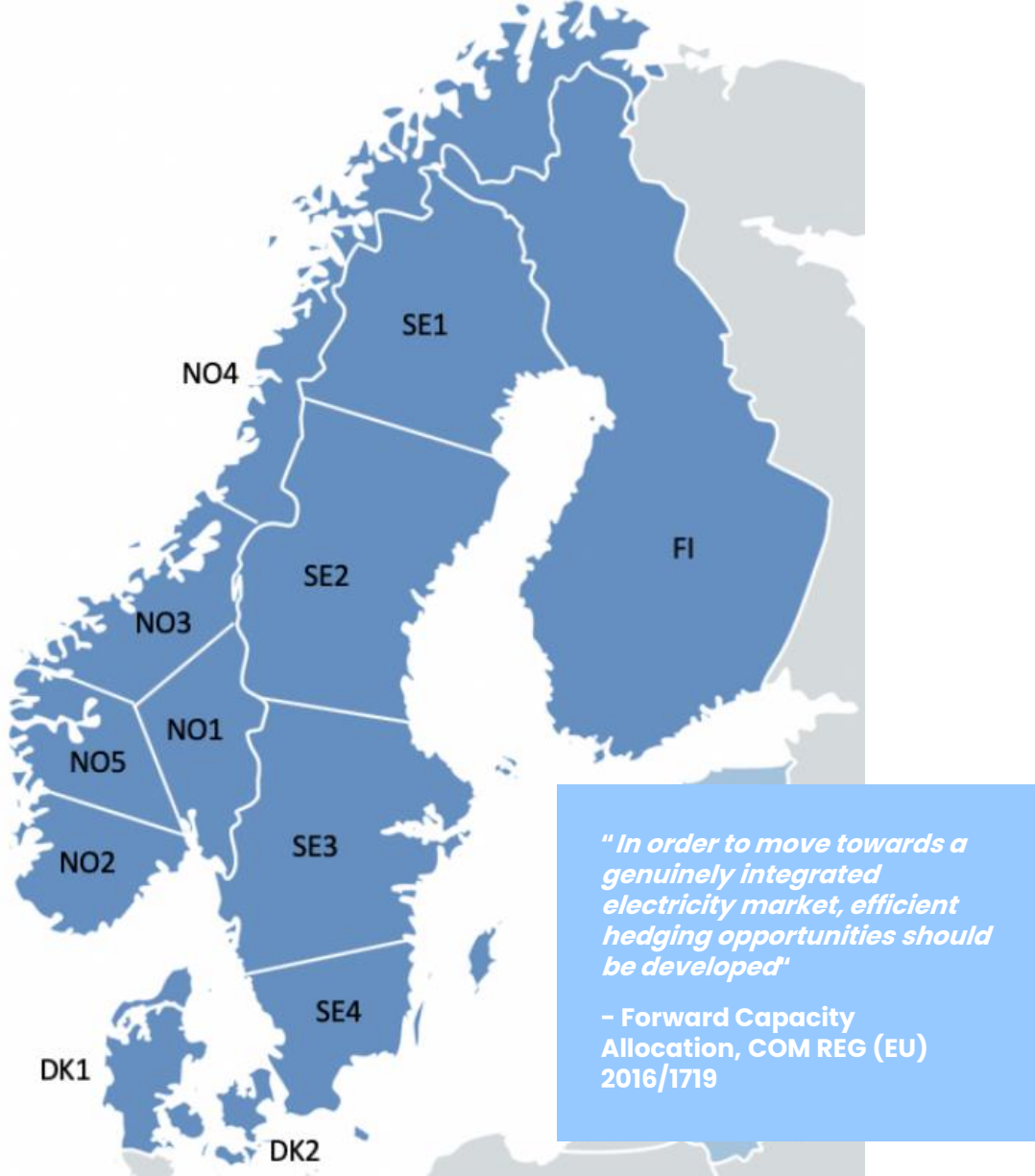


SVENSKA KRAFTNÄT



Designing and implementing EPAD auctions: experiences from Sweden



"In order to move towards a genuinely integrated electricity market, efficient hedging opportunities should be developed"

- Forward Capacity Allocation, COM REG (EU) 2016/1719

Agenda

- The Nordic power market
- Regulations
- Designing new cross border products
- Implementation and Impact
 - Auction setup
 - Results from 2023 and market development
- Key takeaways & Future development



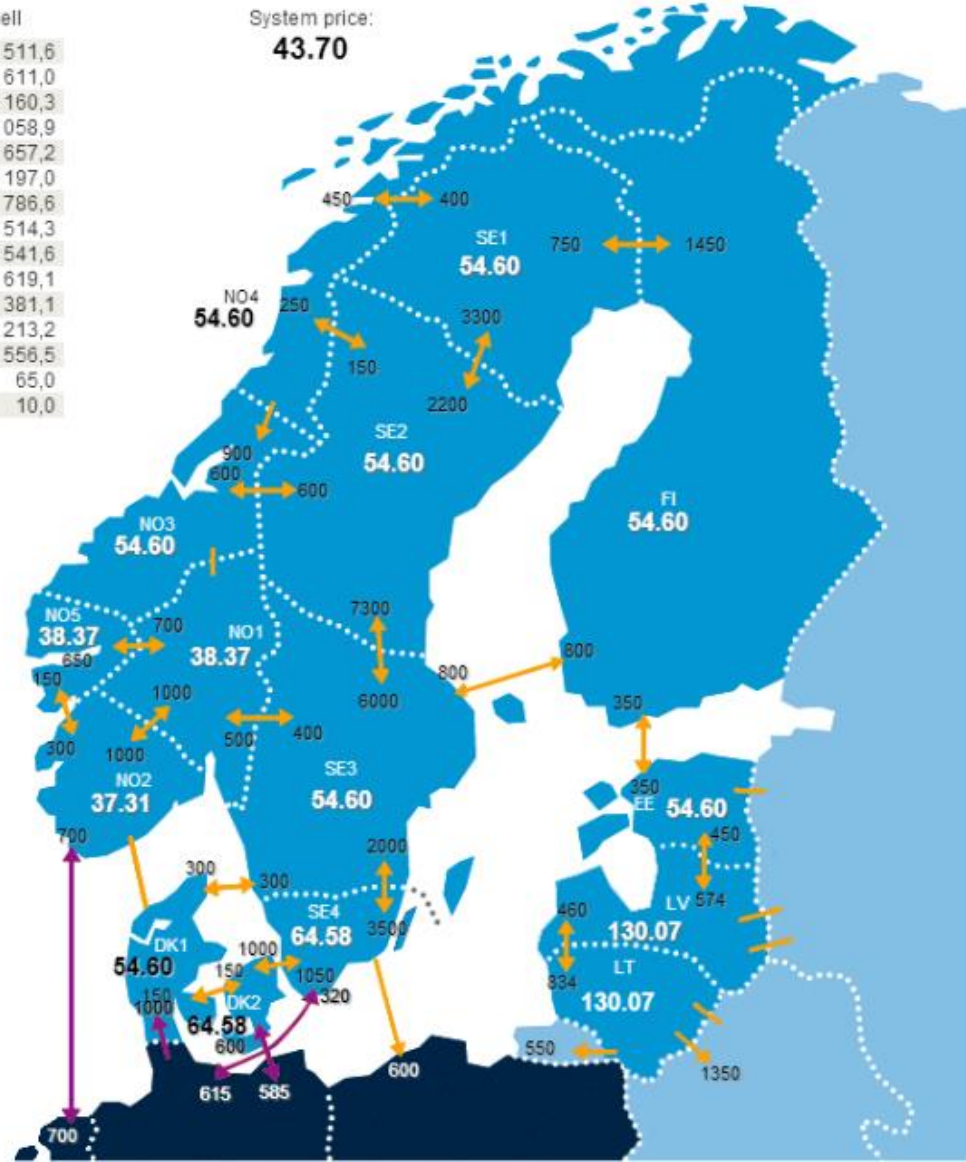
THE NORDIC POWER MARKET

Eislot volumes

	Buy	Sell
NO1	4 020,6	3 511,6
NO2	4 461,0	5 611,0
NO3	2 452,4	2 160,3
NO4	1 720,2	3 058,9
NO5	1 898,2	1 657,2
DK1	1 896,5	2 197,0
DK2	1 909,0	786,6
SE1	1 177,3	3 514,3
SE2	1 552,7	5 541,6
SE3	10 356,8	6 619,1
SE4	2 908,7	381,1
FI	5 978,8	5 213,2
EE	902,2	1 556,5
LT	432,7	65,0
LV	216,3	10,0

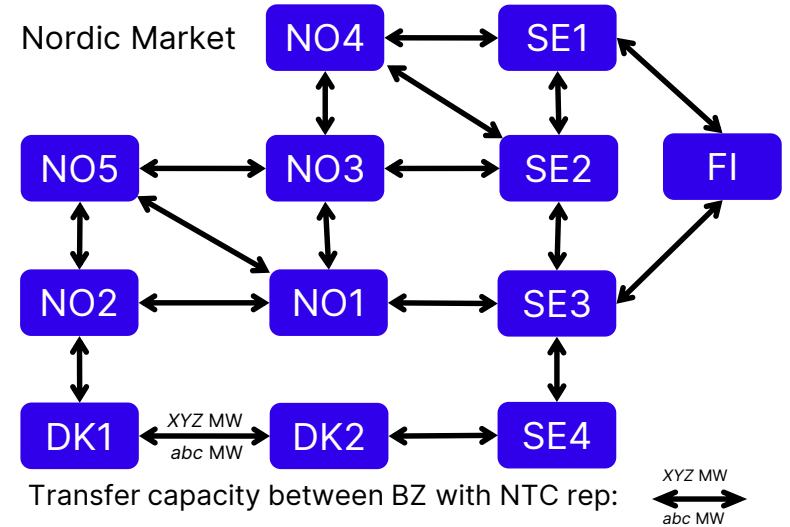
Capacities ↔

System price:
43.70



The Nordic Power market – Physical composition and trading

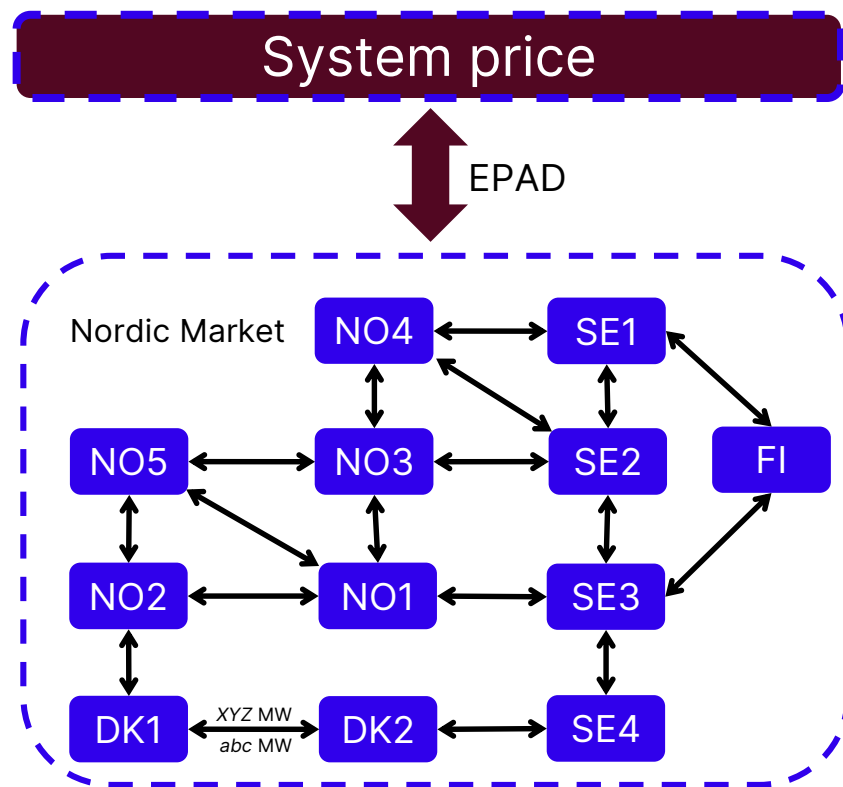
- The Nordic market was established in the late 1990:s.
- Consists of 12 Bidding Zone (BZ) from 2011 when Sweden became 4 BZ.
 - The BZs are of different size, many small a few large, and composition of production and consumption varies, highly weighted towards one side in several BZ.
- BZ prices: The equilibrium price for local sell and buy bids taking sell and buy bids of other BZ into account based on transfer capacity.
 - Original set by NordPools Dayahead market.
 - Now set by Euphemia.



[TWh]	Consumption	Production
NOR	133	158
FIN	87	72
SWE	134	172
DK	36	33

The Nordic Power derivative market model

- Due to the makeup of the Nordic Power Market a virtual price, System price, was introduced in order to pool liquidity for hedging purposes.
 - Providing a proxy hedge.
 - To get a firm hedge against the BZ price a Contract of Difference (CfD) is used.
- System price: The price of all aggregated sell and buy bids all BZ of the Nordic Market.
 - NASDAQ and EEX list System futures.
- EPAD (CfD): representing the difference of a BZ price and the System price. Used with the System price future to get a firm hedge against a specific BZ price.
 - EPADs are listed at NASDAQ.



Key regulations for
forward electricity markets:
EU Inner market for Electricity
Directives and Regulation
EMIR & MiFID II
National Regulations

Regulations

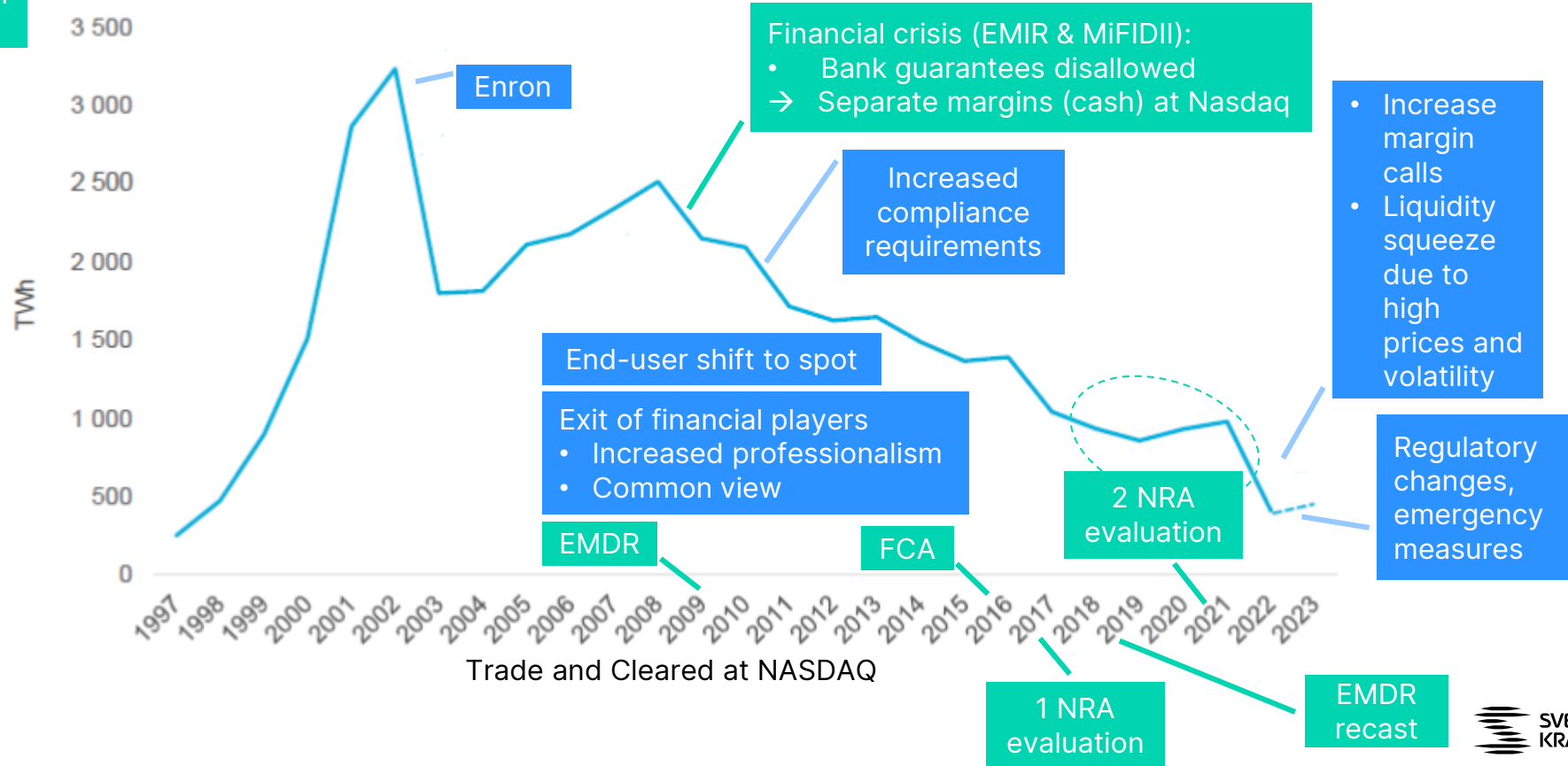
RELATED TO HEDGING ELECTRICITY

Key regulations concerning the forward electricity market

- REGULATION (EU) 2019/943 of the internal market for electricity, article 9:
 - a) Defines the obligation of TSO to issue transmission rights or have measures in place to hedge price risks across bidding zone borders
 - b) Defines the possibility for local NRAs to decide that a TSO is not obliged to follow a)
- COMMISSION REGULATION (EU) Forward Capacity Allocation 2016/1719, article 30:
 - a) Defines how NRAs shall evaluate liquidity in order to decide if the obligation from art 9 of Reg (EU) 2019/943 applies or not;
 - The evaluation shall be done at least every four years
 - b) If the TSO shall issue LTTRs or if other cross-zonal hedging products are to be made available
- EMRI & MiFID II
 - Change in collateral requirement to cash
 - Increased self auditing and reporting
- National Swedish legislation:
 - Forward markets not specifically regulated
 - Svenska kraftnät is a Swedish Authority
 - tasked with supporting the competition and functionality of the electric market

Development of the Nordic Power Derivatives market

- Market events
- Regulation events



Regulations triggering Svenska kraftnät to take action on forward markets

- Svk follows market development and consults market participants on their preferences for hedging.
 - Analysis and assessing ways forward, 2017 onwards.
- Evaluation of liquidity (FCA art 30) 2017:
 - Sweden: Liquidity low but not illiquid → No action.
 - Finland: Liquidity low but not illiquid → No action.
 - Denmark: Liquidity low but not illiquid → No action.
- Evaluation of liquidity in 2021:
 - Sweden: Liquidity decreasing → No decision.
 - Finland: Liquidity is too low → TSO evolution required.
- Evaluation of liquidity 2022:
 - Denmark: Liquidity is too low → TSO evolution required.

The timeline is six months for developing arrangements for other cross-zonal hedging products.

Concept for arrangements and pilot to test these take form, waiting NRA decision

Svk start development of measures to hedge price risks across bidding zone border (FCA article 30.5(b))

The decision on SE-FI borders was taken by ACER in September 2022

DESIGNING NEW CROSS BORDER HEDGING PRODUCTS

Svenska kraftnät's vision for forward markets:

An organic market where market participants can agree on pricing and terms for hedging risks with well-balanced and appropriate involvement of the transmission system operator, when necessary.

How best to create hedging opportunities and support liquidity?

Input of Swedish Market Participants, literature study and market analysis:

LTTTs require EPAD/Futures for "firm" price hedging	LTTTs shift the price risk between BZ; shifting liquidity	The need for hedging is mainly local	LTTTs increase complexity; additional collateral, instruments and time horizons	Nordic market has many small BZ and no natural hub; i.e. LTTTs are a ill fit
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A methodology is needed:

Provide liquidity in products that are already in use	Match TSO cash flow and natural exposure	Method adheres to Regulations	Implementation matches the timeline for of LTTTs in SE-SE-FI
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Engaging in the System Futures and EPADs market

Continuous trade using Market Making			Arranging auctions			
Pros		Cons	Pros			Cons
Continuous liquidity support	Acting on any trading venue(s)	TSOs need to set prices	Pools liquidity	TSO sets volumes not price	Independent of trading venue	Occasional liquidity support

How best to create hedging opportunities and support liquidity?

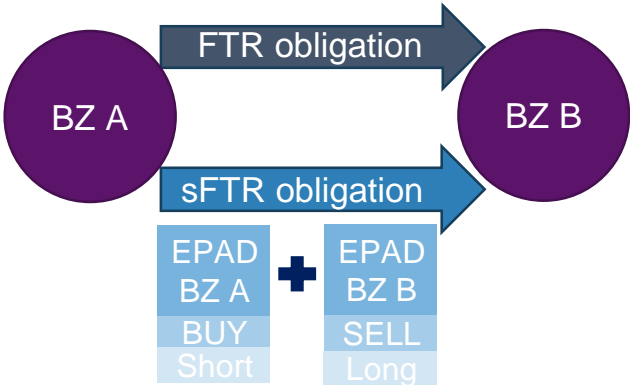
Svenska kraftnät' s concept – Frequent auctions

- The main principle is to use products that are already in use to strengthen liquidity
 - Combine and allocate them in a way that makes positions match TSO cash flow and natural exposure to physical trading and market;
 - i.e. provide cross border opportunities when specific criteria's are fulfilled.
- The unique feature may not be the zone-to-hub-like structure of EPAD contracts that are used
 - Rather, the issuance of contracts that in themselves provide efficient hedging opportunities to market participants is the key for efficient TSO support.
- Coupled EPADs/Futures facilitate competition between PXs/CCPs

Main feature of the concept Hedging Coupling Criteria

Heading coupling criteria;

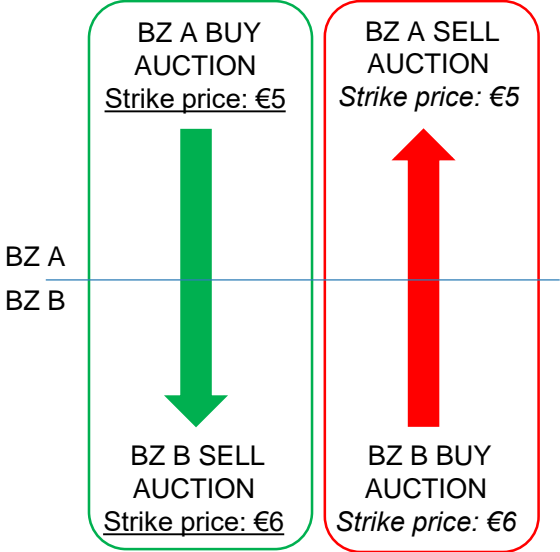
$$\begin{aligned}
 P_{BZA} &< P_{BZB} \quad (1) \\
 V_{BZB} &= V_{BZA} \quad (2) \\
 P_{FTRA \rightarrow B} &= P_{BZB} - P_{BZA} \quad (3) \\
 V_{FTRA \rightarrow B} &= V_{BZB} = V_{BZA} \quad (4)
 \end{aligned}$$



Allocation process

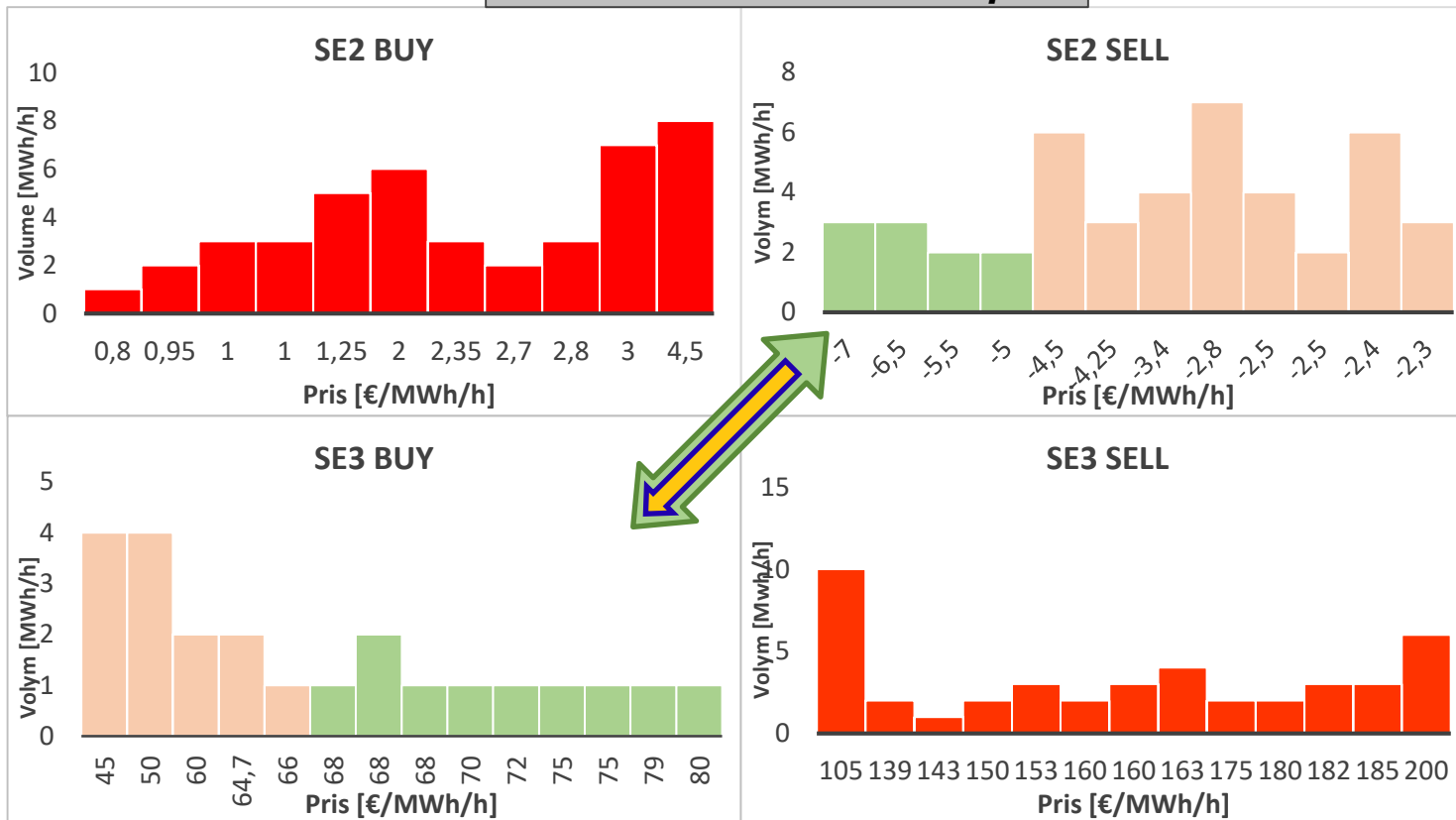
- The allocation process with multiple BZ is similar to DA-auctions.
 - In DA bids are match between BZ through physical capacity made available by TSOs.
 - Trades are settled through energy input (selling in BZ A) and loads (buying BZ B) in the grid.
 - In DA TSO act as import/exporters of a commodity.
- In the forward markets (FM) trades are settled against the difference of the strike price and the spot prices of a BZ.
 - Cross zonal trade in FM requires a explicit counterpart; i.e. TSOs.

4 auctions are run simultaneously, 2 auctions are matched
Additional hedging opportunities provided where they are most desired



Example of Hedging Product Coupling

Offered volume: 10 MWh/h



Auction rules

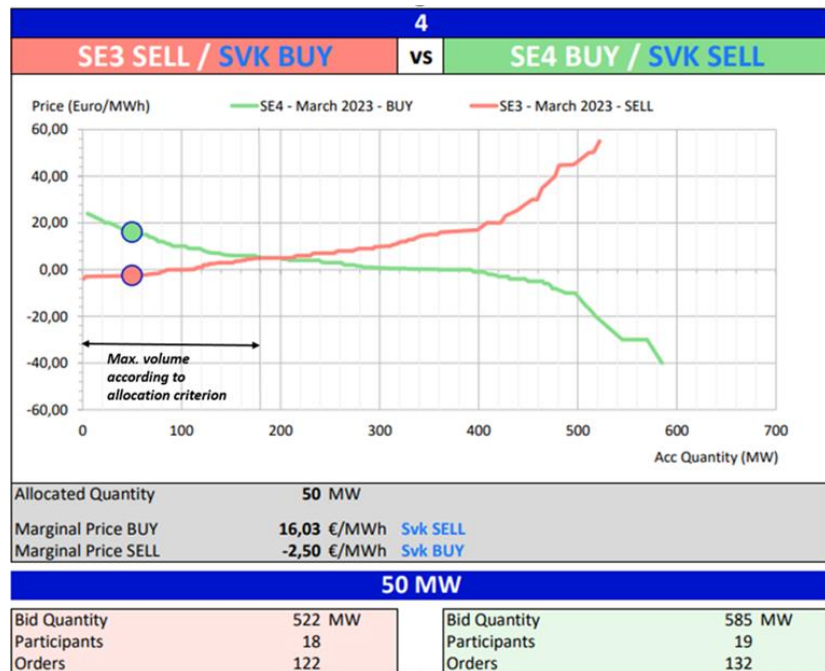
Auctions type:	Marginal price
Tick size	0,01 €/MWh/h
Lot size	1 MWh/h
Total volume	10 MWh/h
Min participants	5
Max allocation per participant	10 MWh/h
Max bid volume per participant	10 MWh/h

Auctions are labelled according to MP position, TSO position is opposite

BZ	Direction	Marginal price [€/MWh/h]	Volume [MWh/h]
SE2	SELL	-5	10
SE3	BUY	68	10

Allocation [not published]	Price [€/MWh/h]	Volume [MWh/h]
SE2 SELL MP 1	-5	6
SE2 SELL MP3	-5	4
SE3 BUY MP1	68	3
SE3 BUY MP2	68	4
SE3 BUY MP3	68	1
SE3 BUY MP4	68	2

also see annex on Pilot Auction example



IMPLEMENTATION AND IMPACT

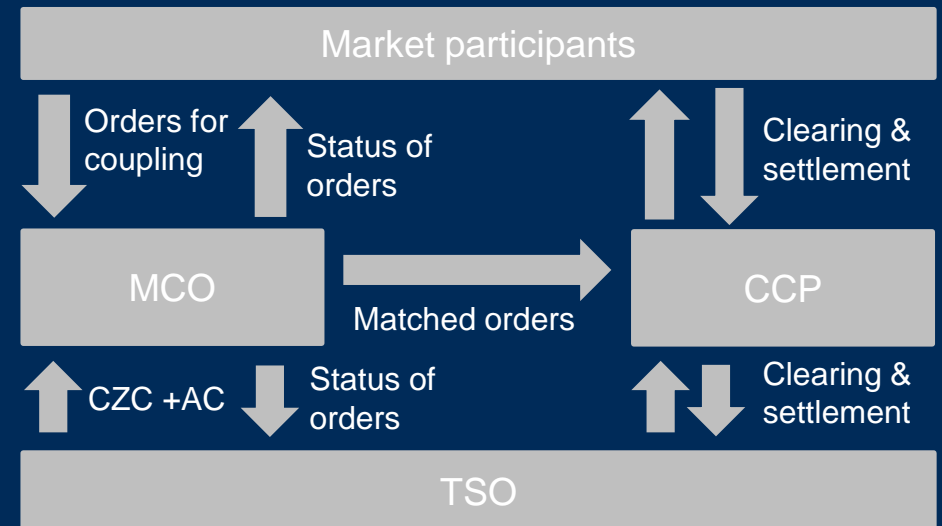
AUCTION SETUP

RESULTS OF 2023 AUCTIONS

Pilot auction set up

- EPADs for Y, Q, M in SE2, SE3 and SE4 are auctioned by Svenska kraftnät, bi-weekly.
 - EPADs listed and cleared by Nasdaq.
- The auctions are performed by the Market Coupling Operator, on behalf of Svk
 - Svk procured SKM for the service.
 - SKM receive bids from MPs, matches and clears these at Nasdaq Clearing(CCP) and publish results.
- The auctions follow the rules defined by Svk and SKM, published at SKM.
 - Main rule is the heading coupling criteria.
 - Calendar of times and volumes published in advance.
- Auctions run in parallel with continues trading at Nasdaq.
 - Auctions are explicit TSO to MP trades not a trading venue for MP to MP trade.

- The start up of pilot auctions discussed with the Ministry of Commerce and internally.
- The hedging coupling criteria and the set up of the pilot auction further development in dialog with Swedish MPs
 - Bi-weekly meetings with ref. group
- Svenska kraftnät management singe of on start in pilot
 - Procurement of MCO starts in August 2022



CZC = Cross Zonal Capacity, AC = Allocation Constraints,
MCO = Market Coupling Operator, CCP = Central Counterparties

Formal arrangements similar to the pilot auctions

- In September 2022 ACER decide, FCA article 30.5(b), that other cross-zonal hedging products are made available between SE-FI borders
 - Svenska kraftnät and Fingrid developed arrangements
 - Svenska kraftnät submitted these to its NRA
 - Fingrid didn't submit these to its NRA
- Development is on going on SE-LT borders by Litgrid and Svenska kraftnät
 - Submission in November
- The Norwegian Regulator decide that Statnett should develop and implement
 - Auctions are planed for later in 2024

Results of 2023 auctions

Short recap

An overview of the EPAD auctions in 2023 and the survey responses can be found in Svenska kraftnät's [review](#).

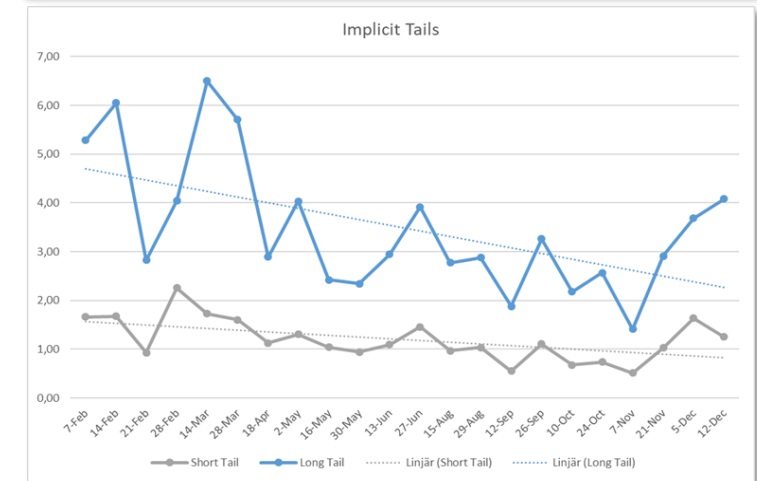
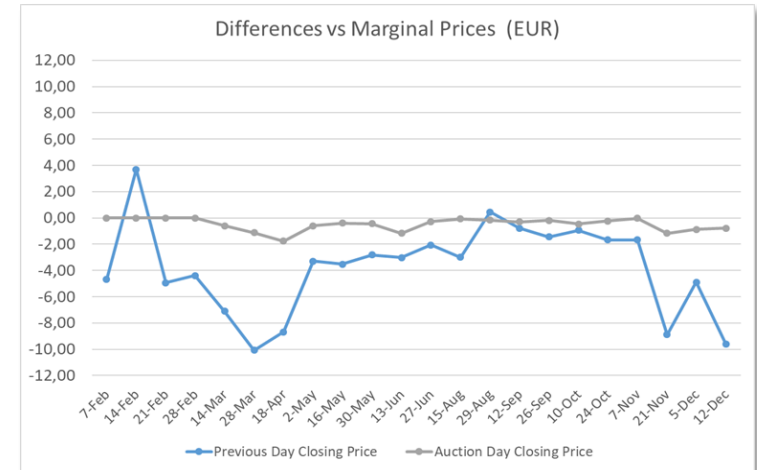
- First EPAD auction in February 2023, then about every two weeks, a total of 22 auction occasions and a total of 376 auctions.
- Contracts for a total of 22.6 TWh, approx. 10% of the average annual transmission capacity between SE2, SE3 and SE4, were settled in 2023.
- The turnover of EPADs in SE2, SE3 and SE4 increased by 68% from 2022 to 2023, while the turnover in the rest of the Nordic region decreased by 33%.
- Trade in Svk's auctions accounted for approx. 35% of turnover for EPADs in SE2, SE3 and SE4.
- On average, 20, at most 26 (12/12) and at least 16 (21/2) market participants participated in an auction.
 - In total 27 unique market participants.
- The Bid-to-cover of the auctions was an average of 5.0

Results of 2023 auctions

Transparency and price formation

Auctions have contributed to transparency and price formation.

- Prices after auctions are steady but prices right before the auctions differ.
- The tails, i.e. the difference of the bids around the clearing prices, indicating that the marginal price is a relatively good reflection of market participants general price expectation.
- A general trend towards smaller difference in all the metrics, with the exception of the last auctions.

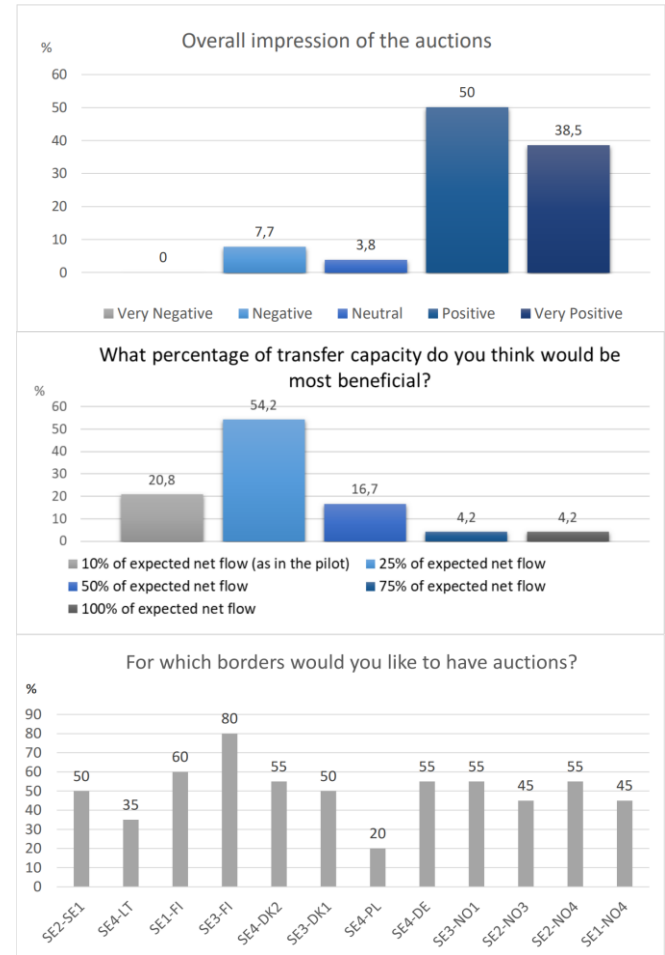


Results of 2023 auctions

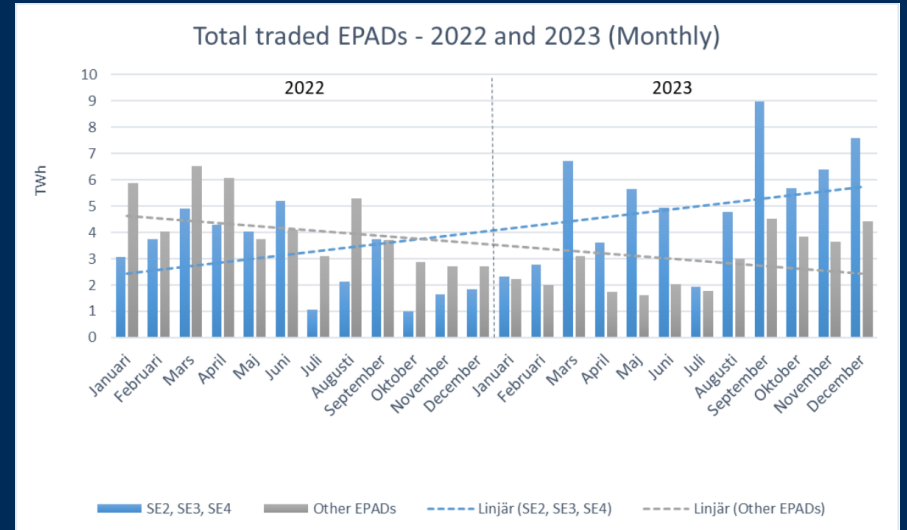
Market Participants views

A selection of Market Participants responses

- Overall impression of the auction is high, 88.5%.
 - Two replies to the survey were from non participants.
- Most Market Participants, 79.1 %, would like to see an increase to 25% of predicted transfer capacity.
 - Many, 20.8 %, are happy with 10%.
- Market Participants were most interested in seeing an extension of the auction to include Finland .
 - High interest for Nordics and smaller for bordering BZ.



KEY TAKEAWAYS & FUTURE DEVELOPMENT



Key takeaways

The relative success of the pilot auctions in Sweden can be contributed to:

- Focus on the effects and the goal of the legislation, enabled by EMDR article 9 and FCA article 30 →
 - Innovation in design.
 - Flexibility towards local and regional prerequisites.
- Design utilising the existing market structure.
- Dialog and cooperation with market participants.

Future development

- Svenska kraftnät ambition is to continue with auctions using the hedging coupling criteria after the pilot ends in 31 of December 2024.
 - Products could changes pending on EEX acquiring Nasdaq going through and when.
 - Expansion of the auctions to include also other BZ is possible, depending on other parties interest.
- The update of EMDR will soon enter into force
 - FCA is to be updated pending 18 month of evaluation of tools to be included.

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