

ID results and analysis after flowbased go-live

Nordic CCM post go-live stakeholder event
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Amanda Moberg, Krishna Solberg, Rickard Nordlöf, Jakob Møller

Contact: ccm@nordic-rcc.net



Agenda

1. ATCE methodology description
2. Comparison of external parallel run and production data
3. Balancing after FB go-live
4. New RCC standalone tool for 15 min



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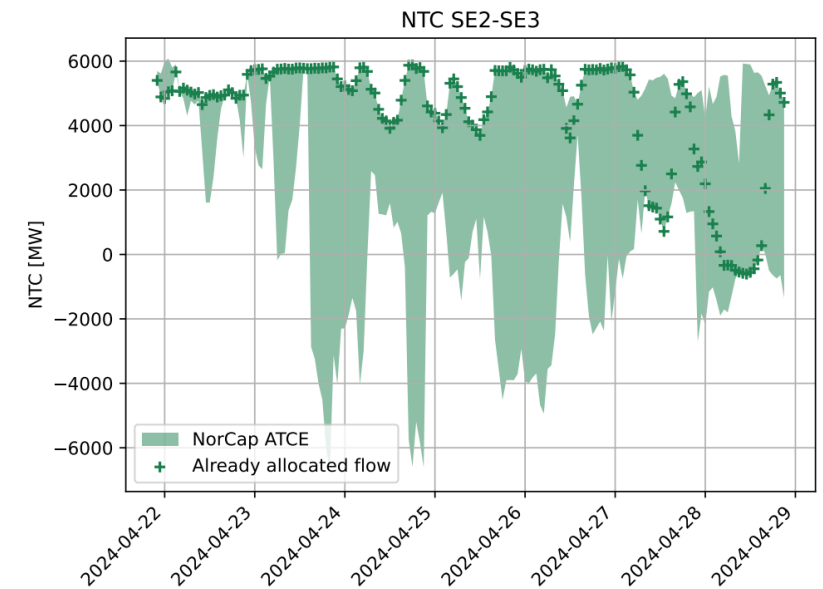


Methodology

Background

- The “left over” capacity from the flowbased day-ahead market will be allocated for the intraday market with the ATCE-method
- The ATCE-method optimizes the available transfer capacity as a CNTC (“NTC-like”) capacity
 - Based on the FB-DA result
 - Distributed among all corridors
 - Using relaxation on certain parameters
- The main result is that the capacities are more varying (and in general smaller) compared with the old NTC method
- The EPR results are published on the NRCC-website <https://nordic-rcc.net/flow-based/simulation-results/>

SE2-SE3



Example: ATCE on the SE2-SE3 border



Main difference between NTC and ATCE

Higher utilization and optimised flows on FB-DA result in less ID-capacities

All capacities are dynamic and depends on the flow direction

- For FB DA the market turnout optimise the capacities depending on the flow direction

ATCE takes into account all flow scenarios likely as well as unlikely resulting in more strict ID-capacities

More flow scenarios affects capacities

- NTC-world considers only forecasted/likely flows and optimise the capacities where there needed the most
- The ATCE-world considers "all flows" to be possible and allocates capacities to manage all of these

ATCE takes into account loop-flows which increase operational security and limits ID-capacities

Accounting for loop-flows

- The NTC world assumes trade from BZ to BZ in a straight line
- In reality the same trade will transfer through several bidding zones (as in the ATCE-world)
- Example: Trade in Sweden might be limited by bottlenecks in Norway (and vice versa)



Applied ATCE-relaxation

Applied relaxation in the ATCE-method to avoid unnecessary restrictions

- Capacities are more operational secure, but also more conservative compared to current NTC-method
- Motivates some relaxation to the ATCE-parameters to increase the capacities in an operationally secure and more comparable way
- Applied relaxations adjust for unrealistic loop-flows (less than 2 %) and takes a calculated risk that all 'loading' flows won't happen at the same time (increased RAM)
- Relaxation leads to increased capacities but also opens up arbitrage possibilities

Relaxation: A trade-off between increased capacities and operational security



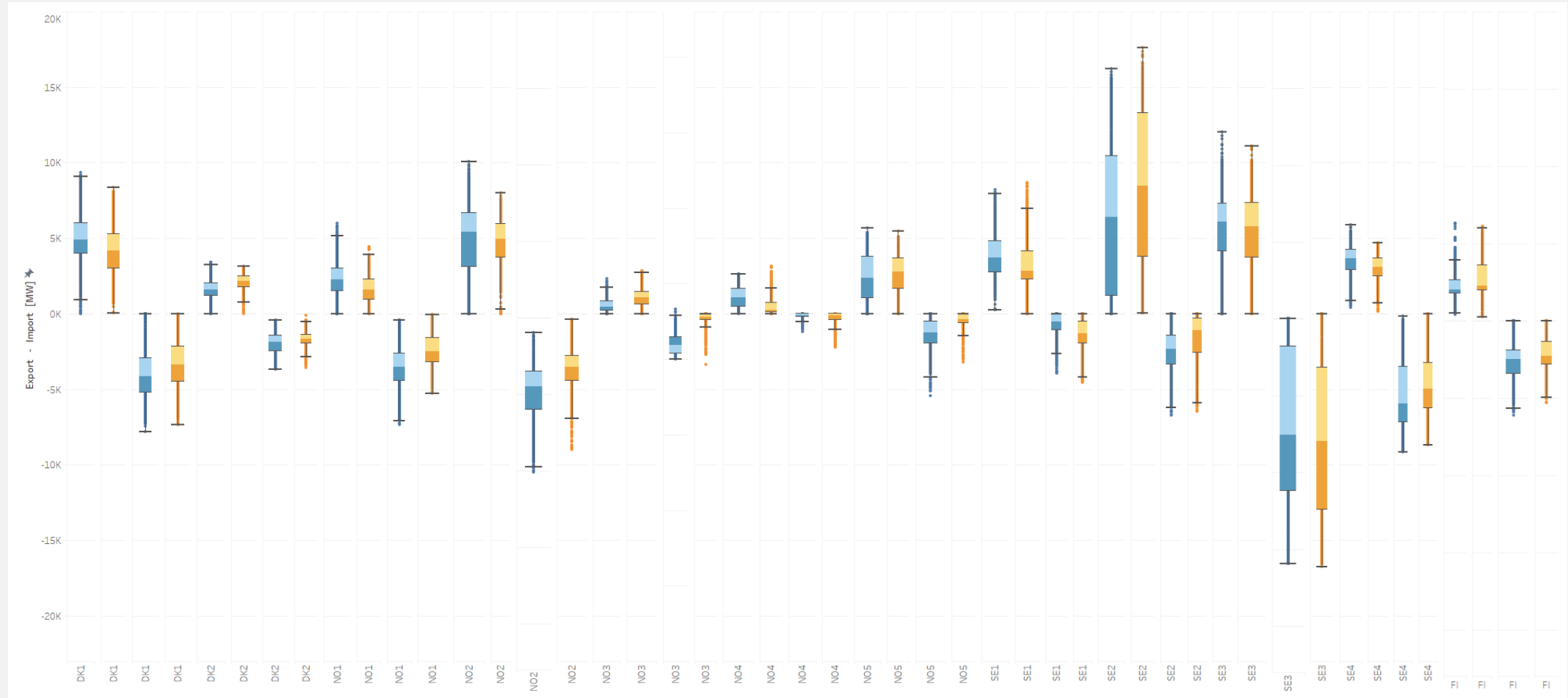
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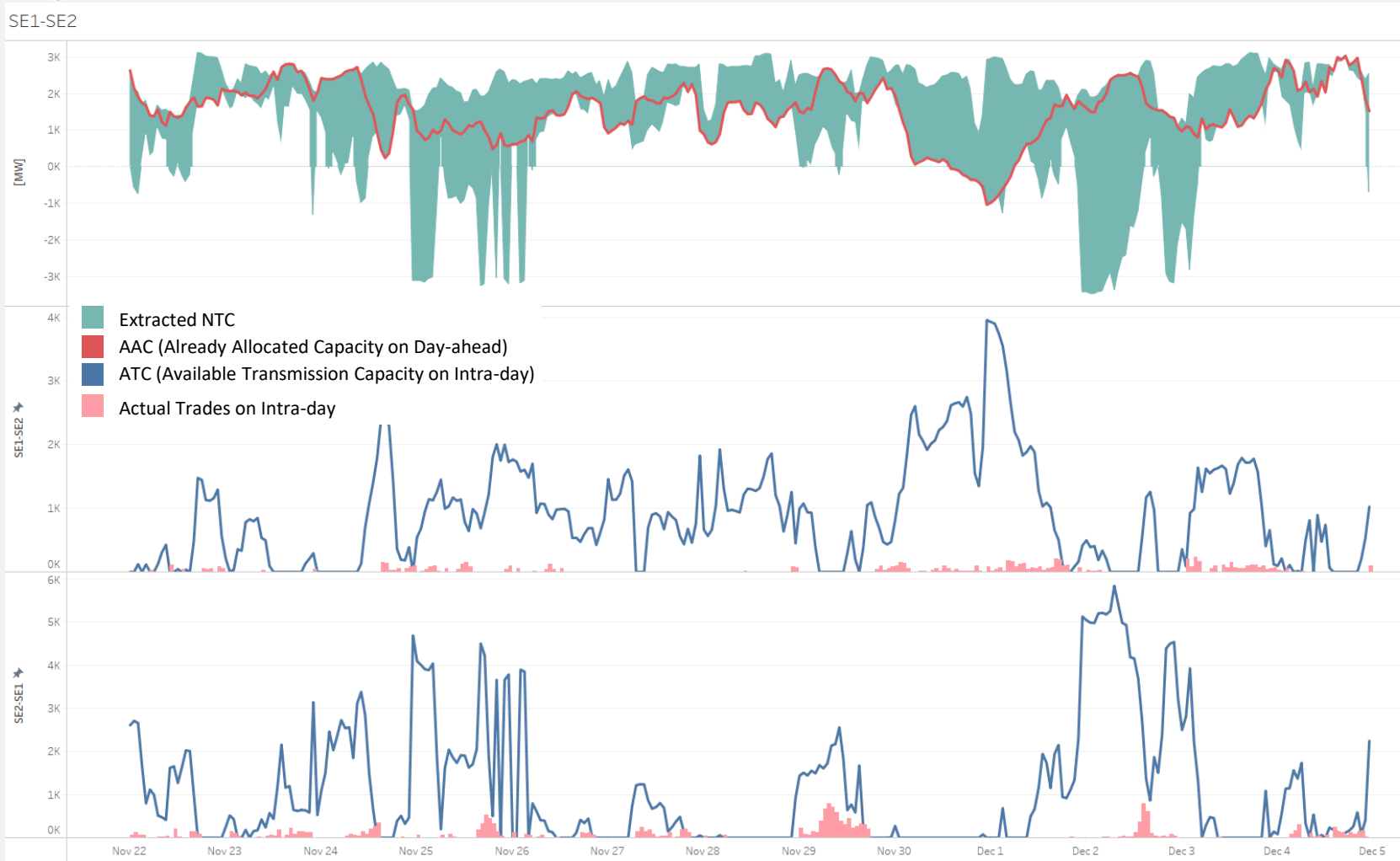
Comparison of ATCE results from EPR (Nov-Dec 2023, blue) and after go-live (Nov-Dec 2024, orange)

ID ATC Nov-Dec23 (EPR) ID ATC Nov-Dec24





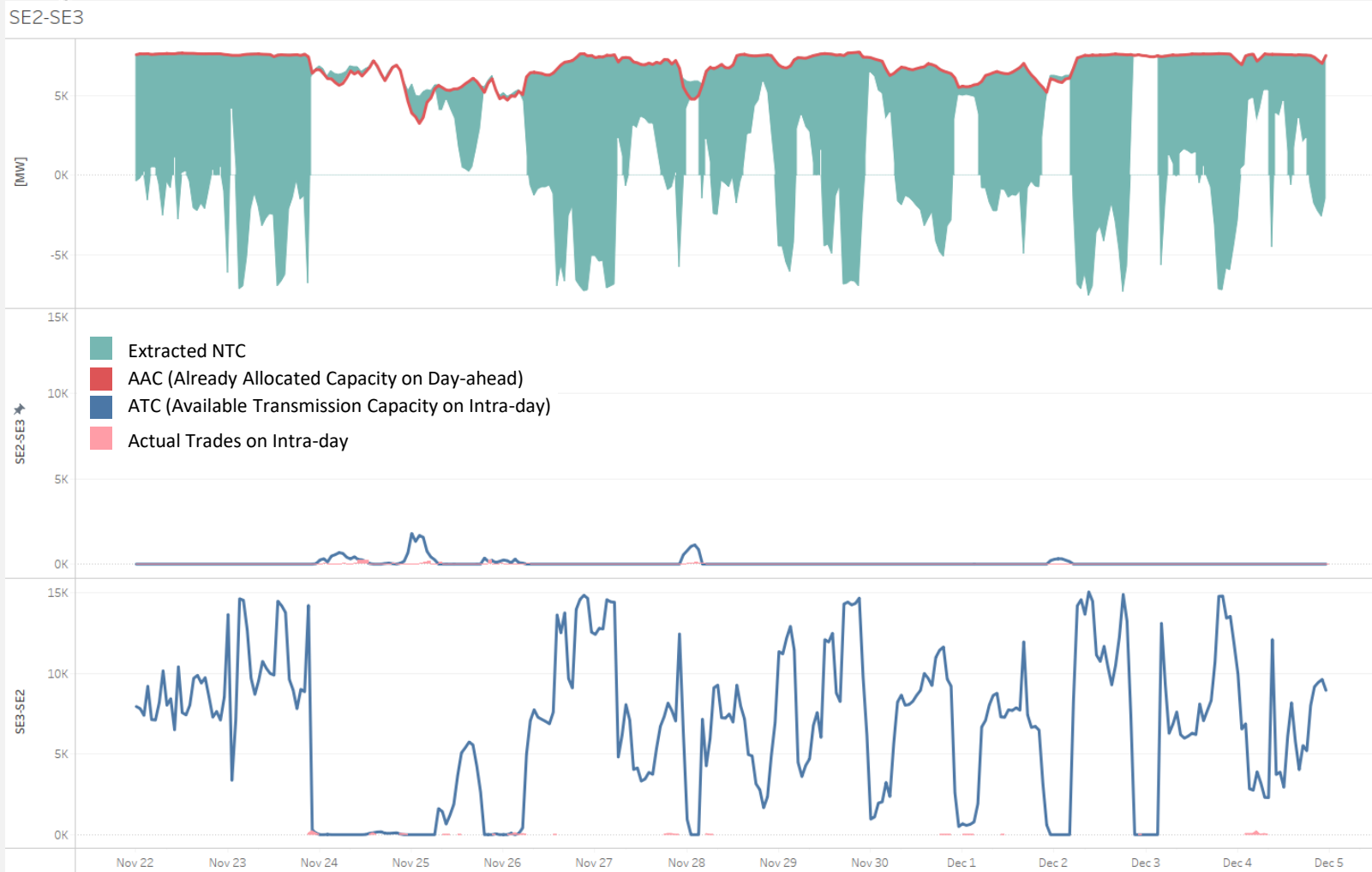
Selected border: SE1-SE2



- On general level, the results observed at SE1-SE2 border have been relatively similar to those during the EPR period
- **SE1-SE2:** most of the time, there seems to be enough capacity for intraday trading, and the lack of capacity isn't limiting trading activities
- **SE2-SE1:** there have been large variations in available intra-day capacity. However, it seems that most of the time, there is a sufficient level of ID capacity available



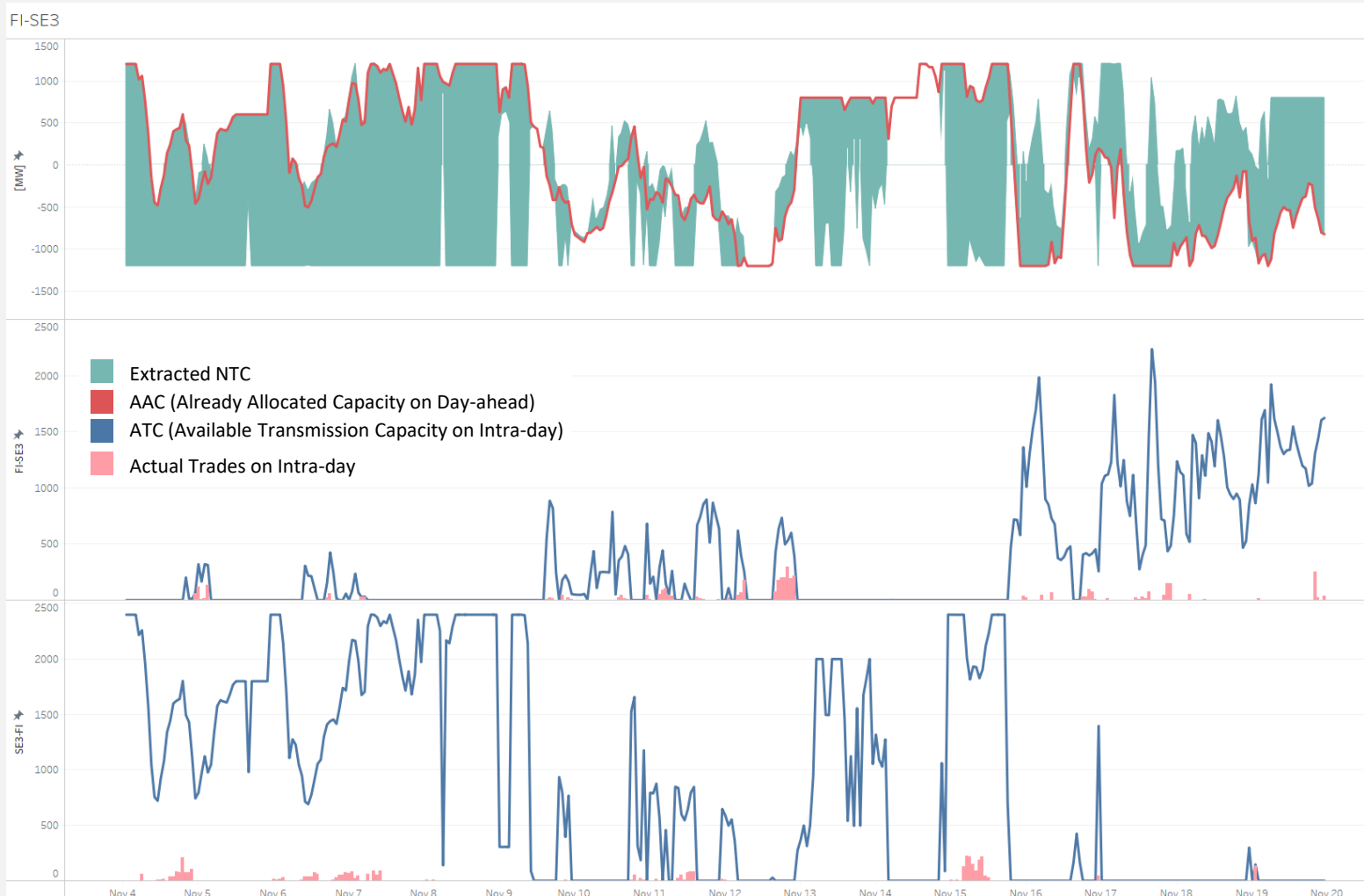
Selected border: SE2-SE3



- Overall, results have been relatively similar than during the EPR, with some shorter periods of very low or zero capacity
- **SE2-SE3**: the intraday ATC is usually close to zero since the capacity is already allocated at day-ahead
- **SE3-SE2**: there have been quite large variations in intraday ATC but on the other hand, the actual intraday trading has been very limited despite capacity being available. Usually, the ATC seems to be lowest between 7 am and 5 pm



Selected border: FI-SE3



- Large fluctuations in available intraday capacity have been observed in both directions, similar to what was seen during the EPR. There have also been periods with zero capacity on both directions (lock-ins)
- **FI-SE3**: during the past months, intraday trading has been more active on this direction. Available capacity has varied significantly, but there has also been times with zero capacity which could have limited the trading.
- **SE3-FI**: There have also been large variations in capacity in this direction, with slightly more hours of zero capacity on average.



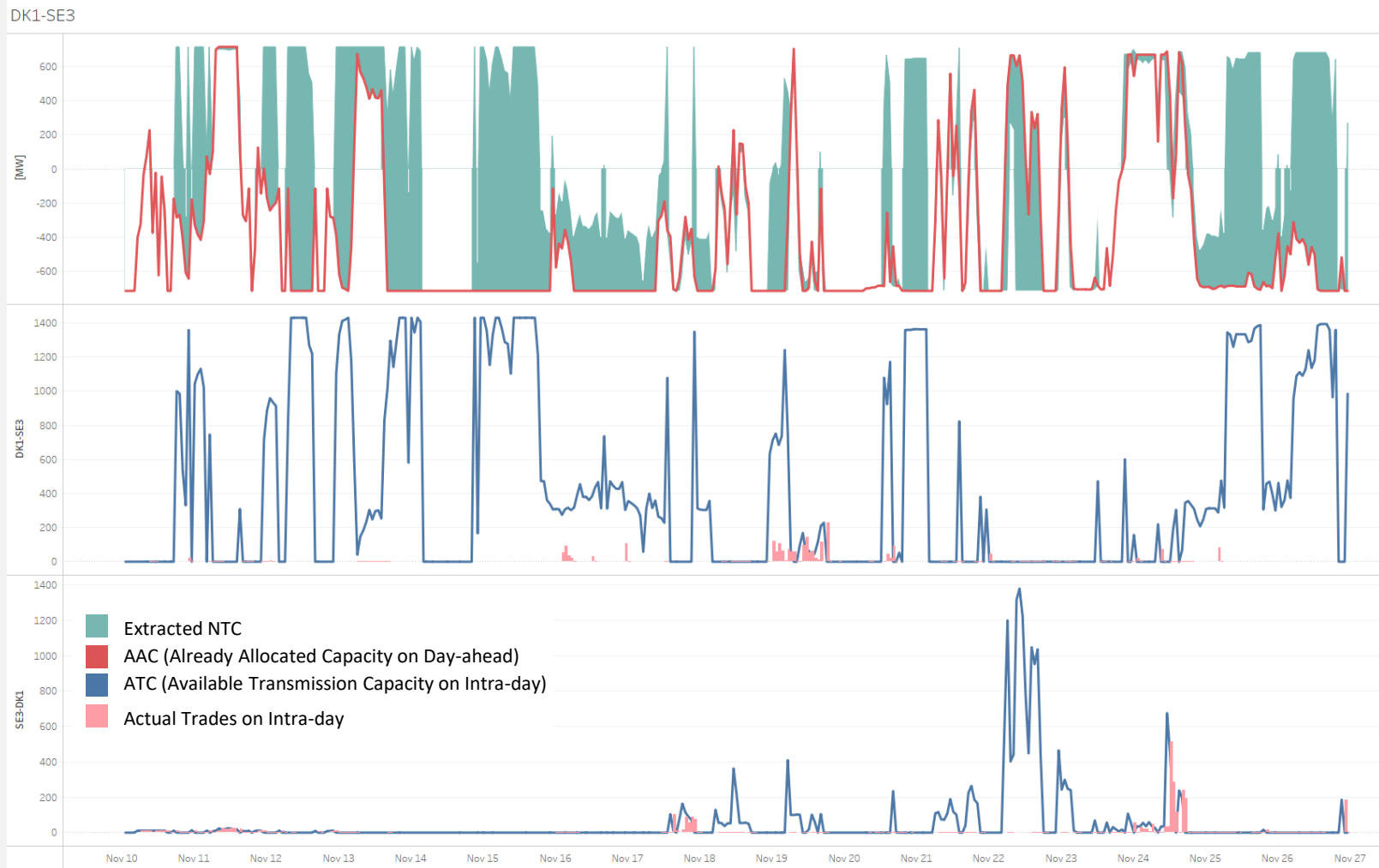
Selected border: NO5-NO2



- One direction usually fully utilized on day-ahead market, which was also observed during the EPR.
- **NO5-NO2**: most of the time, the ATC is zero. When there is capacity available, it is usually utilized for intraday trading
- **NO2-NO5**: There have been a few shorter periods with a low level of available capacity, but most of the time, a sufficient level of capacity has been available.



Selected border: DK1-SE3



- Available intra-day capacity varies a lot and could potentially limit the intraday trading possibilities.
- **DK1-SE3:** Most of the time, there is more capacity on this direction. There are large fluctuations in values and also periods with very low / zero capacity
- **SE3-DK1:** There are long periods with zero capacity (already allocated on day-ahead). When there is capacity available, it is quite often utilized for intraday trading



Conclusion

- Overall, the ATCE results have been consistent with the results seen during the EPR.
 - Some borders have a sufficient level of intraday capacity, while for others, the available capacity is limited.
 - Given capacities can also vary significantly within the same border between the MTUs.
- The TSOs are investigating options to further improve the ATCE method.



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Flow-based impact on balancing

- Flow-Based (FB) comes with a reduction of ATC.
 - Lower ATC mean less exchange of balancing energy and higher local activation.
 - Higher reserve need in each area.
 - Higher balancing energy prices.

- Flow-Based (FB) improves the representation of the grid:
 - Lower local activations due to congestions.
 - Reduced reserves need for local congestions.

The Security of Supply for the Nordic area is ensured by dimensioning process.

- 1) TSO's will take reduced ATC from Flow-based into reserve procurement considerations:
 - Increase local FRR procurement
 - TSO's can reserve ATC prior DA (e.g. mFRR CM)
- 2) Frequency products (FCR and aFRR) utilize FRM's*.
- 3) TSO can deviate from Flow-Based ATC if critical situation(accepting overloads).

*Flow Reliability Margin

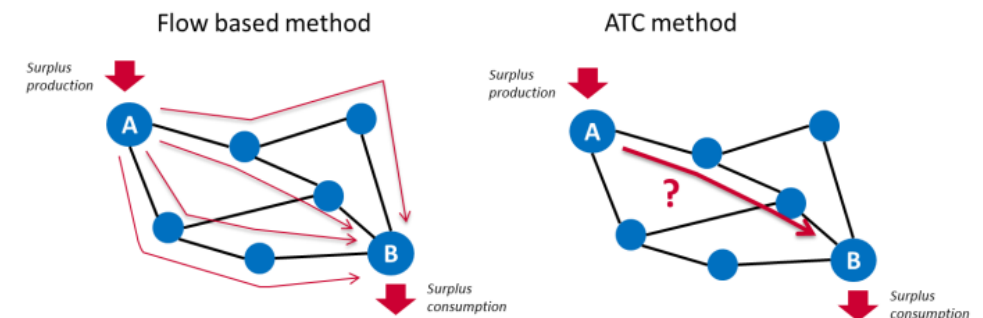
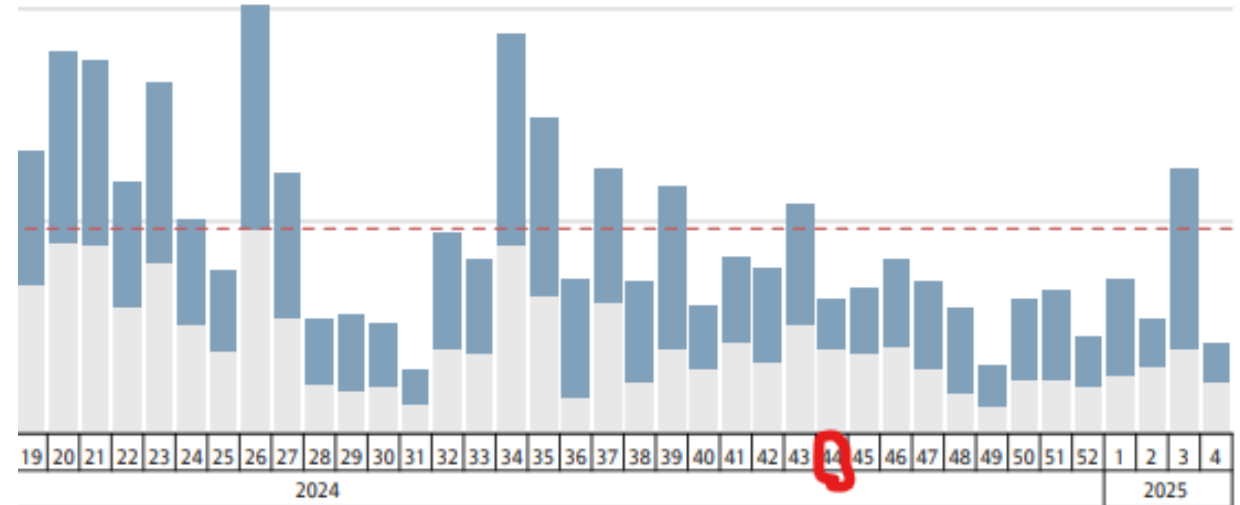


Figure 4 Difference in calculated power flows between bidding areas using the FB and CNTC methods

Flow-based impact on balancing so far

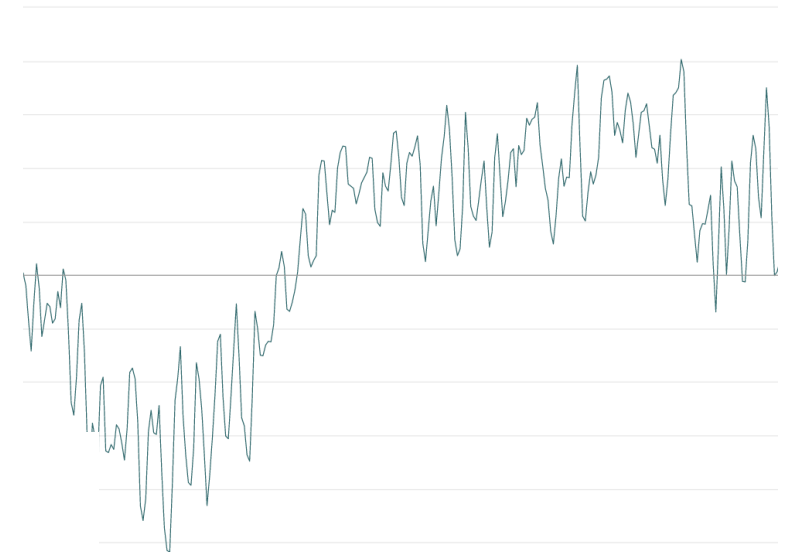
- The frequency trend has been significantly improved since Flow-based go-live
- Could partly be due to a more consistent flow
- Difficult to say what the frequency trend would have been with the old method



From frequency based balancing to ACE

Balancing will be automated and based on ACE (area control error) from the **4th of March**.

- Balancing will be done per 15 minute instead of per hour
- Each TSO is responsible to handle its LFC-areas per quarter
 - Manual management of capacities and activations per quarter is not feasible for the operators
 - A prerequisite is to have automatic and proactive activation of mFRR
- We move from an **operator-centric balancing model** to an **algorithm-centric balancing model**
- The algorithm (AOF) will view the ATC as law
- Imbalance prices will be area specific more often compared to today

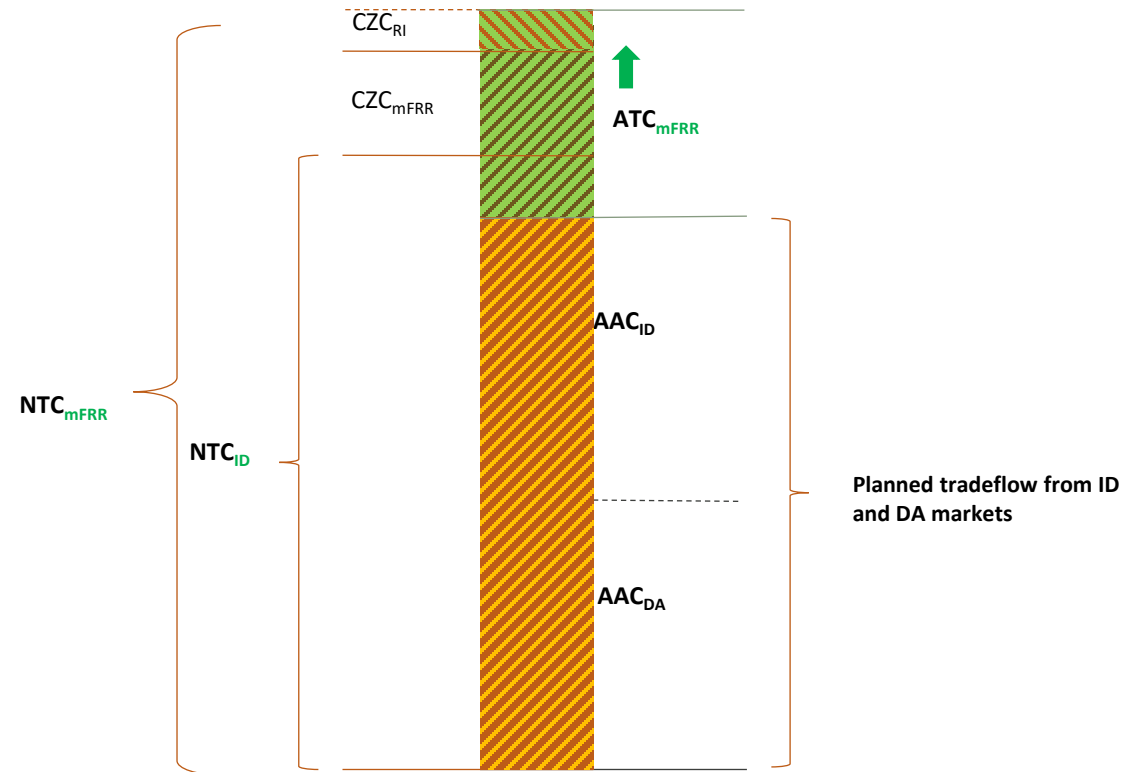


Remaining ATC for balancing

- ATC_{mFRR} is calculated according to this:

$$ATC = NTC_{ID} - \text{Tradedflow} + CZC_{mFRR}$$

- CZC_{mFRR} is reserved transfer capacity from the mFRR capacity market
- Each bidding zone has a procurement requirement for mFRR capacity



Questions

Read more about NBM: [nordicbalancingmodel](#)



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New RCC standalone tool

Newsletter from 28 Nov 2024: New tool in operation for the ATC extraction

- Nordic TSOs are switching to a new tool in operation for the ATC extraction (ATCE) process.
- Part of the preparations to the transition to 15 minutes resolution in the intraday and day ahead markets during spring 2025.
- Includes a few refinements over the current tool (presented on next slide)
- For most borders, no major changes for the ID capacities have been observed so far and are expected from this new implementation.
- Cut-over on Feb 25, first calculation on Feb 26, for delivery day Feb 27 [NUCS link](#)



Main updates (1/2)

The refinements to the ATCE tool include

- ATCE in 60' resolution and 15' resolution
Needed for 15' MTU go-live
- Change of constraint formulation from NTC to ATC base
Fixed an issue with implicit loss factor (ILF) when the ATCE optimizer encounters negative NTCs, and an issue with AACs being relaxed by PTDF relaxation
- Exclusion of non-ID market borders in ATCE, but not in AAC calculation
Fixed an issue such that the non-ID market borders are properly excluded in the ATCE calculation, considering their DA AACs
- Fix to double counting of HVDC borders
Fixed an issue of HVDC borders currently having higher weight in the objective function than other borders



Main updates (2/2)

The refinements to the ATCE tool include

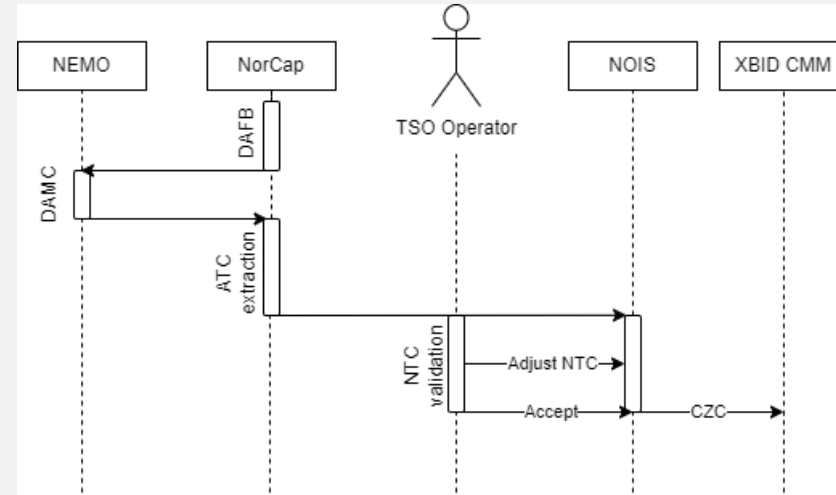
- **Improved outage detection on border_CNECs**
Fixed an issue that if a border_CNEC has status “OUT” it is falsely considered in service in NorCap ATCE
- **Quarter-hourly polarity reversal elimination on HVDCs**
Implemented a new feature that if enabled for a given HVDC, the border is not allowed to reverse flow from DA result during ID
- **Automatic re-run with relaxed parameters**
Improved automatic computation process that if calculation with default **solver parameters** does not converge, a relaxed parameter profile is automatically applied, and calculation is rerun for the affected MTU.



Sequence diagram for DAFB and ATCE process

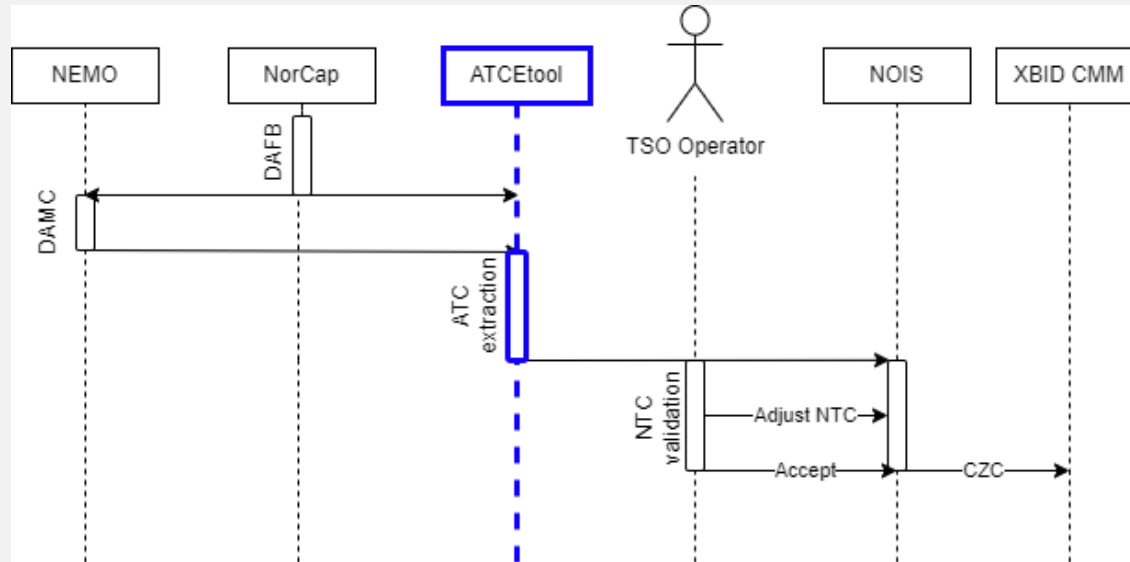
Existing solution (ATCE process since flow-based go-live)

- NTC/ATC extraction performed in NorCap



New solution

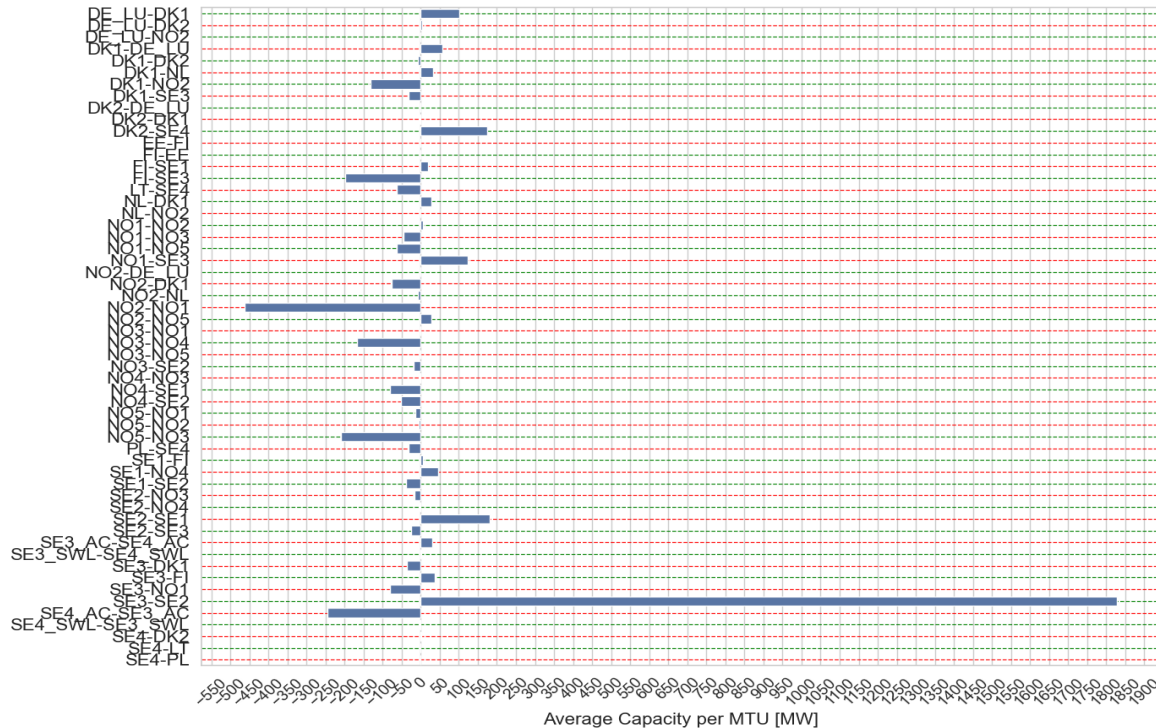
- ATCE stand-alone replaces the ATCE process that is now taking place inside NorCap





What to expect in terms of capacities?

Average ID ATC per border



Average ATC per border and direction calculated for weeks 48-53 in November/ December 2024

Standalone ATCE provides **less** capacity than NorCap ATCE

Standalone ATCE provides **more** capacity than NorCap ATCE



Thank you!

Any questions?

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ENERGINET

 **SVENSKA
KRAFTNÄT**

FINGRID

Statnett



Annex

ENERGINET

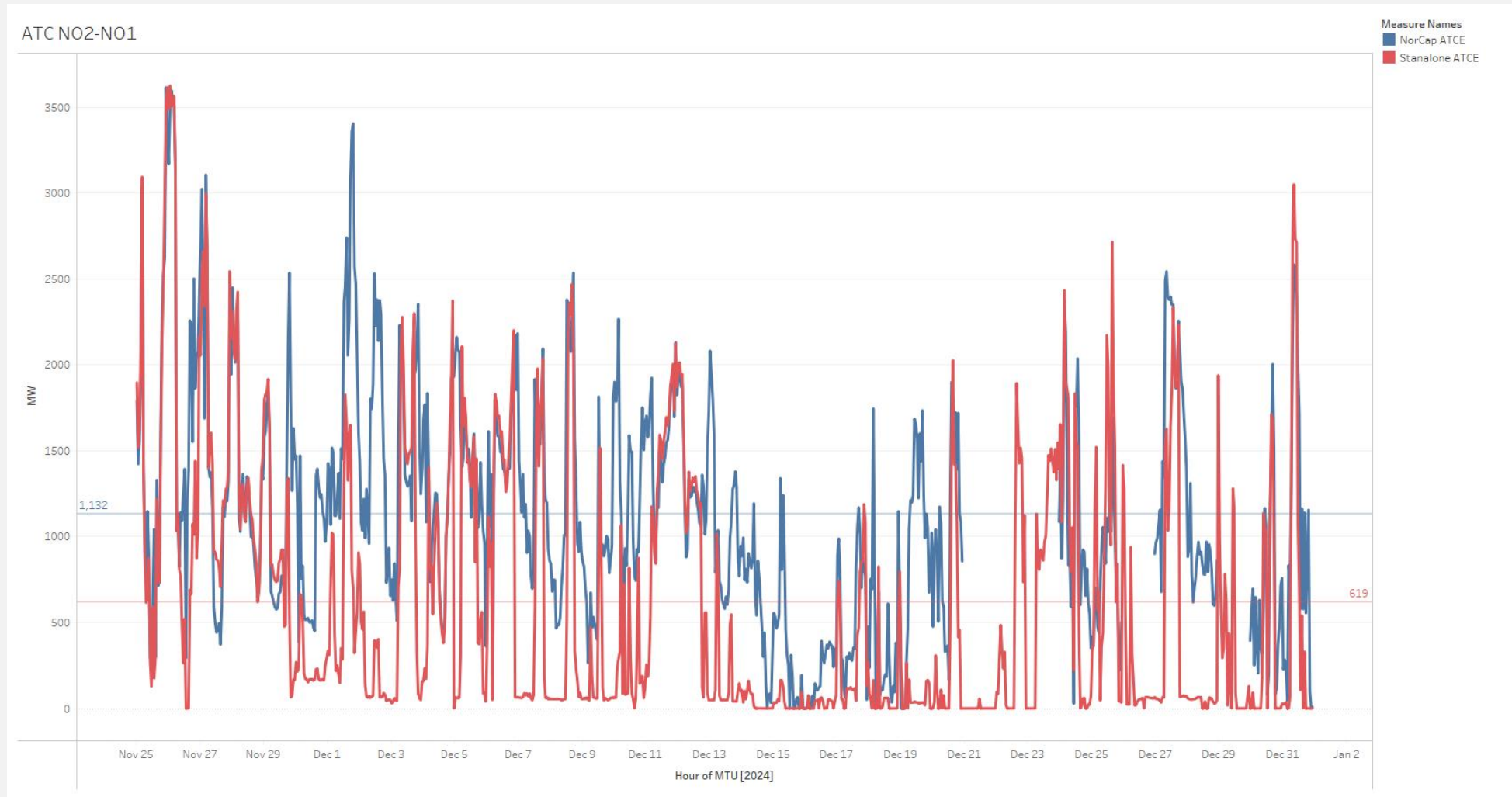


FINGRID

Statnett



Smaller capacity in some directions in new tool





Larger capacity in some directions in new tool

