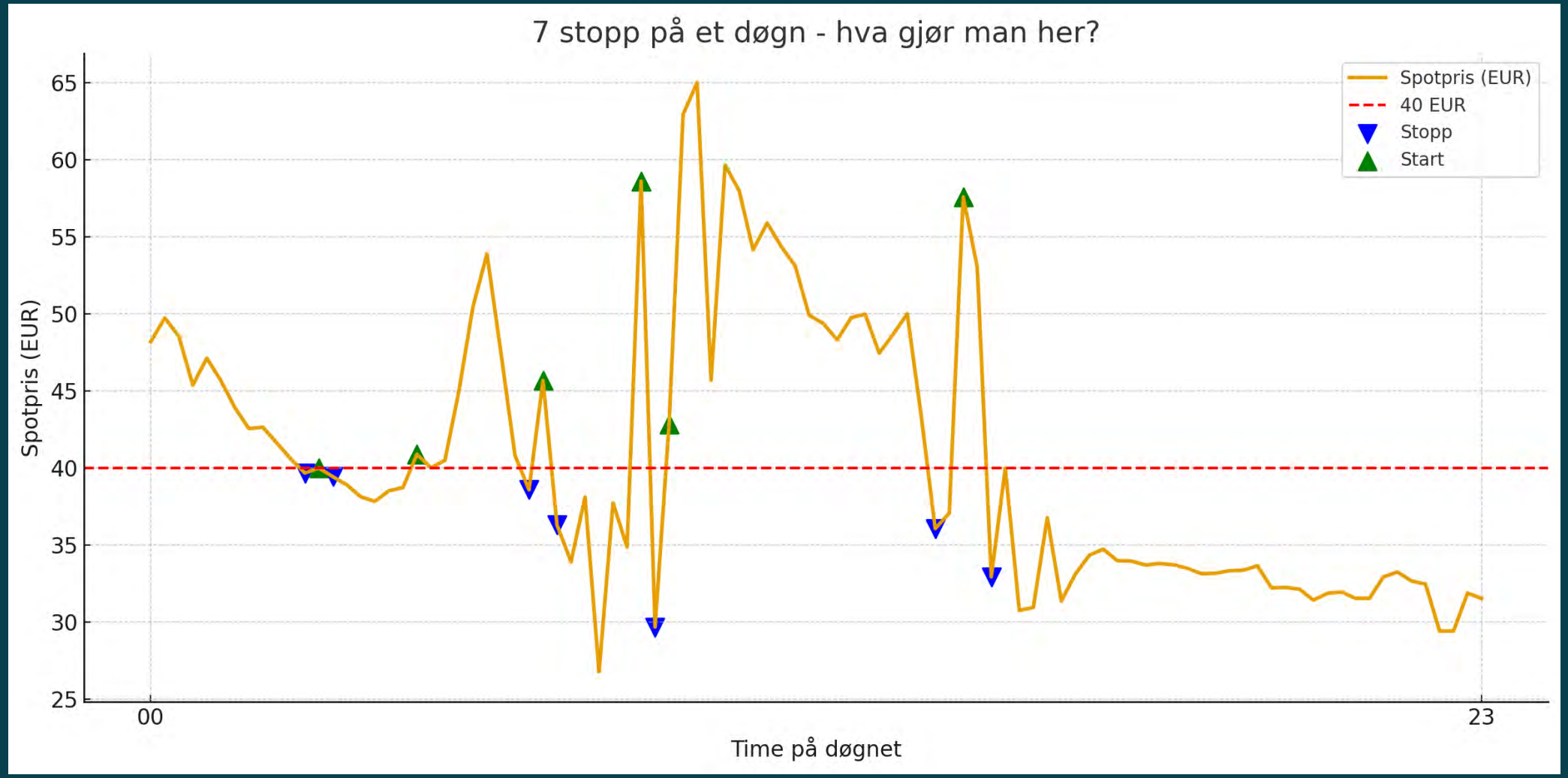
Tractor and transformer – Hemsil development, Hallingdal 1959

Truck and penstock – Hol development, Hallingdal 1952

mFRR EAM has led to more start/stop and increased stress on generators



30 October case: you are a producer with water value 40 EUR



Comment: generic example

Committed a volume leading to 7 stops – what do you do?

- Try to avoid it by:
  - Pricing in start-up and shutdown costs in all markets
  - Different block bids?
    - Increases complexity a lot – especially in cascading reservoirs
    - Manual block bids? ~75 generator units, 96 quarters, ~8 markets
  - Will 15-minute resolution lead to more multi-hour block bids?

- When the unwanted has happened
  - Optimize once more – SHOP could smooth out the start/stop in a larger portfolio
  - Intraday
  - Reduce number of start/stop – take on imbalance risk
  - Overburden the generators with too many start/stops

*«This **blinker production** is going to reduce expected life time of our plants by multiple years»*

Hafslund Operations Center on the frequent start/stop after mFRR EAM

Number of starts and stops is higher than before – how do we find the balance?

Reflections on NBM EAM

Tomas Hirsch Head of Energy Affairs

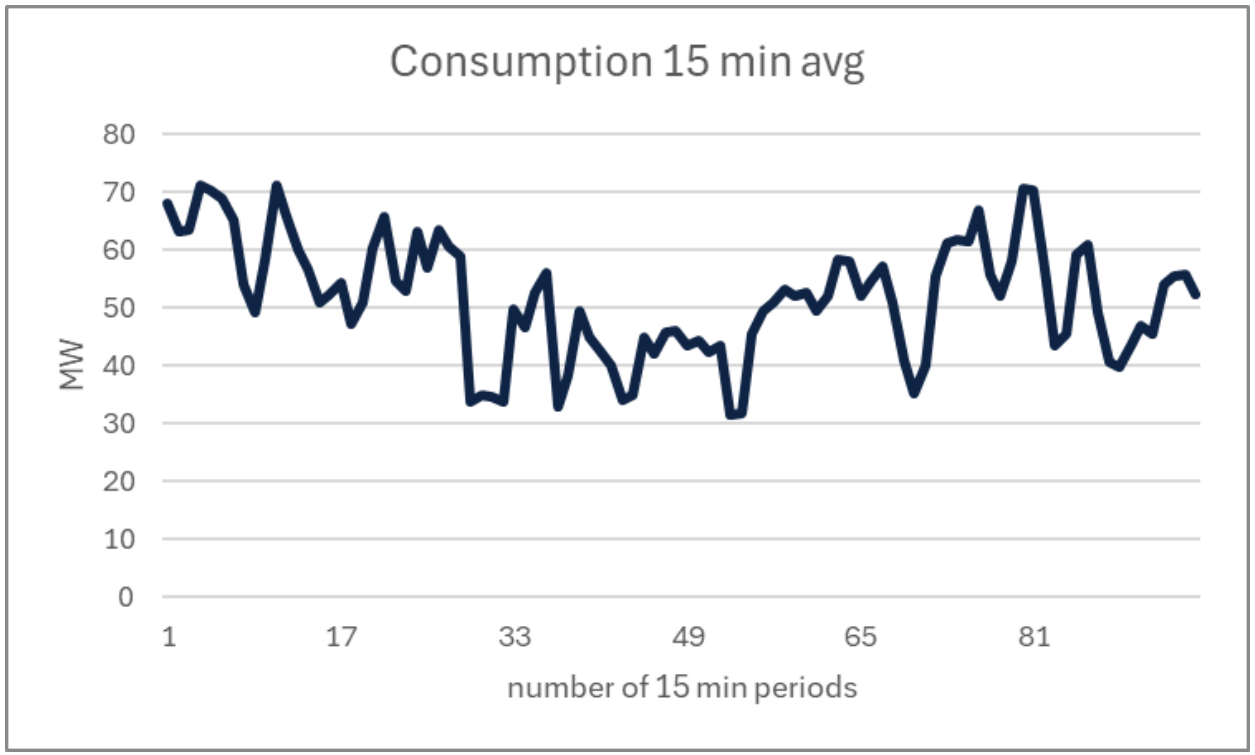
tomas.hirsch@ssab.com

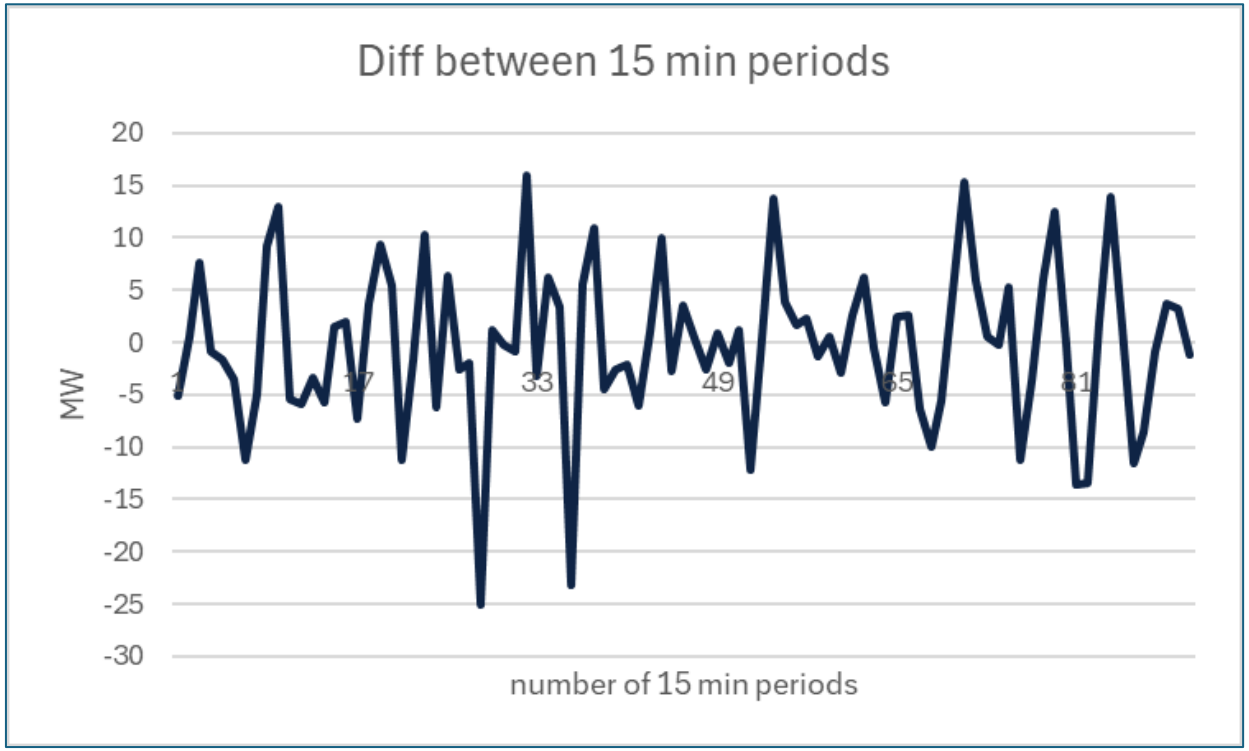
Energy intense industry of Sweden
exportvalue of 27 B€, ~30% of Swedens export
177 000 directly, or indirectly employees

Experience from mFFR EAM

- Forecast electricity consumption day ahead at MW level for a 15 min period is impossible for some industries
- Balancing cost have increased 4 – 7 times for industries that are BRP
- Very difficult to react on the market
  - Cannot just increase the power consumption
  - Direct cost increase, higher losses of goods and energy
  - Indirect cost increase, downstream production, logistic chains etc
- Indications that BRPs assesses that the risk is to high, and might leave the role

Forecasting of industrial processes, not a walk in the park





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Nordic Energy Regulators
POWER THROUGH COOPERATION

PANEL – DEBATE

Experiences with mFRR EAM & 15 MTU

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CACM 2.0

NordREG Wholesale & Transmission seminar
20. November 2025

Tore Granli
Market Design Expert
Statnett

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Market Coupling

- Market coupling is a critical infrastructure for TSOs and NEMOs
- Market coupling function is a monopoly function and should be separated from competitive activities
- It is therefore necessary that the governance and operation of market coupling is governed jointly at all aspects with joint responsibility for TSOs and NEMOs.
  - ✓ Terms conditions and methodologies
  - ✓ IT infrastructure
  - ✓ Decision making
  - ✓ Voting rules - QMV to be applied
  - ✓ Costs – no good arguments to use other keys than 50/50 between TSOs and NEMOs
- TSOs welcome that the Commission propose that
  - ✓ all TCMs will be joint TSOs and NEMOs
  - ✓ NEMOs and TSOs will have the same responsibility for the systems
  - ✓ Joint decision making based on QMV
- The phase-out of legal monopoly NEMOs should be expedited and MNA should be expanded throughout the remainder of the European market. This is a pre-requisite for even further improving governance of market coupling

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Fallback in day ahead market

- Nordic TSOs considers the current Nordic/Baltic fallback as more efficient than alternativs being applied
  - ✓Provides extra time to solve issues by allowing for a regional implicit auction in DA to keep running
  - ✓Reduces the risk for use of reference day in the Nordics
  - ✓Secures <u>one</u> price in each bidding zone for each MTU
    - More efficient reference price

- Nordic TSOs therefore welcome the provisions in CACM 2.0 to allow for regional solutions proven to be more efficient

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Access to market data

- Equal access to market data is a prerequisite for an efficient market

- TSOs welcome that the Commission propose that market data will be available free for use and reuse. This is a major step forward.

- But the proposal should go further
  - ✓Data should also be made available free for market participants
  - ✓Aggregated bidding curves should be made available

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Capacity Calculation Regions

- Nordic TSOs are satisfied with the current CCR configuration. With Hansa as a coordination region between Nordic CCR and CCR Core, we can develop capacity calculation methodologies within a region we know and manage ourselves.

- The CACM proposal introduces the possibility that a bidding zone border could belong to two CCRs. Such changes would increase coordination efforts and put pressure on the governance structure. This challenge becomes even greater if Hansa is removed, as Core TSOs and NRAs would then be part of the Nordic region.

- We must ensure that CACM 2 wording enables coordination at the highest level and preserves the Nordic region for Nordic TSOs and NRAs — now and in the future.

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NORD POOL
A EURONEXT COMPANY

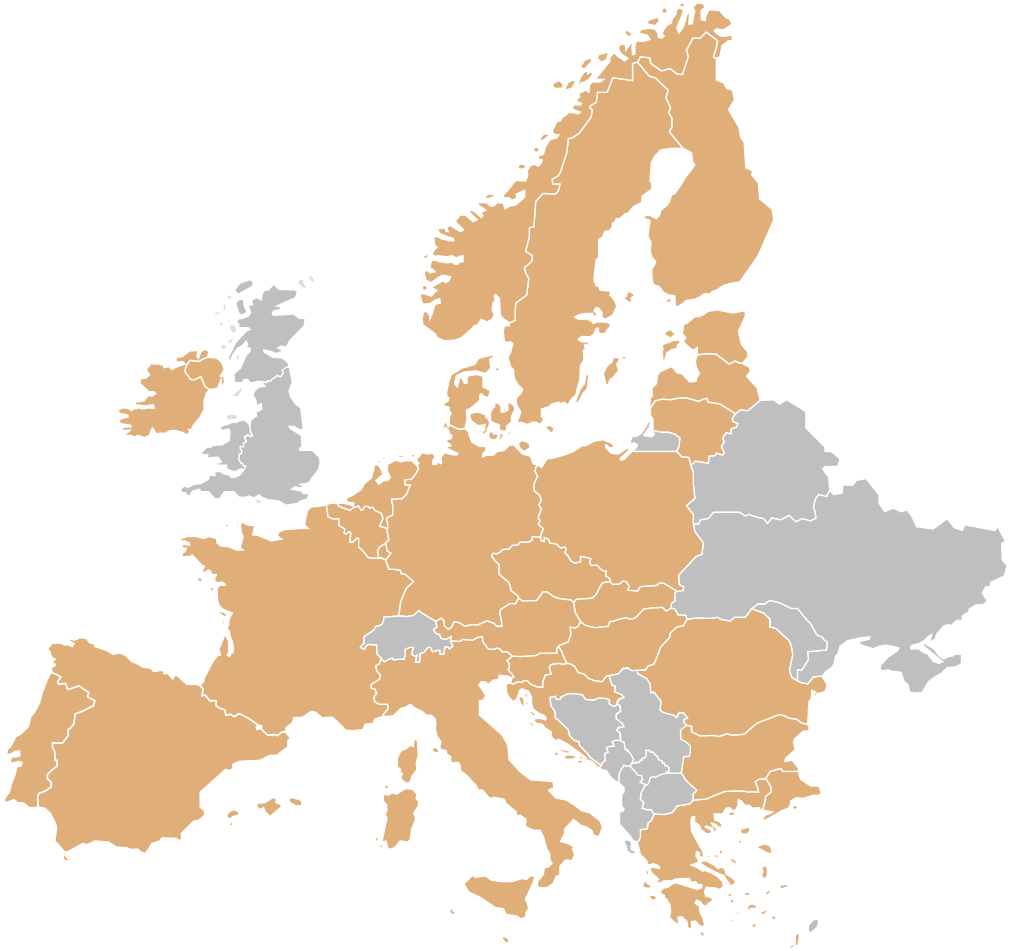
CACM 2.0 / SMCO

Improving the efficiency of market coupling and enhancing its governance

NordREG Meeting – 20 November 2025 - Oslo

Context

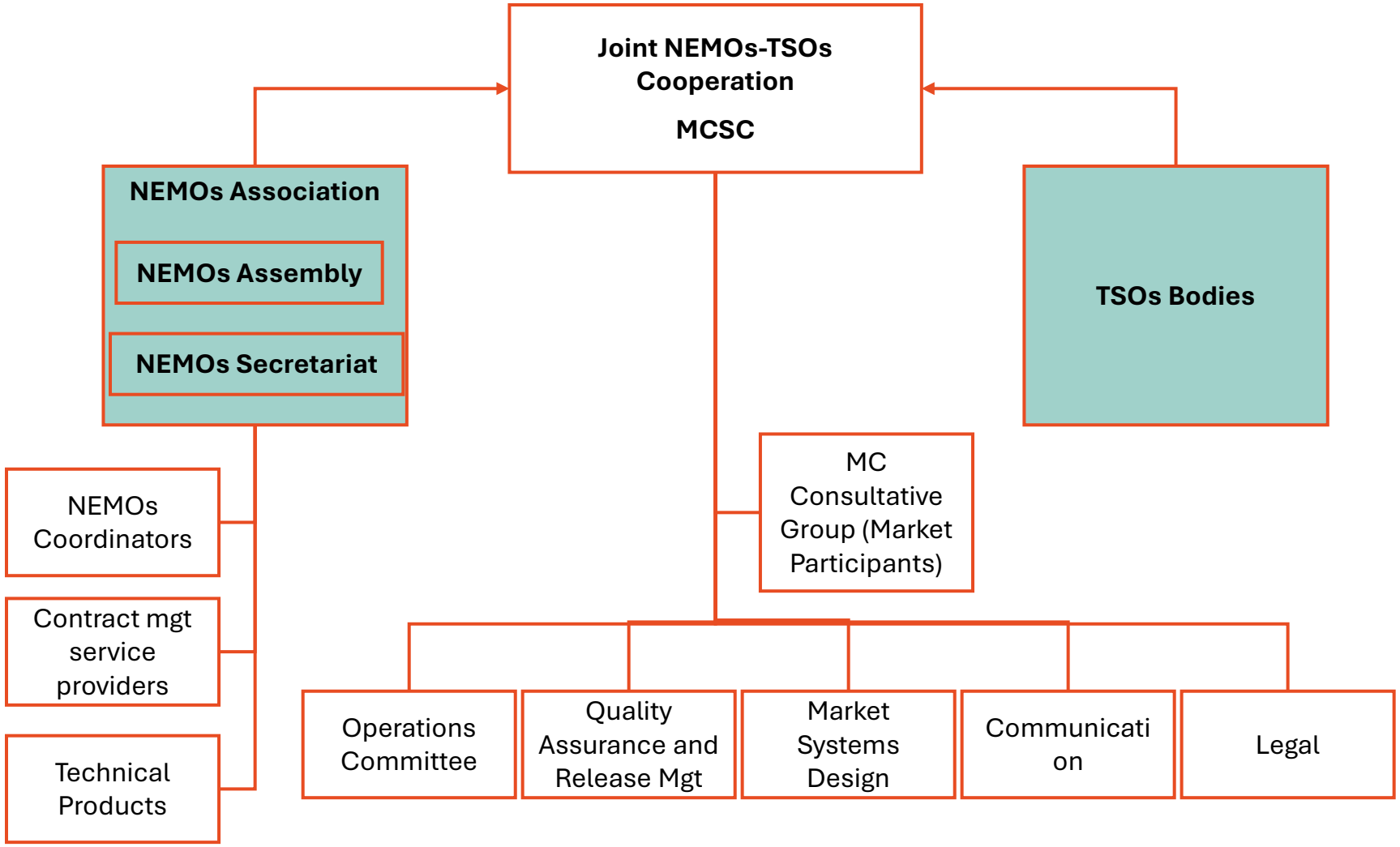
- Roles of TSOs and NEMOs in market coupling:
  - TSOs calculate capacity while
  - NEMOs manage market operations and price
- Governance issues and cost duplication is recognized and should be addressed
- Improvements of NEMO Governance should result in **increased efficiency, agility and accountability**
- This proposal constitutes a way forward given the **absence of legal basis** to mandate the establishment of a SMCO entity in CACM
- Reforms include **streamlining governance, reducing coordinators, and adopting Qualified Majority Voting**



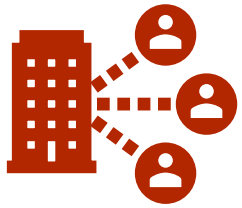
This proposal addresses all EC concerns, with lower cost and faster implementation

Governance reform proposal in a nutshell

- Establish new NEMO Association
- Reform joint NEMO-TSO cooperation
- Clarify responsibilities
- Introduce EU Qualified Majority Voting (QMV)
- Limit number of dedicated expert staff



Streamlining the existing joint NEMO-TSO governance and the NEMO-only governance



- Reforming the existing joint NEMO-TSO cooperation and establishing a **new NEMO Association**
- Revising and clarifying the **scope of responsibilities** allocated solely to the NEMOs and those allocated jointly to NEMOs and TSOs
- Restructuring **decision-making processes**, by amending and further expanding, the use of Qualified Majority Voting based on the well-established Lisbon Treaty procedures (EU QMV)
- Both should employ a **limited number of dedicated expert staff** to ensure the timely delivery of the allocated tasks by NEMOs and TSOs
- All **costs incurred in connection with the MC function** should be recovered via network tariffs in accordance with a **harmonized pan-European methodology** including reward/penalty measures, guaranteeing
    - the same compensation rate in all Member States
    - ensuring a level playing field among NEMOs
    - fairness for market participants and final consumers
- Further simplify and harmonize NEMO and TSO **technical requirements** to simplify operations and make them even more robust

Streamline governance, reduce coordinator count, retain robust operations and a fair playing field

Streamlining the Joint NEMO-TSO Cooperation

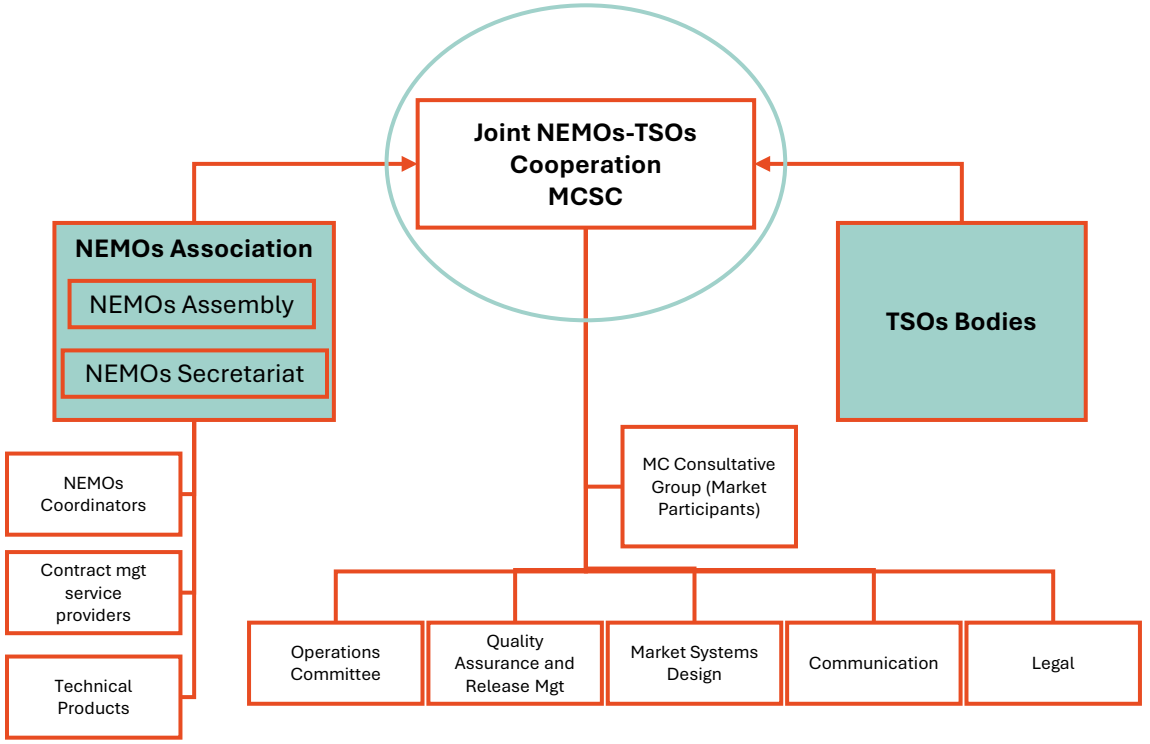
The Joint NEMO-TSO Cooperation (today's Market Coupling Steering Committee – MCSC – including its Working Groups and Task Forces) would be responsible for:

- **the implementation of all joint NEMO-TSO SDAC and SIDC projects** (e.g. the equivalent of today's 15 Minutes MTU, co-optimisation and enlargement to the Energy Community (EnC) Parties);
- the **coordination of TSO and NEMO development** requirements for the SDAC and SIDC solutions;
- and the **drafting of proposals** for the joint NEMO-TSO terms, conditions and methodologies in accordance with current CACM text, to be presented to ACER for approval.
- Annual roadmap with quarterly updates

Further, it should

- Have a **limited number of staff** to ensure **the timely delivery of tasks.**
- Act as the **single point of contact** towards EU institutions, ACER, member states and market participants for the matters that fall under its competence.
- Voting rights allocated 50% to NEMOs and 50% to TSOs. Then, all decisions would be taken **based on Qualified Majority Voting (EU QMV).**

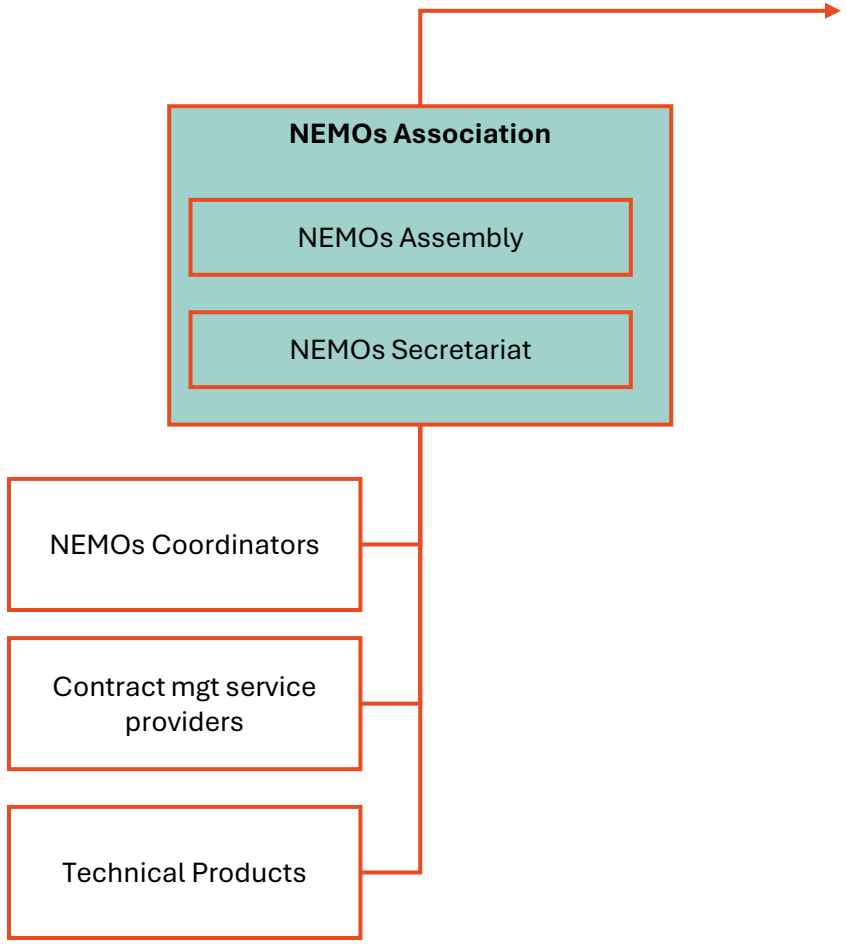
Simplify operations, ease the overall regulatory monitoring



Streamlining the NEMO governance 1/2

The NEMOs should establish an Association e.g. a non-for profit association under Belgian law, such as ASBL (Association sans But Lucratif (ASBL) or European Economic Interest Grouping (EEIG) which would take all decisions according to the EU QMV set forth in the current draft of CACM 2.0 proposal. The NEMO Association would have following main tasks:

1. **Overseeing performance** of NEMO Coordinators
2. **Submitting proposals to ACER** for terms, conditions and methodologies
3. **Approving requests** to develop the SDAC and SIDC algorithms that affect exclusively NEMO systems and tasks.
4. Acting as a **single point of contact** and single voice for European Authorities and other stakeholders
5. **Providing information** related to the single day-ahead and intraday coupling in accordance with the relevant methodology
6. **Providing data and information** that ACER or national regulatory authorities may require in order to monitor that the objectives of this regulation are being fulfilled



Level-playing field amongst NEMOs, transparency and efficient regulatory oversight

Streamlining the NEMO governance 2/2

☐ **Decision making**

Majority of decisions taken by a **revised QMV,** based on the EU-QMV model and adapted to ensure fair and proportional representation of all NEMOs.

Unanimity should only apply to the following decisions:

- any decision related to the application and interpretation of operational procedures by the NEMO Coordinators (other than decisions made in the context of the resolution of any incident); and
- any decisions related to the resolution of operational incidents by the NEMO Coordinators.

☑ **Clearing & Settlement**

The financial settlement of transactions should continue to be based on the existing, low risk and efficient framework as agreed between NEMOs, TSOs and financial Central Counterparties today. This model has proven:

- its **resiliency** during the energy crisis of 2022;
- its **scalability** with the entry of many new NEMOs and bidding zones;
- its **robustness compared to a single CCP**. Under the current framework, if one NEMO is unable to clear, market coupling can still produce results for all the remaining NEMOs. If the central CCP is unable to clear for whatever reason (e.g. cyberattacks), a full decoupling ensues;
- its **ability to create a harmonized framework over time**, as when contracts are extended to new bidding zones and parties, they tend to become much more similar to each other;
- its **ability to perform cross border shipping** (inc. transit) in an efficient manner.

☑ **Market Coupling Assets**

All NEMOs shall continue to have equal access right to the algorithms and other systems needed for the operation of the single day-ahead and intraday coupling for operation of individual local markets to all NEMOs (e.g. in case of decoupling; suspension of central systems) and operation of SDAC and SIDC.

Streamlining Cost Recovery and Technical Requirements

☐ **MC Cost Recovery**

Cost allocation and recovery should be **harmonized through a pan-European methodology**.

- Shared between TSOs (50%) and NEMOs (50%)
- All costs incurred in connection with the MC function should be eligible for recovery through regulatory recognition in network tariffs, according to EU-harmonised rules, to ensure the rate of recovery for each cost category is the same in all Member States.
- Methodology based on the incentive regulation principles and include reward/penalty mechanisms to continuously improve performance and control spending.

☑ **Technical requirements**

NEMOs have already centralized the coupling part of the process

- One set of operational procedures
- One version of the algorithm
- One Coordinator per trading session

☐ **Further simplify and harmonize the technical landscape:** TSOs should agree on a single communication tool across CCRs to exchange cross-zonal capacity information and market results with the Coordinator NEMOs. This harmonisation will lead to:

- Simplified, more secure, operations
- Easier change management and project implementation, with quicker lead-time to market

Conclusions

NEMOs recognize challenges, but are concerned about unproportional, undemocratic CACM 2 proposal lacking a legal basis

The presented proposal addresses all EC concerns, with lower cost and faster implementation

All EC's concerns can be solved in a less drastic, legal manner

We ask for your support in implementing something which makes common sense in a liberalized and competitive spot power market

RME

The upcoming network code on demand response (NC DR)

What is it about and what to expect

Alexander Kellerer

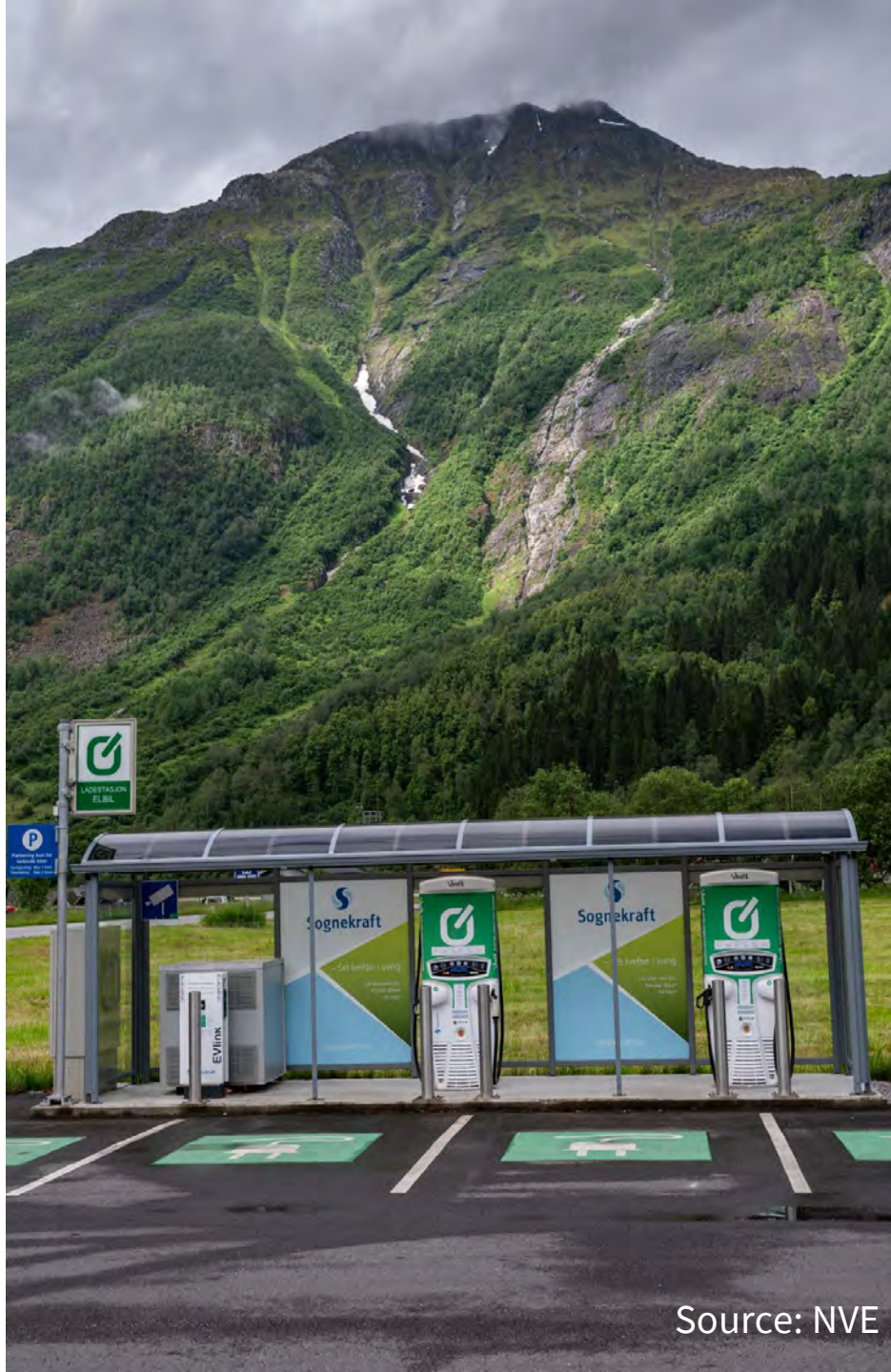
Senior Adviser - RME

Oslo, 20.11.25

Why a network code on demand response (NC DR)?

- **Decentralised resources on distribution level** are reshaping the dynamics in the power system
  - Growing interdependency between transmission and distribution level due to bi-directional power flows
  - DSOs are likely to play a more prominent role in the future's system operation
  - Increasing network congestions require new automatised tools and solutions
  - Stronger coordination between TSOs and DSOs is needed

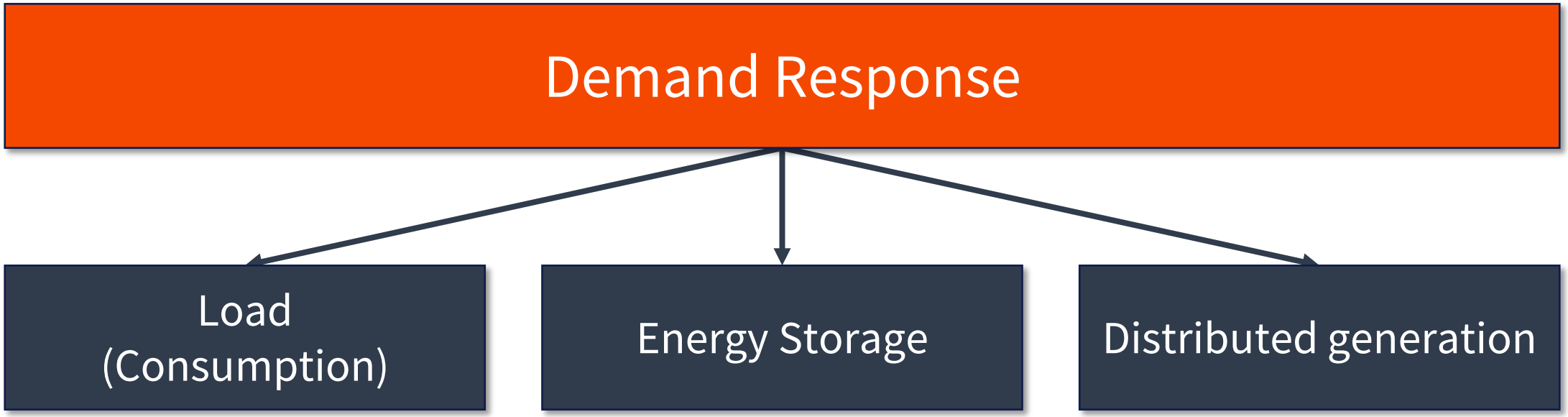
- With more intermittent renewables, the potential to **harness additional flexibility from the production side appears limited**
  - Demand side flexibility remains largely untapped
  - Clear and predictable price signals to incentivise demand side flexibility
  - Organised electricity markets must become more open towards smaller market participants



Source: NVE

RME

What does the term «demand response» cover?



«Decentralised resources»

The content of the NC DR

Enable active participation and new business models

- Aggregation & Independent aggregation
- Lower minimum bid size in balancing markets
- Requirements to enable value stacking
- Principles for baselines & measuring demand response
- Rules for shared ownership of energy storage

Simplified market access

- Harmonised & simplified product prequalification
- Product verification whenever possible
- Establishment of flexibility information systems

TSO/DSO & DSO/DSO coordination

- Responsibilities of DSOs and TSOs
- Data exchange between DSOs and TSOs
- Establishment of DSO observability areas
- Forecasting and detection of congestion and voltage issues
- Distribution network development plans

Provide system operators with new market-based tools

- Market-based congestion management
- Market-based voltage control
- Interaction with non market-based measures
- The role of local market operators
- Interaction with other exisiting markets

Topics excluded from the NC DR

- **Implicit demand response og network tariff design**
- **Incentives given in the TSOs' and DSO's economic regulation**
- **Many topics related to electricity retail markets (with some exceptions)**

Timeline and process for establishing the NC DR

Step 1

Oct 2021 – Feb 2022

ACER's scoping exercise

(Finished)

Step 2

Jun 2022 – Dec 2022

ACER's framework guidelines

(Finished)

Step 3

Mar 2023 – May 2024

ENTSO-E's and EU DSO Entity's proposal for a new network code

(Finished)

Step 4

May 2024 – Mar 2025

ACER amends proposal
+
Sends recommendation

(Finished)

Step 5

Mar 2025 – Q1 2026

Commission amends proposal
+
Comitology process

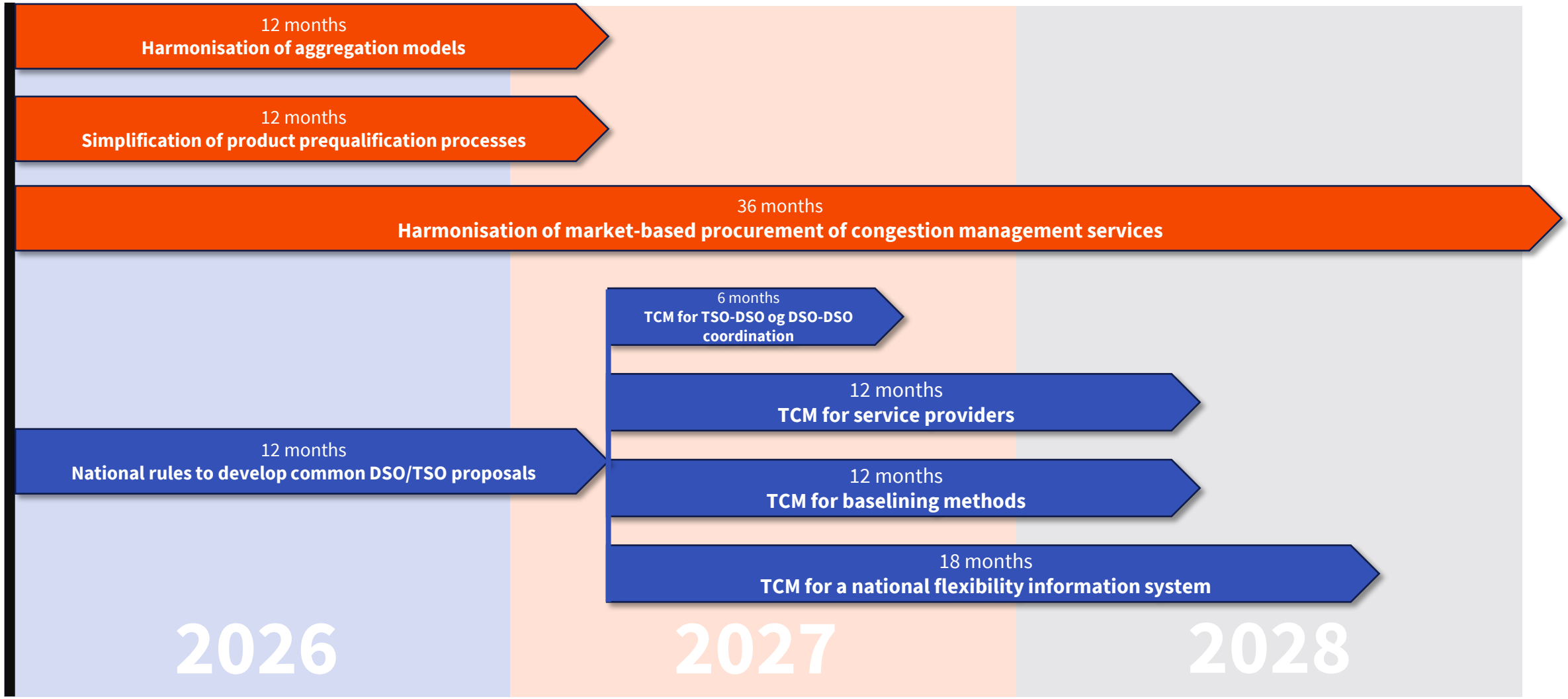
(Ongoing)

Novel features compared to previous network codes

- **TSOs and DSOs will need to cooperate** more closely
  - ENTSO-E and EU DSO Entity must develop joint European TCM* proposals
  - Member States need to determine how national proposals need to be developed
- Many solutions **need to be developed from scratch**
  - Limited business-as-usual experience makes it difficult to define European target models
  - The NC DR therefore foresees primarily national solutions
  - Provisions in the NC DR are less descriptive to allow for future innovation
- The work will not only establish a new network code **but also amend exisiting network codes (EB, SO, DC**)
  - Demand response impacts the entire electricity value chain
  - Strong link with provisions in the Electricity Directive

*TCM: Terms and conditions or methodologies

Timeline for *Terms and conditions or methodologies* (TCMs)



*TCM: Terms and conditions or methodologies

What's next?

- When the NC DR enters into force, **the clock for developing the underlying TCMs* starts ticking**
  - National actors will need to devote considerable time and resources to define adequate national solutions
  - ENTSO-E, EU DSO Entity and ACER will need to start working on the European TCMs*.
  - ACER is already in the process to preparing several surveys that will become the basis for dedicated ACER reports on issues related to demand response
- **The regulatory framework is becoming more intertwined**
  - Growing number of cross references
  - Important to ensure compatibility between network codes during amendment processes
  - Increasingly challenging, requires a more holistic understanding of the regulatory framework

*TCM: Terms and conditions or methodologies

Thank you for your attention!

RME

Source: NVE Fotostrøm

NordREG
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Wrap up

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Thank you for participating!