



1. Welcome and opening words

Nordic CCM Stakeholder Meeting

13 March 2024

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Meeting guidelines

- Please turn “OFF” your microphone and camera by default
- To comment or pose a question you can either
 - Write in the “CHAT” window.
 - Use the “RAISE-HAND” feature in MS Teams.
 - Specific slots for questions or comments are set after each section presentation.
- When speaking, please
 - Turn your microphone and camera “ON”
 - Start by identifying yourself
 - Remember to turn your camera and microphone “OFF” afterwards

In order to ensure technical quality in the meeting we ask all attendees to adhere to the meeting guidelines.



Please provide feedback!

During the meeting

- This stakeholder event will be recorded.
- Questions and comments will be noted during the meeting and answers provided directly if possible.
- Answers to remaining questions and comments will be provided “to all” after the meeting.

Questions or comments after the meeting

- E-mail us at ccm@nordic-rcc.net



Agenda: Nordic CCM hybrid stakeholder meeting 04 March 2024

08:30 – 09:45 Part 1: New capacity calculation – an introduction to Flow-based (including a 5-min break)

09:45 – 10:00 Break

10:00 – 11:30 Part 2: Flow-based market coupling for beginners (including a 5-min break)

11:30 – 11:45 Break

11:45 – 12:30 Part 2 continued: Results of external parallel run



Part 1: Roles and Responsibilities, introduction to NTC and flow- based

Nordic CCM Stakeholder training session

13 March 2024

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Content

- Capacity calculation
 - What is capacity calculation and capacity allocation: purpose, roles and responsibility
 - Capacity calculation methodology
 - Current method: NTC
 - New method: Flow-based
 - Why we are changing the methodology
- The implementation process and how we can learn from it
 - The implementation process and EPR (overview of plan and purpose)
 - EPR practical setup and limitations
 - The EPR results and recommended use
- What will change after go-live of flow-based (FB)
- After go-live 2024: Continued FB implementation for other timeframes



Introduction to capacity calculation and allocation

What is capacity calculation and capacity allocation?

Capacity calculation

The process of determining the available transmission capacity on the electricity grid for a specific period of time.

Capacity allocation

The process of assigning and granting access rights to the available transmission capacity on the electricity grid to market participants*.

It is an essential component of the broader capacity calculation process, ensuring that the capacity determined by transmission system operators (TSOs) is allocated efficiently and fairly to support electricity trading and the overall functioning of the electricity market.

*Including generators, traders, and distribution system operators (DSOs).



Capacity calculation and allocation is a legal obligation

- All TSOs must provide capacity calculation
- It is to be done in a common coordinated process within each Coordinated Capacity Calculation Region (CCR)
- In the Nordics capacity calculation and allocation is channeled through Nordic RCC
- NEMOs are responsible for market coupling
- The legal background for capacity calculation and allocation is provided by both national and European common legislation (the CACM-GL, the FCA-GL, SO-GL) as well as the Nordic CCM



Why capacity calculation and allocation?

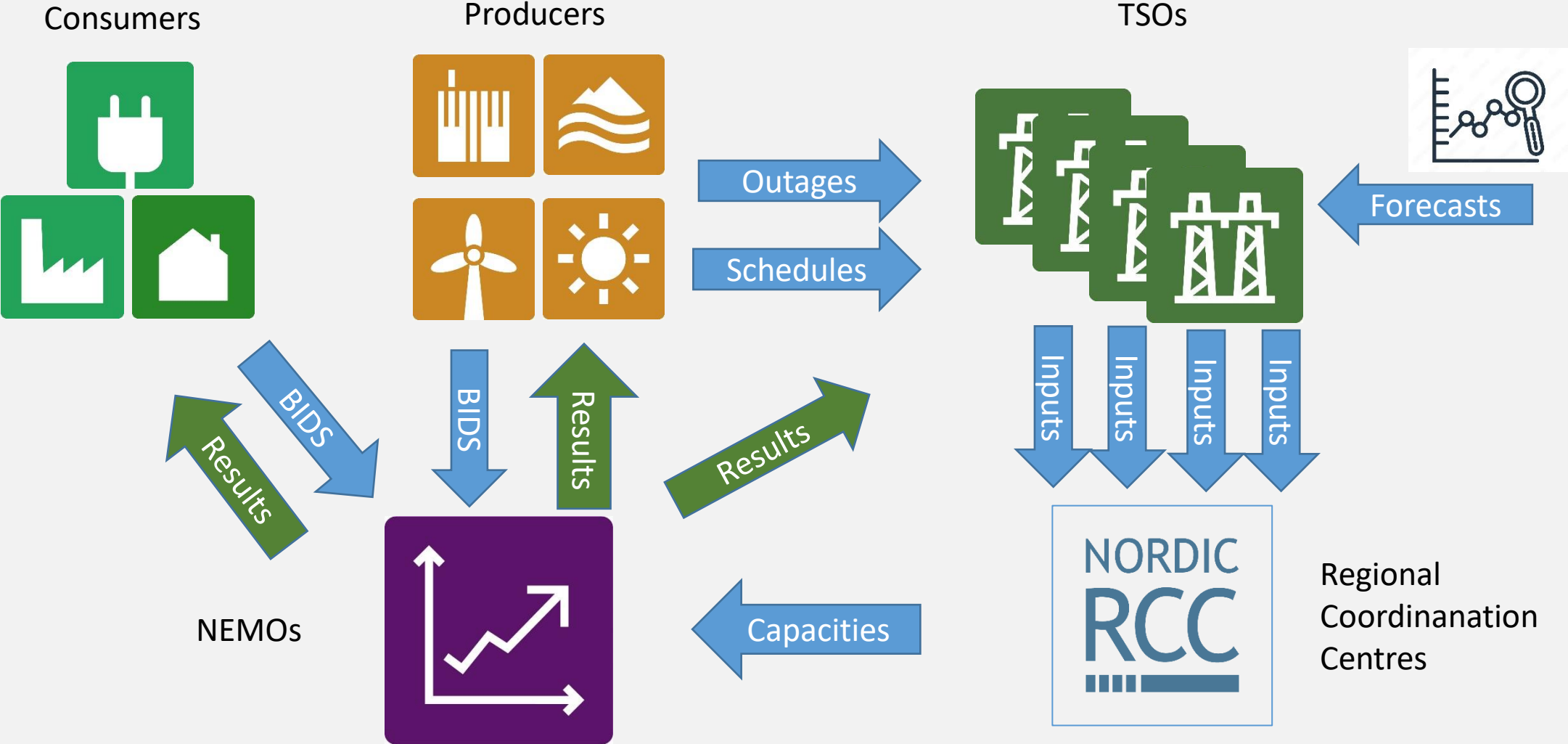
The purpose of capacity calculation and allocation is to translate physical transmission limits in the electricity grid into limits on commercial trades at par with the market design and operational security.

Goal

- Efficient Electricity Market – to ensure the efficient functioning of the European electricity market by determining the available transmission capacity on the grid.
- Facilitate Cross-Border/Zonal Trade – to enable the trading of electricity across national borders within the European Union (EU) by providing transparency and access to cross-border capacity.
- Grid Reliability – to maintain grid reliability and security by preventing overloading of transmission lines and infrastructure.

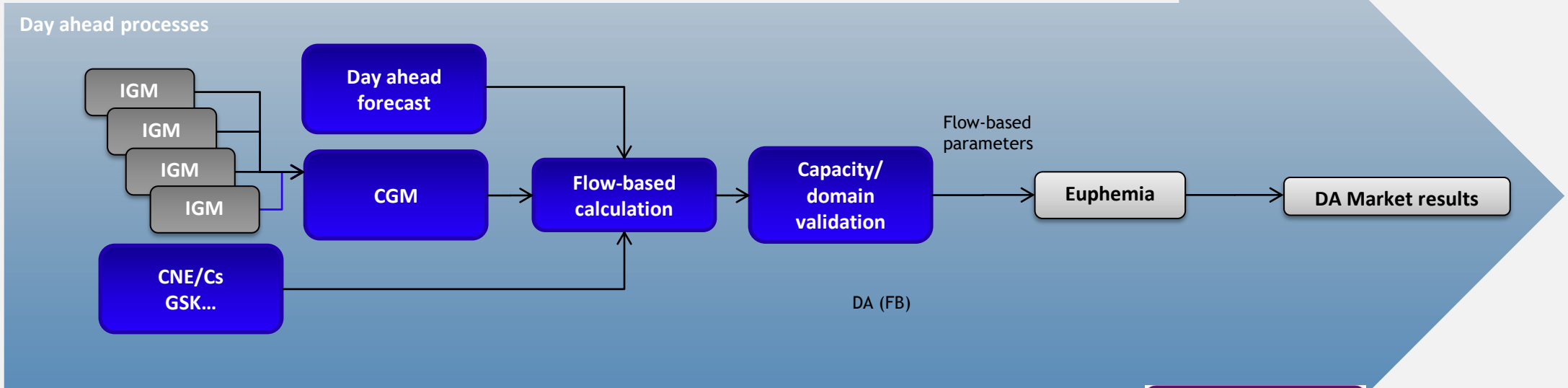


Parties involved in capacity calculation and allocation





CCM High level process



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Roles and responsibilities of the Transmission system operators (TSOs)

Capacity calculation - determining available transmission capacity for each timeframe (each TSO within its own area of responsibility)

Rule: Provide all available operationally secure transfer capacity for each timeframe

Tasks in practice

- The role of TSOs is to provide as much transmission capacity to the markets, as operationally secure, to ensure efficiency and maintain detailed network models
- Collect and analyze grid data, including demand forecasts and generation schedules
- Provide inputs to the Regional Coordination Center for coordination of capacity in the Capacity Calculation Region*
- Monitor real-time grid conditions to ensure capacity compliance

*For us: Nordic Capacity Calculation Region (Nordic CCR)



Roles and responsibilities of the Regional Coordination Centre (RCC)*

Capacity calculation and allocation - determining the available transmission capacity on the electricity grid within the coordinated capacity calculation region (Nordic CCR) and allocating it to the electricity market via the NEMOs

Rule: Provide all available operationally secure transfer capacity for each timeframe

Tasks in practice

- Harmonize and merge the input data provided by the Nordic TSOs
- Perform capacity calculation and other relevant computations
- Send capacity calculation outcome to publication platforms

*For us: Nordic Regional Coordination Centre (Nordic RCC)



Roles and responsibilities of the Nominated electricity market operators (NEMOs)

Capacity allocation – Market Coupling (MC) and providing the market coupling outcome to market participants

NEMOs tasks in practice

- Develop, implement, and operate the European Market Coupling
- Collect bids and offers from market participants;
- Assess the results calculated by the MCO function;
- Inform market participants about the results of their orders;
- act as central counter parties for clearing and settlement of the exchange of energy resulting from SDAC and SIDC;



Roles and responsibilities of the market participants

- Participate in capacity auctions or market coupling mechanisms to access available transmission capacity
- Use capacity information for planning electricity transactions and optimizing their portfolios
- Ensure compliance with market rules and regulations in their operations



Roles and responsibilities of the National regulatory authorities (NRAs)

Promote legal and institutional framework and conditions for the capacity calculation and allocation

Tasks in practice

- Provide opinions on and approve methodologies related to European Network Codes and Guidelines, including those defining capacity calculation methodologies and procedures
- Oversee compliance with regulations, ensuring transparency and non-discrimination in capacity allocation
- Participation in development of legal and institutional framework through participation in ACER
- Nordic regulatory cooperation through NordREG



Capacity calculation methodology: Current method – Net Transfer Capacity (NTC)

The Net Transfer Capacity (NTC) is the maximum exchange program between two areas compatible with security standards applicable in both areas and taking into account the technical uncertainties on future network conditions.*

Definitions

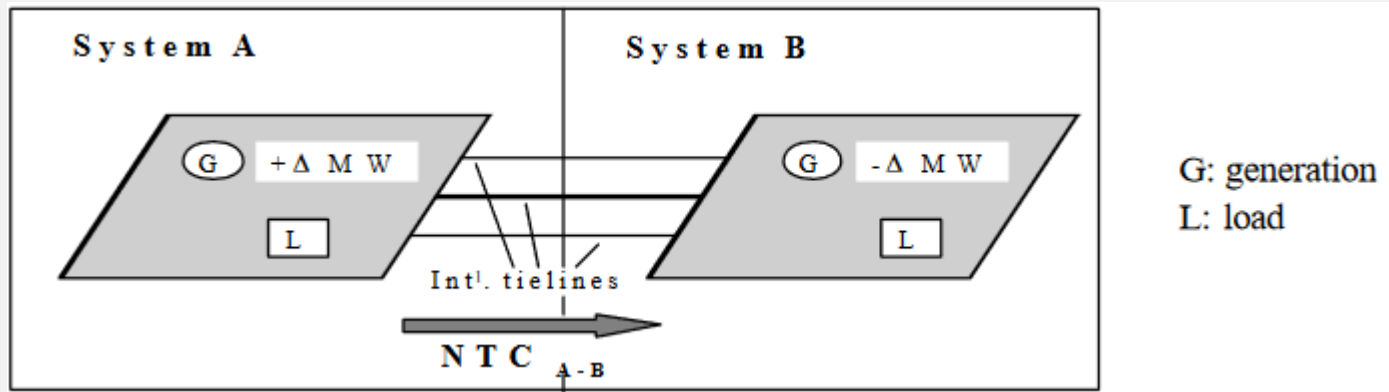
- $NTC = TTC - TRM - FRR$ capacity reservations
- $TTC =$ Total Transfer Capacity
- $TRM =$ Transmission Reliability Margin
- $FRR =$ Frequency Restoration Reserves
- FRR capacity reservations = capacities needed for transfer of aFRR (automatic FRR) and mFRR (manual FRR) from one area to another

*For full description, please refer to: [Principles for determining the transfer capacities in the Nordic power market](#)



NTC: Calculation of Total Transfer Capacity (TTC)

- Each TSO calculate available transfer capacity individually
- The ability to transmit power is calculated for each state of operation (applies to both transmission systems within each subsystem and exchanges between subsystems)



Limitations:

Dynamic stability limitations
Voltage limitations
Thermal limitations

- Capacity on interconnectors: If TSO calculations differs, the lowest value is used
- Important questions to be answered by the TSOs
 - What is the maximum power that can be transmitted from system A to system B?
This question is equivalent to: What is the Total Transfer Capacity (TTC A→B) between A and B?
 - What is TTC from the opposite direction (TTC B→A)?
 - Is capacities valid for all flows?



NTC: Transmission Reliability Margin (TRM)

TRM is a security margin to cope with uncertainties in the computed TTC values

- The TRM values for each connection are agreed upon in the specific System Operation Agreements
- TRM is to cover uncertainties arising from
 - Unintended deviations of physical flows during operations due to physical functioning of load-frequency regulation,
 - Emergency exchanges between TSOs to cope with unexpected unbalanced situations in real time,
 - Inaccuracies, e.g. in data collection and measurements
- For present values, please refer to:
[Principles for determining the transfer capacities in the Nordic power market](#)



NTC: Effects and limitations

- TSOs do not
 - mutually share information on their assumptions taken when computing NTCs
 - coordinate calculations
- Consequence: NTC levels are very conservative (and at times very low)
- Market participants only see the border NTC capacity

A lot of assumptions are made in order to derive the border level capacity and internal network constraints are “hidden” behind the border NTC capacity



Questions and Coffee Break

Questions

..... and then a 5 minute coffee break



Capacity calculation methodology: New method – Flow-based capacity calculation (FB)

Introduction

Basic principles and how it works

Highlight the improvements or changes it brings compared to NTC



Why we are changing the methodology

- Legal requirements: Current method (NTC) no longer acceptable
- Increased needs for efficiency to keep up with changing power system
- Increased demands for security: Need to improve operational security in the Nordics



Legal requirements

Reference: CACM <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015R1222>

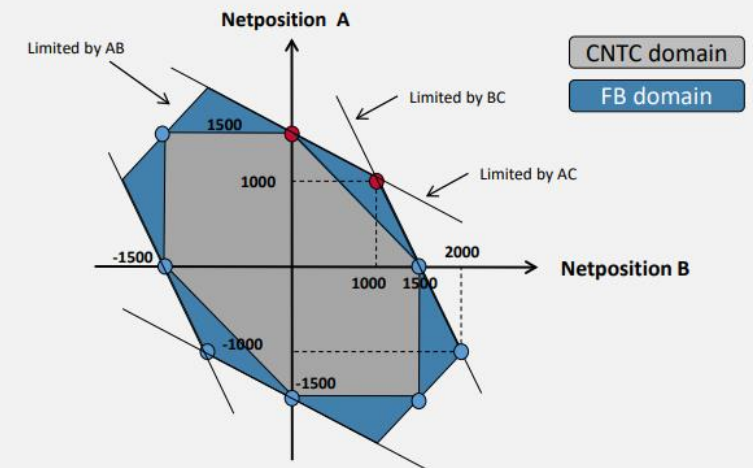
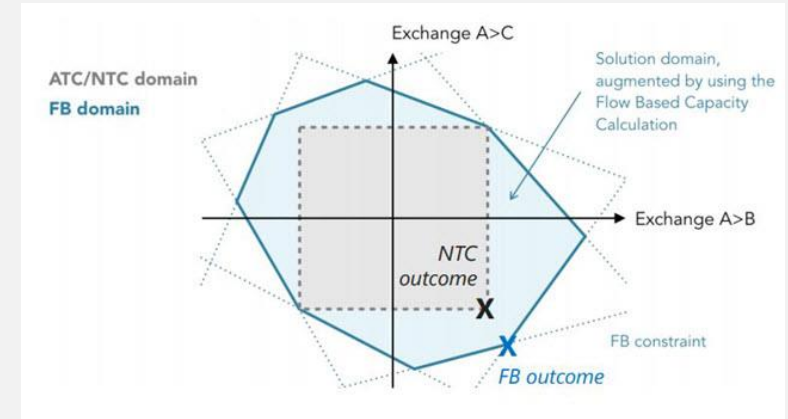
Article 20.1: For the day-ahead market time-frame and intraday market time-frame the approach used in the common capacity calculation methodologies shall be a flow-based approach, except where the requirement under paragraph 7 is met.

Article 20.7: TSOs may jointly request the competent regulatory authorities to apply the coordinated net transmission capacity approach in regions and bidding zone borders other than those referred to in paragraphs 2 to 4, if the TSOs concerned are able to demonstrate that the application of the capacity calculation methodology using the flow-based approach would not yet be more efficient compared to the coordinated net transmission capacity approach and assuming the same level of operational security in the concerned region.



Increasing transmission capacity increases SEW

- **An increase in transmission capacity to the market will provide a higher social economic welfare.**
 - Larger domain allows for more trade, and increased opportunity for trade provides increased economic efficiency in any market.
 - SEW gain can be anywhere in the Nordics or SDAC (Europe).
- **TSOs can offer more transmission capacity to markets, e.g., by**
 - Changing the capacity calculation method
 - Building more transmission capacity between bidding zone borders
- **In FB, a larger domain than possible in NTC is provided directly to the market in the form of PTDFs, RAMs, and CNEs.**
 - This has the same effect as installing more capacity to the entire Nordic CCR. The setup, where and how much more flow is enabled, depends on forecasted flows and market bids.
 - FB development will continue after DA FB go-live.





High level comparison between NTC and FB methods

- NTC is a **black box**, a lot of assumptions are made in order to derive the border level capacity. In other words, internal network constraints are hidden behind the border NTC capacity.
 - NTC is not easy for TSOs.
- FB is more transparent. All important network constraints are visible by the market participants.
- FB more is more **complex** and requires more knowledge and analysis from all stakeholders to comprehend



Capacity Calculation: From complexity to simplicity

The physical world

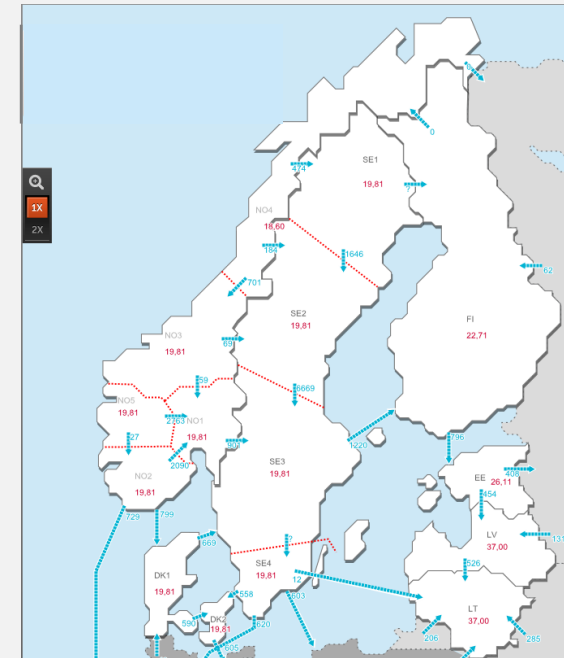


Detailed grid model (CGM) Nodal pricing FB NTC

Capacity calculation is the process of translating the complex physical grid into a simplified form that can be understood and applied by the power exchange

➤ Providing grid constraints to the market platforms

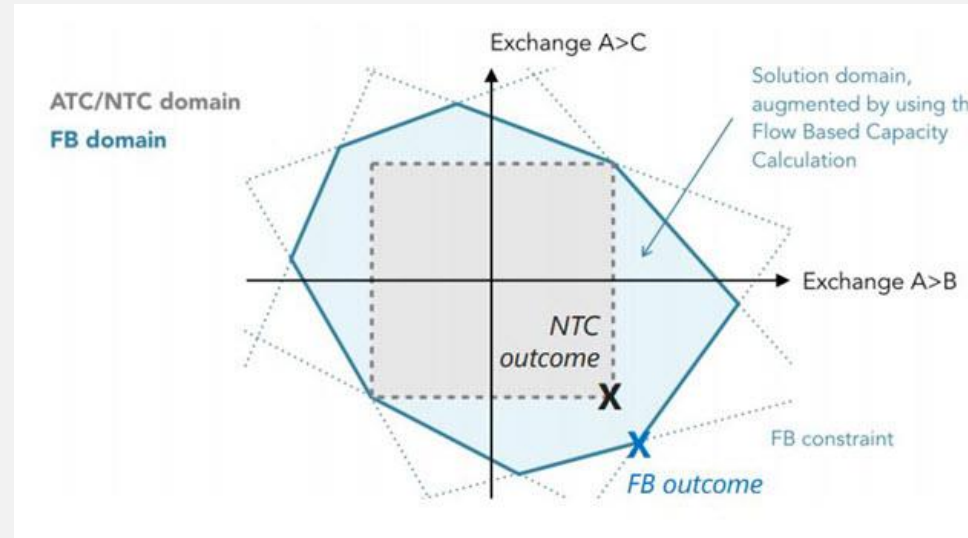
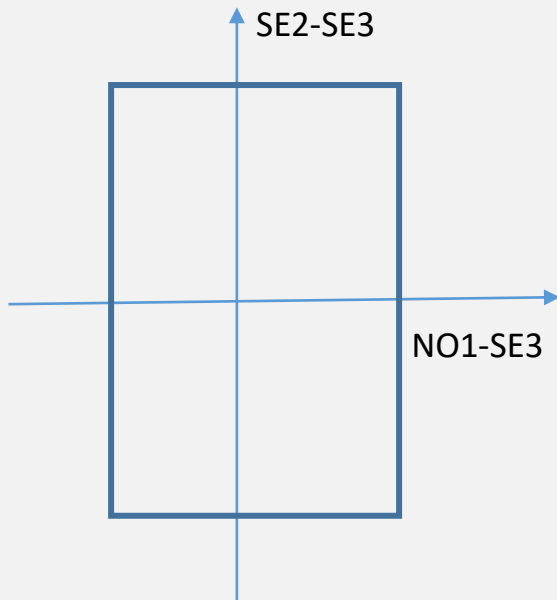
The power market



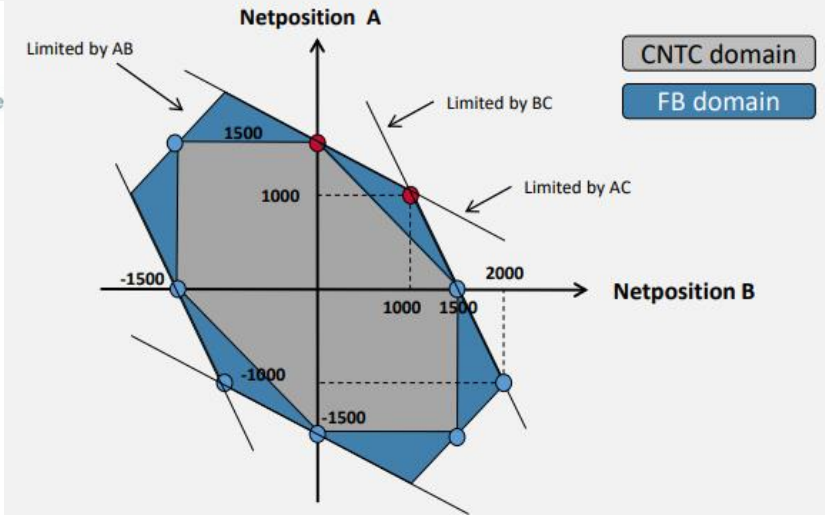


Capacity Calculation: From simplicity to complexity

Moving from capacities described as cross border limitations to capacities based on linear grid limitations



Source: [Elia](#)





Important expressions

- **NTC** = Net transfer capacity between pair of bidding zones
- **PTDF** = A parameter indicating how much of a MW injected in a certain bidding zone occurs on a particular CNEC
- **RAM** = A parameter defining how many MWs of electricity can be allowed on a particular CNEC due to cross border trade
- **CGM** = Common Grid Model describing the individual components and the state of the Nordic Grid in a particular MTU (24 CGMs for each day)
- **CNEC** = A limiting grid component (CNE) considering a contingency (C)
- **F_{max}** = A parameter defining how many MWs of electricity can be carried by a particular CNEC
- **F₀** = Flows occurring on a particular CNEC caused by trades within a certain bidding zone
- **RA** = Available tools to mitigate overloads applied to increase capacity on specific CNECs
- **FRM** = Security margin to manage linearization errors and activation of frequency containment reserves
- **IVA** = Individual validation assessment to mitigate last minute security issues



Implementation process and external parallel run in the Nordics

Reference: CACM <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015R1222>

What is an external parallel run (EPR)?

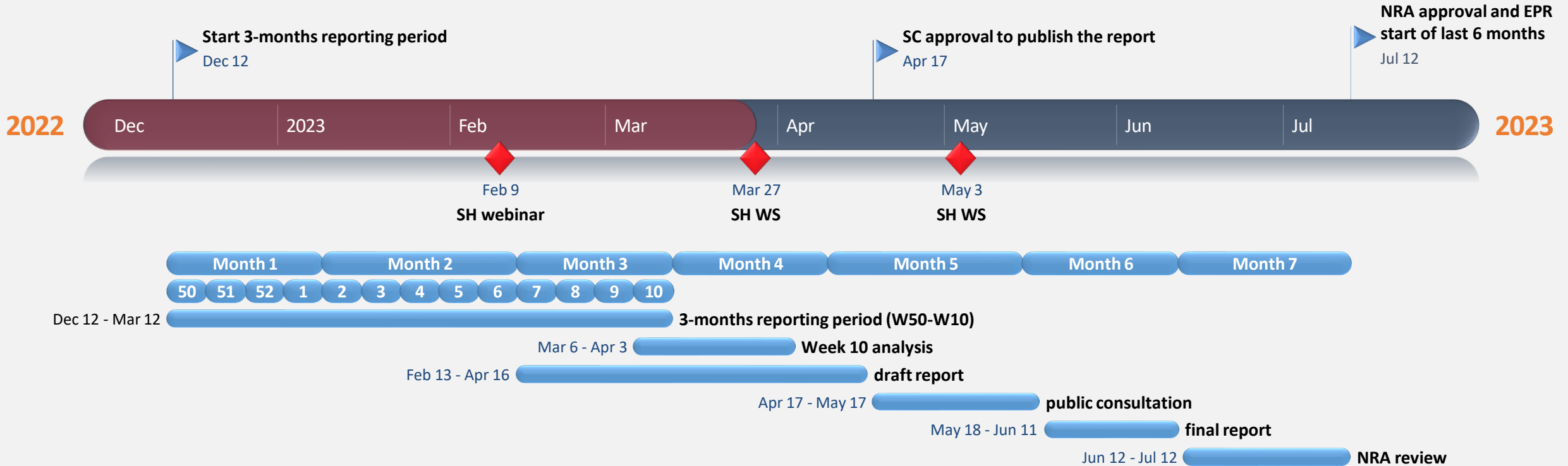
Article 20.8: To enable market participants to adapt to any change in the capacity calculation approach, the TSOs concerned shall test the new approach alongside the existing approach and involve market participants for at least six months before implementing a proposal for changing their capacity calculation approach.

Duration of EPR

- *According to CACM: at least 6 months*
- *According to approved Nordic DA and ID CCM: at the minimum 12 months*



EPR timeline



Where do we come from and where are we now?

EPR

External parallel run evaluation report - For assessment by the NRAs of the Nordic CCR, as required by the Nordic DA/ID CCM

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Nordic Capacity Calculation Methodology External Parallel Run Evaluation Report

Overview

This consultation concerns an external parallel run evaluation report for assessment by the NRAs of the Nordic CCR, as required by the Nordic DA/ID CCM that was approved by the NRAs of the Nordic CCR on October 14th, 2020.

Closes 17 May 2023
Opened 17 Apr 2023

Contact
Zongyu Liu
(Nordic CCM Project stakeholder involvement working group PMO)
liu@entsoe.com

Why your views matter

We are seeking input from stakeholders and market participants on this important checkpoint report. The NRAs will carry out an evaluation of the Nordic CCM external parallel run based on this checkpoint report. The NRAs have required to include the stakeholder comments in the report.

Give us your views
[Online Survey >](#)

External parallel run evaluation report - For assessment by the NRAs of the Nordic CCR, as required by the Nordic DA/ID CCM

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October 2024



Continue the parallel run for 6 months

July 13

NordREG
Nordic Energy Regulators
POWER THROUGH COOPERATION

NRA communication regarding the TSOs' June 2023 EPR report

The Nordic NRAs find that the Nordic TSOs in the external parallel runs (EPR) report have demonstrated that the flow-based (FB) capacity calculation works sufficient in operational terms, given the current state of development. However, the Nordic NRAs conclude that there are still open issues beyond the key performance indicators (KPIs), and the Nordic NRAs request the TSOs to investigate and elaborate on those issues in more details during the upcoming 6-months of EPRs.

On June 12, 2023, the Nordic NRAs received from the Nordic TSOs a report on the results and elaborations from the EPRs of the FB capacity calculation methodology.

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The Nordic CCM External Parallel Run (EPR)

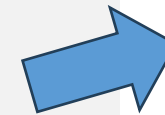
- In EPR, the capacity calculation process for both FB and NTC is performed in parallel. Market results are available for:
 - NTC = actual day-ahead market coupling results, “production”
 - FB = simulated market coupling results with FB constraints
- **Goals of the EPR:**
 - 1) Ensure that the capacity calculation process works
 - 2) Show the differences between FB and NTC capacity calculation methods
 - 3) Intended for market participants to become familiar with FB capacity calculation and the impacts FB may have on the market outcome
 - 4) “Learning by doing” for TSOs



The role of TSOs and EPR

- **The role of TSOs is to provide as much transmission capacity to the markets, as operationally secure, to ensure efficiency.**
 - Other market participants are responsible for other segments of the day-ahead market; TSOs should not intervene or speculate in these.
- **Assumption in the EPR: Different capacity calculation method, but same market coupling algorithm and same order books**
 - Changing nothing else as the capacities enables a fair comparison of the two capacity calculation methods. It isolates the impacts solely from FB capacity calculation without further assumptions.
- **Why we measure the SEW impact of FB?**
 - EPR is done the way NRAs and CACM require TSOs to perform it.*
 - Higher SEW **per MTU** indicates **higher or economically more efficient flows** in the system
 - Higher SEW **over a long time** indicates **a trend of the above** in the system

- The report shall include at least the following, based on a per MTU level of granularity:
 - A calculation of DA socio-economic effects (as measured by delta in consumers' surplus, producers' surplus and congestion income) from flow-based capacity calculation compared to the current capacity calculation method in use. The geographical area for this calculation shall be the Nordic market area plus neighboring countries if possible.
 - If the accumulated DA socio-economic effect of flow-based is negative over any two-week period, the TSOs shall provide analysis and explain why this occurred.



* <https://www.fingrid.fi/globalassets/dokumentit/fi/tiedotteet/sahkomarkkinat/2020/paatos-cacm-suuntaviivojen-202-artiklan-mukaisen-nordic-kapasiteetin-laskenta-alueen-yhteisen-kapasiteetin-laskentamenetelman-muuttamisesta.pdf>



FB enables higher utilization of the grid and will result in other changes in the market

- **When FB enables more capacity provided to the day-ahead market, it is likely that there will be other changes in the markets.**
 - EPR enables SHs to learn how to read, analyze, and use FB domains.
 - EPR is not a forecast of future prices and flows.
- **Why EPR cannot be designed to use “FB order books”?**
 - No such information available from market participants.

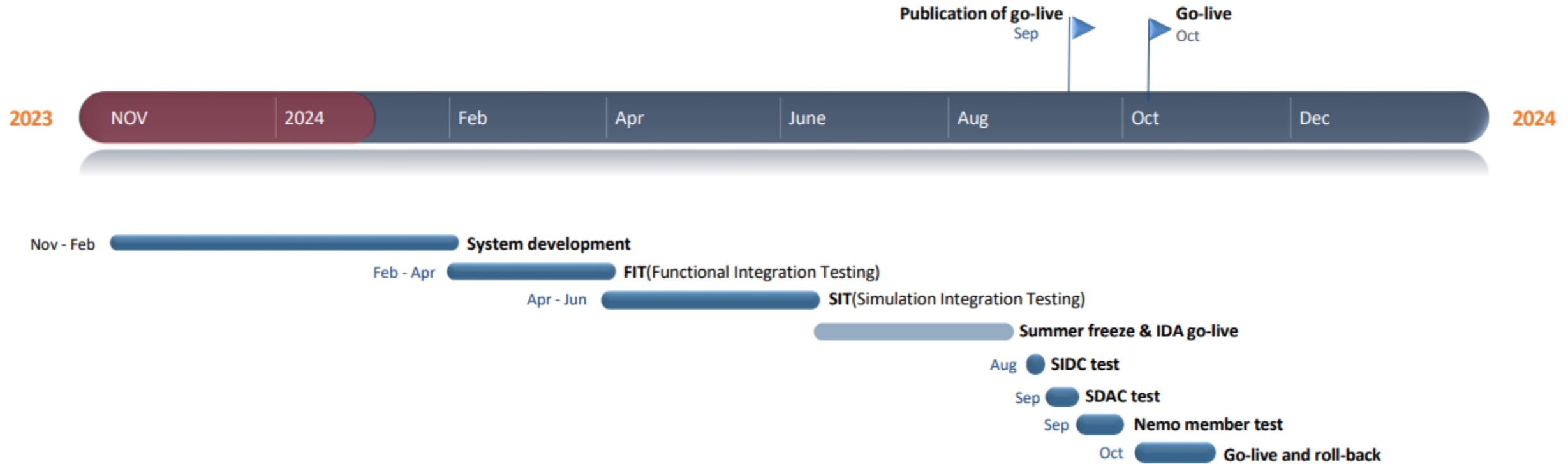


Available information

- [Methodology](#)
- [Simulation results](#)
- [Operational learning points](#)
- Market information: [NUCS](#)
- Market information: [JAO](#)



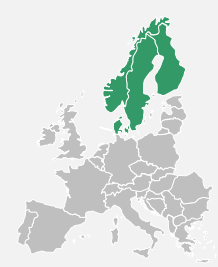
Timeline for go-live in 2024





What will change after go-live of FB DA

- Day ahead will move Flowbased
- Initial ID capacities will be based on ATC-E (from FB domain)
 - More details in next stakeholder meeting
- Market information: For example, NUCS and JAO results
- Methodology Updates (required in current methodology)
- Up to 3 weeks after go-live a rollback procedure will be in place if any major problem are discovered
- Development of FB-ID
- FB for Long Term



Projects which have been waiting for FB

Dependencies

