OUR STRATEGY

NORDIC

Desired position

VISION

Bridging Nordic power systems to enable the green energy transition.

Phases to

MISSION

We provide critical Nordic and European services and insights to Transmission System Operators for the benefit of society.

Through collaboration, we proactively enable Transmission System Operators to optimise beyond their individual capabilities.

We digitalise to increase security, efficiency, and transparency of Nordic power systems.

DESIRED **POSITION 2026**

In our desired position, we create value beyond what is regulated, and we show proactiveness by eyeing opportunities.

> PHASE 3 **Expand our** influence

reach desired position position

Current

PHASE 1 Prepare to change

> PHASE 2 **Improve** efficiency and value-add



TODAY'S AGENDA



9:30: Registration & Welcome Coffee

10:00 Session 1: Nordic RCC What we do Welcome
Henrik Kofod, CEO Nordic RCC

General introduction to the Nordic RCC Louise Nørring, Head of Business Development

First Annual Report - Main insights
Markus Hübner, International Relations Officer

Use cases - How we provide value to TSOs Common Grid Model, *Håkon Nystad* Short Term Adequacy, *Ignacio Murga Castro* Outage Planning Coordination, *Stig Richard Hansen*

12:15 Lunch

13:15 Session 2: Stakeholder Views

TSO views on regional coordination

Value for TSOs, priorities in the future

Erik Ek, Svenska Kraftnät, Member of the Board

of Directors Nordic RCC

NordREG views on regional coordination Regulatory oversight, priorities and expectations Eske Benn Meyer and Anne-Marie Pedersen, Danish Utility Regulator

14:30 Session 3: Discussions

Common discussion

Regional topics, future priorities and development, stakeholder interaction

Concluding remarks

15:30 Coffee & Close

NORDIC RCC STAKEHOLDERS





Regulators

Other RCCs



Vendors

Other stakeholders

NORDIC

Shareholders

Board of Directors

TSOs

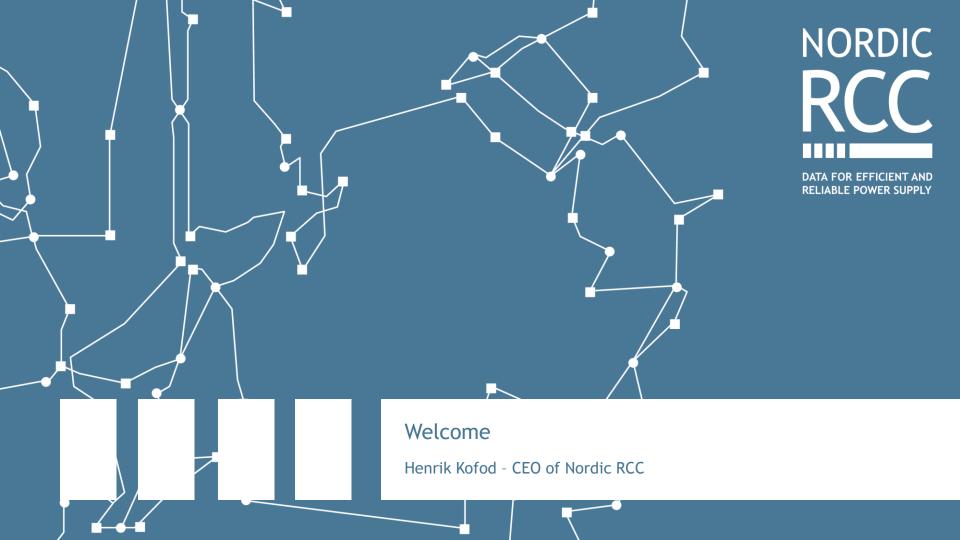
ENERGINET SVENSKA KRAFTNÄT Statnett FINGRID

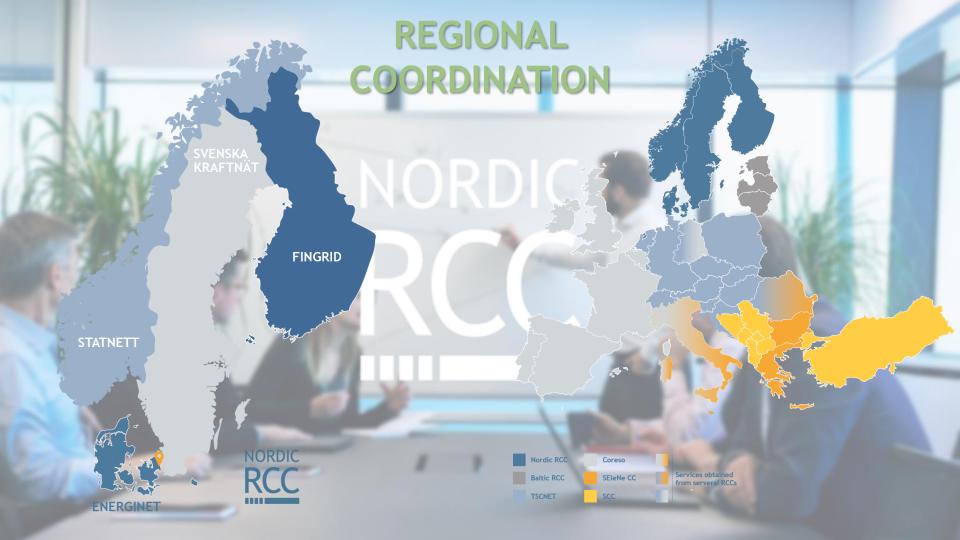
Relevant fora

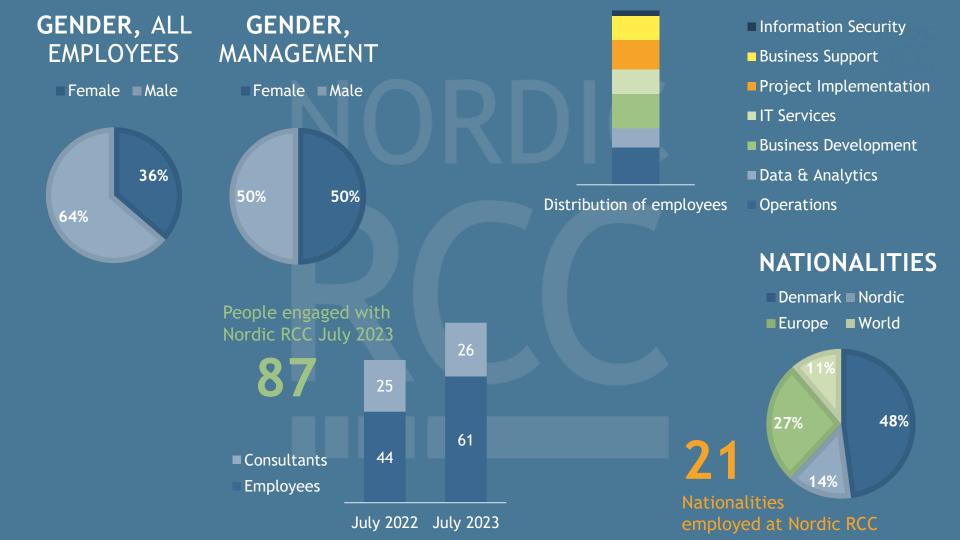
Cooperation Committee RGN MSG NIT InfoSec



SESSION 1: NORDIC RCC - WHAT WE DO







VISION & MISSION



VISION

Bridging Nordic power systems to enable the green energy transition

MISSION

We provide critical Nordic and European services and insights to Transmission System Operators for the benefit of society

Through collaboration, we proactively enable Transmission System Operators to optimise beyond their individual capabilities

We digitalise to increase security, efficiency, and transparency of Nordic power systems



2023

PREPARE TO CHANGE

We focus on succeeding with current tasks to secure trust with the TSOs.

We ensure that we get a solid foundation in place to succeed with the strategic phases to come.

We know who we are, and we know where we are going. We act with one voice.

2024

PHASE 2

IMPROVE EFFICIENCY AND VALUE-ADD

We improve the way we work to become more efficient and customer-oriented.

We push the boundaries for the value our services provide to society through collaboration with the TSOs.

We drive digitalisation.

PHASE 3



EXPAND OUR INFLUENCE

We proactively pave the way for synergies across Nordic TSOs by leveraging regional processes, expertise, and insights.

We engage proactively with the Nordic TSOs, other RCCs, fora in ENTSO-E, etc. to add value to the Nordic TSOs for the benefit of the society.

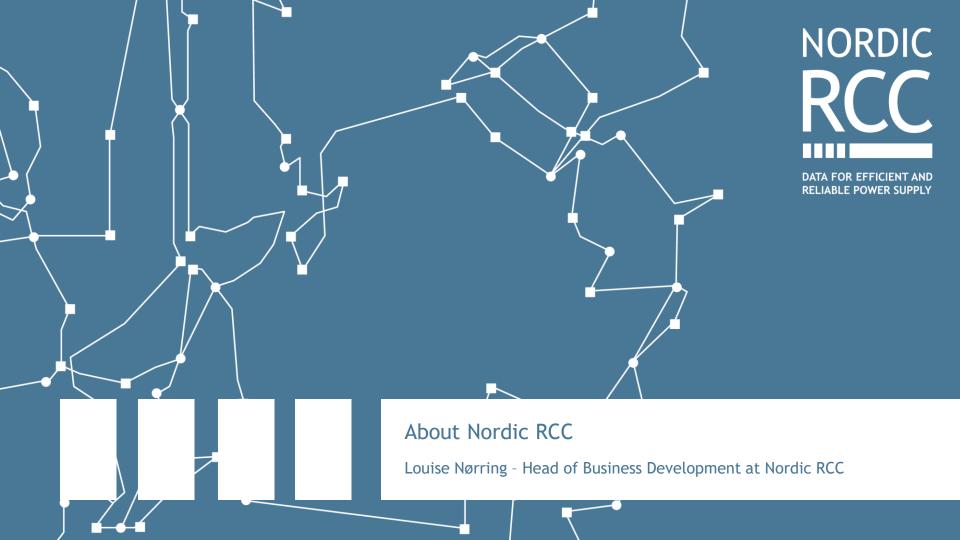
We become the one voice representing the Nordic TSOs on RCC-related topics.

2026

PHASE 3

PHASE 1

2025





Have you heard the story of the cruise ship?



4 November 2006. Newly built Norwegian Pearl was leaving the shipyard in Papenburg Germany.

The German power company had to turn power off from a 380,000 volt overhead line

BUT the downed line caused a build-up of pressure in other areas of the power grid.

It sparked a chain reaction across Germany which quickly spread to other parts of Europe.

Around 10 million people were left without power for two hours at a time.

TSOs in continental Europe realized the need to coordinate better!



From idea to law to now



coreso & TSCNET established in 2006 as voluntary partnerships/companies





Long history of collaboration in the Nordics



Nordic RCC 1 July 2022





Network Codes & Guidelines

RSCs became mandatory with 6



In November 2016 Nordic RSC was established





2019 Clean Energy Package RCCs mandatory as companies 16 tasks









TASKS OR SERVICES?



At Nordic RCC, we understand our obligations as both required tasks to support the safe and efficient operation of the electricity system, and services to the TSOs that make their operation easier and provide value to their organisations.



What is a service?



= A coordination done by Nordic RCC to provide overview to TSOs

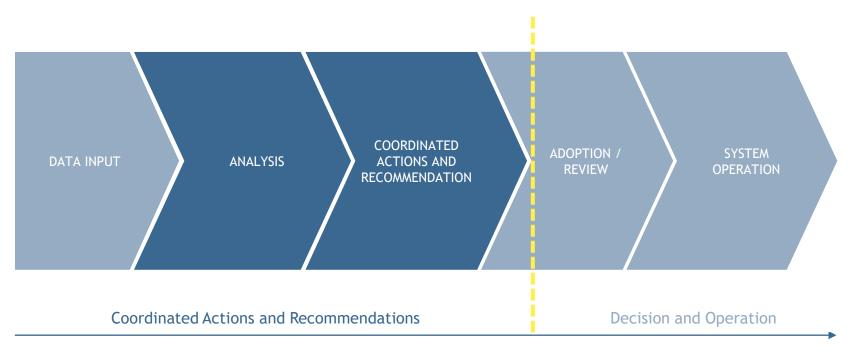
... and to give them recommendations and coordinated actions based on our overview

Service ≠ tool/product/application

The service is the coordination done by RCC. This can be through a teams call, through a calculation, through workshops etc. This can be in the coordination centre or as a back-office task. In many cases the service will need to be facilitated by a tool. Services will generally be based on TSO input, but this can be more or less digitalized and data driven.

The split between TSOs and RCC





RCC monitoring and reporting





Which services shall we develop according to legislation?



Capacity calculation	Coordinated Security Analysis	Common Grid Model (incl. alignment)	Outage Planning
Adequacy	Emergency Restoration planning	Training	Support restoration
RIAR	Sizing	Procurement	Inter-TSO settlements
Crisis scenarios	Seasonal adequacy	MEC	IOSN

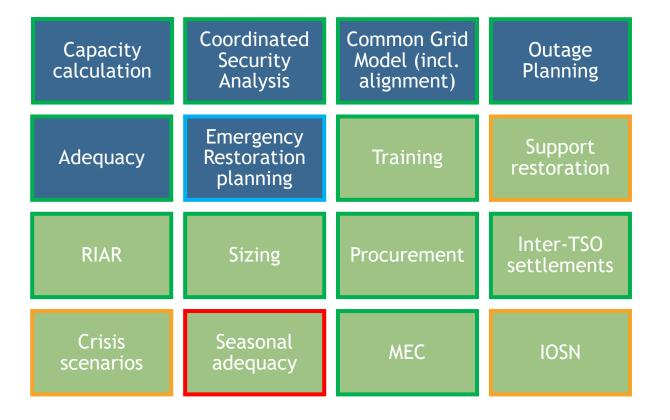
NCs & GLs

CEP

We get the service request from TSOs when the methodology is done.

How far are the methodologies?





NCs & GLs

CEP

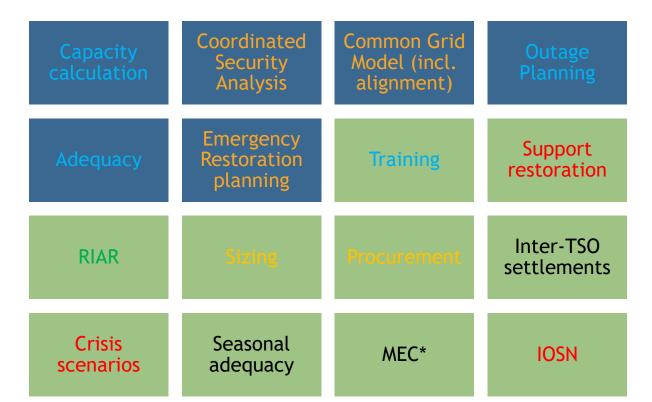
Methodology done

No methodology needed

Under development

Voluntary service, decided not to be requested

How far are we?





NCs & GLs

FP

Done

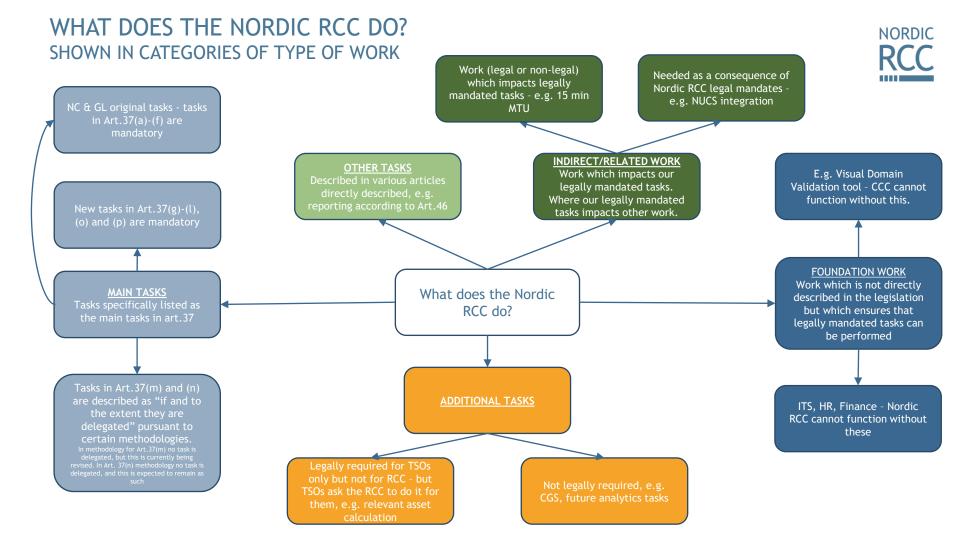
Part in operation but also under development

Under development

Not yet started

Under discussion

Not requested





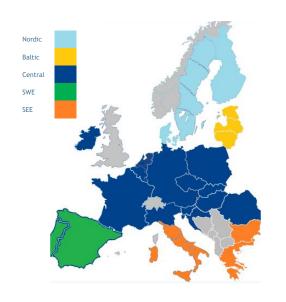
Geographical scope



Services are performed <u>by</u> RCCs <u>in</u> different regions (not necessarily corresponding to the RCC scope)



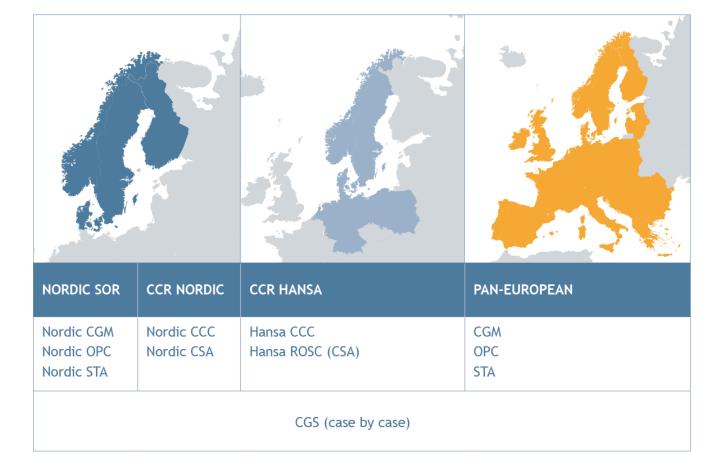
CCRs (IU & Channel no longer exist post Brexit)

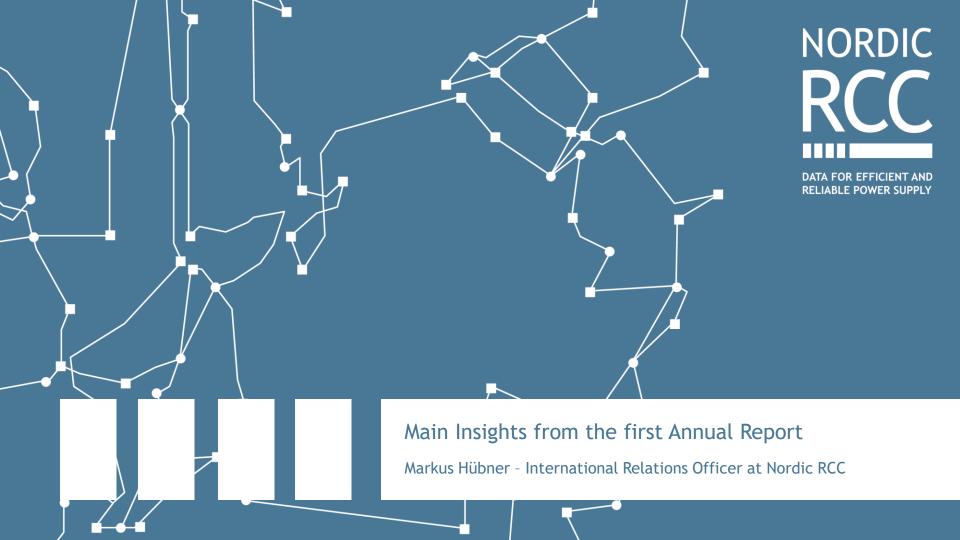




GEOGRAPHICAL SCOPE OF NORDIC RCC TASKS

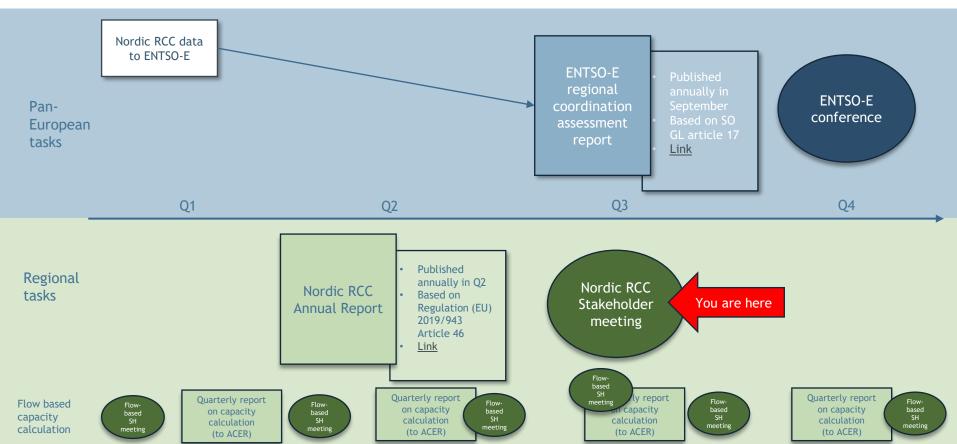






REPORTING AND TRANSPARENCY - HOW TO KEEP INFORMED

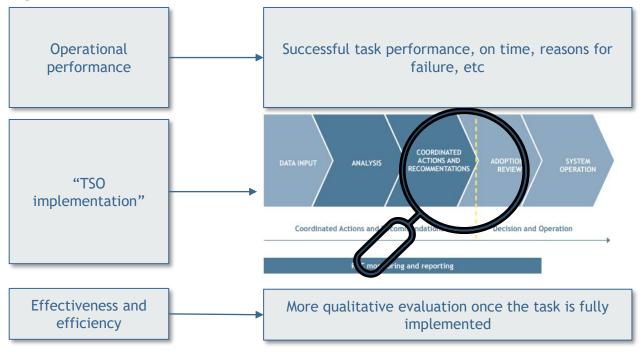




REPORTING ELEMENTS



- Annual Report includes results of monitoring, implementations status, costs/financials, shortcomings and general information about Nordic RCC
- Monitoring Elements:



MAIN RESULTS

- We successfully run several daily processes (regional)
 - Regional CGM creation D-2
 - Short Term Adequacy Analysis (STA)
 - "CCC1c" (Capacity provision)
 - FB external parallel run
 - Coordinated Security Analysis (trial in 2022)
- Operational performance is monitored and reported
- Quality (input, output) is not part of reporting
- Monitoring and reporting requirements are written for fully implemented tasks
- Tasks to be further developed recommendations, coordinated actions still to be issued
- Results of daily, monthly, yearly tasks are used on an operational level in the "WOPT and DOPT"

FIGURE 12: Percentage of days with Nordic STA process completed before 8.30 am



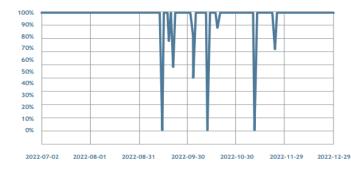
RCC

STA

FIGURE 11: Successfully merged CGMs

Average substituted CGMs for 2nd half 2022 2,63%

Successfully merged CGMs



CGM

CHALLENGES

Complexity

New standards & Different starting points

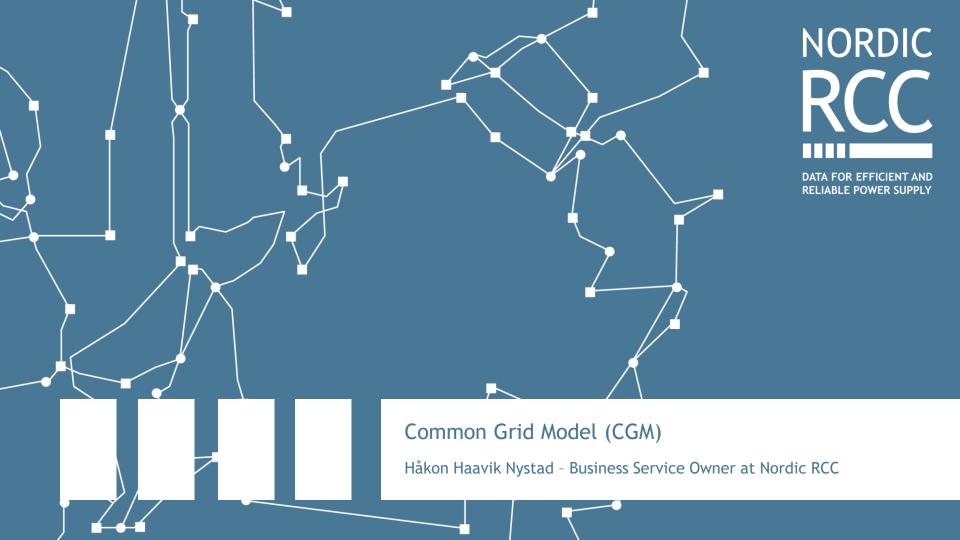
Data quality and consistency

Information Security and Confidential Data





SESSION 1: NORDIC RCC - WHAT WE DO Q&A



HOW DOES THE COMMON GRID MODEL PROVIDE VALUE TO THE TSO?



Quick intro to the CGM Service



How does the CGM provide value?



History of CGM



CGM today and in the future







IGM	Individual grid model
CGM	Common grid model
CGMA	CGM alignment

QUICK INTRO TO THE CGM SERVICE - WHAT IS A CGM?

"a data set describing power system characteristics (generation, load and grid topology) and related rules to change these characteristics during capacity calculation, prepared by the responsible TSOs, to be merged with other individual grid model components in order to create the common grid model"





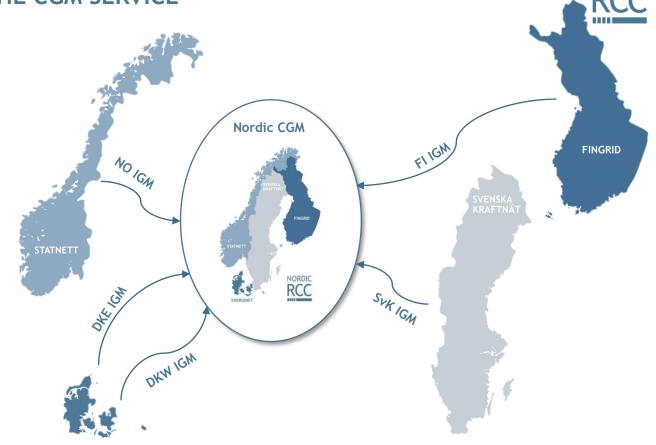


QUICK INTRO TO THE CGM SERVICE - WHAT IS A CGM?

ENERGINET

"a data set describing power system characteristics (generation, load and grid topology) and related rules to change these characteristics during capacity calculation, prepared by the responsible TSOs, to be merged with other individual grid model components in order to create the common grid model"

"Union-wide data set agreed between various TSOs describing the main characteristic of the power system (generation, loads and grid topology) and rules for changing these characteristics during the capacity calculation process"

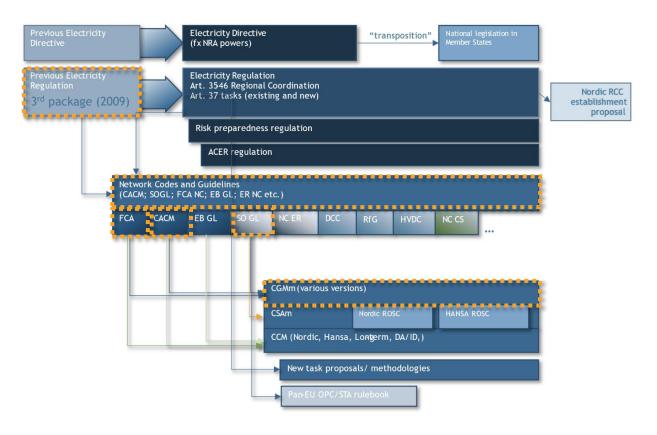


NORDIC



QUICK INTRO TO THE CGM SERVICE

- WHAT DOES THE REGULATIONS SAY?

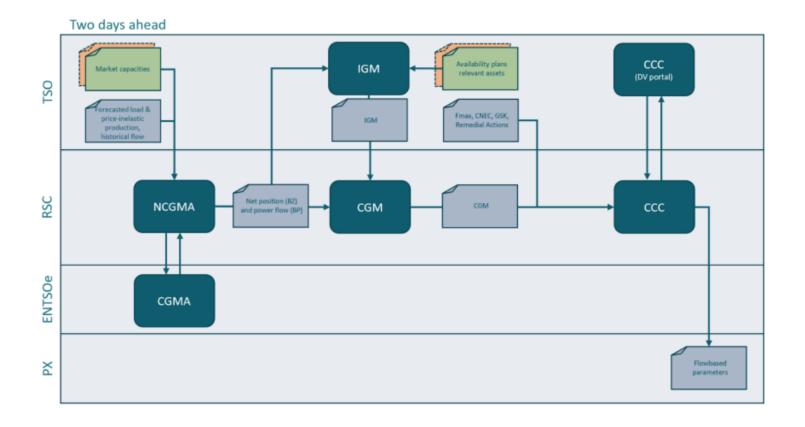






QUICK INTRO TO THE CGM SERVICE - HOW DOES IT WORK?







HOW DOES THE CGM PROVIDE VALUE?

- GRID MODELS



...all models are wrong; the practical question is how wrong do they have to be to not be useful.

- George Box
- > Grid models have always been used at the TSOs
- The TSOs' models have not necessarily been compatible with each other
- To capture the whole European grid in ONE model, that incompatibility needs to change

The models contains

- Transmission grid voltage levels
- AC and DC Lines
- Transformers
- Generators
- Load

With this information we can:

- Run static simulations of the grid
- Calculate how the electricity will flows
- · Which lines and transformers will be overloaded

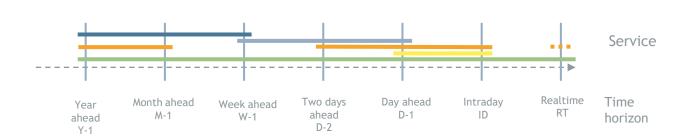




HOW DOES THE CGM PROVIDE VALUE?

- OTHER RCC SERVICES







The CGM service end with the creation of the CGM

The models contains

- Transmission grid voltage levels
- AC and DC Lines
- Transformers
- Generators
- Load

With this information we can:

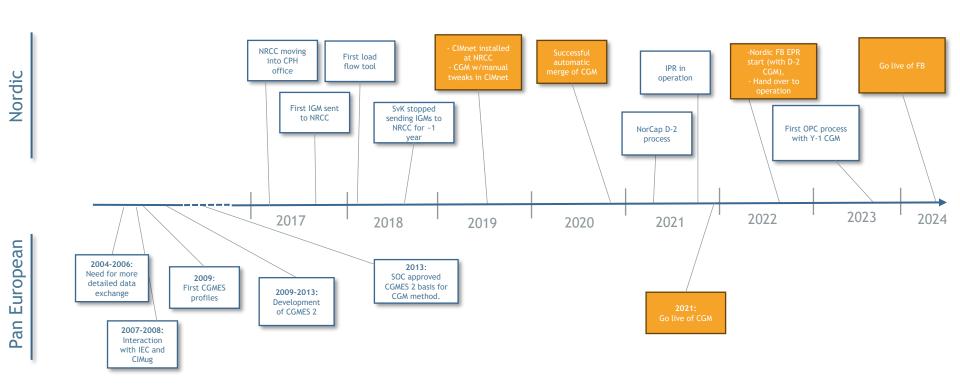
- · Run static simulations of the grid
- Calculate how the electricity will flows
- · Which lines and transformers will be overloaded

The model can then be used for

- The available capacity on the lines
- Simulate scenarios to better understand how the grid response in different situations





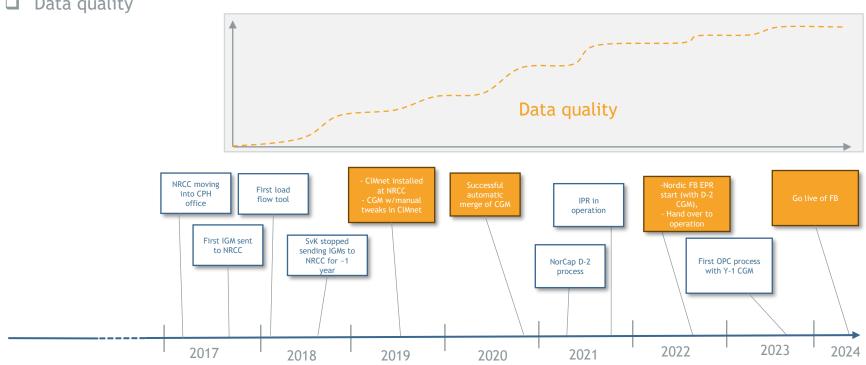


HISTORY OF CGM



2 sides to service implementation

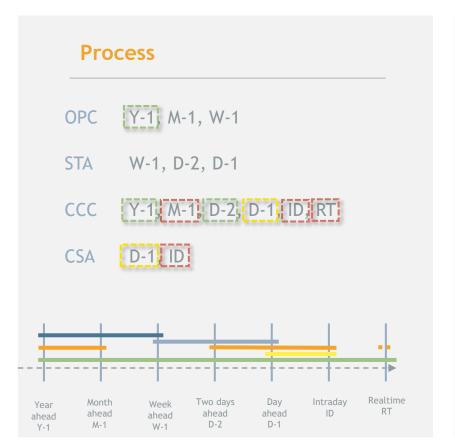
- Process
- Data quality





CGM SERVICE TODAY AND IN THE FUTURE





Data Quality



CGM SERVICE TODAY AND IN THE FUTURE



Process Y-1, M-1, W-1 STA W-1, D-2, D-1 Y-1, M-1, D-2, D-1, ID, RT CCC D-1 ID CSA Realtime Two days Day Month Week Intraday RT ID ahead ahead ahead ahead ahead D-2 D-1 M-1 W-1 Y-1

Data Quality

- 1. Data quality
- 2. Data confidence

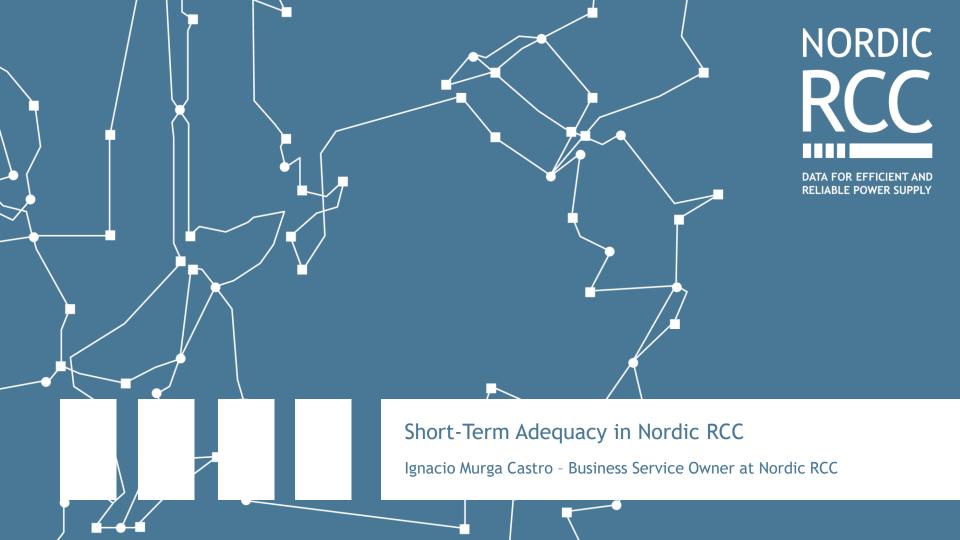
How do we get there?

- > More focus on data analysis
- ➤ Close collaboration between TSOs and NRCC
- > Long time spans, instead of single timepoints
- ➤ Good KPIs both on management and expert level





QUESTIONS?



AGENDA

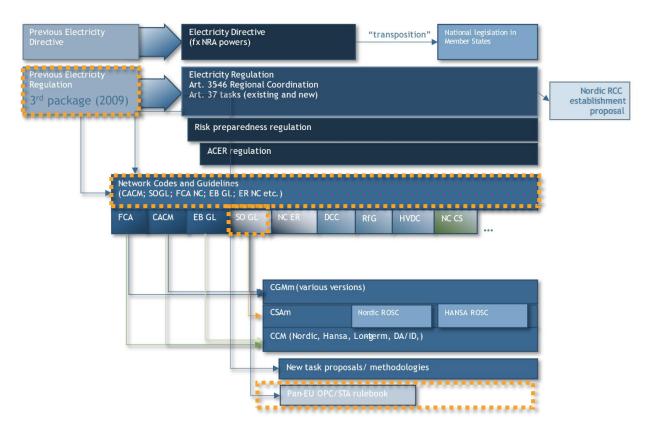


- Intro: What is Short-Term Adequacy?
 - STA service provided today
 - Nordic and European
- Value added
 - Winter assessment
 - Weekly Operational Planning Teleconference (WOPT)
- Challenges
- Future of the service
 - Current development
 - Future development: Nordic influence in the European community



QUICK INTRO TO THE CGM SERVICE

- WHAT DOES THE REGULATIONS SAY?





WHAT IS AN ADEQUACY ASSESSMENT?



• Purpose:

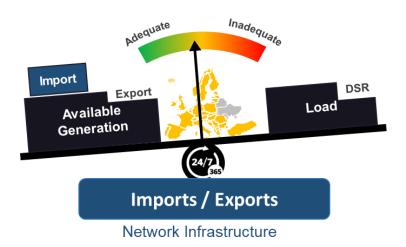
• The purpose of the Short-Term Adequacy (STA) service is to make an assessment if there is acceptable production to cover the load in a specified area, considering transmission capacity constraints in the assessment.

Why:

• If a lack of adequacy is discovered in the STA service there is time for planning which remedial actions to take to relieve the situation, and when the situation is discovered before the operational hour it is possible to use less costly remedial actions

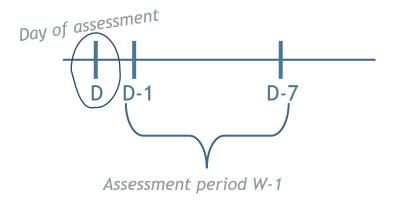
How:

- Different methods to achieve this can be used:
 - Simple rough calculations
 - Realistic flow calculations
 - Actual flow calculations



SHORT TERM?

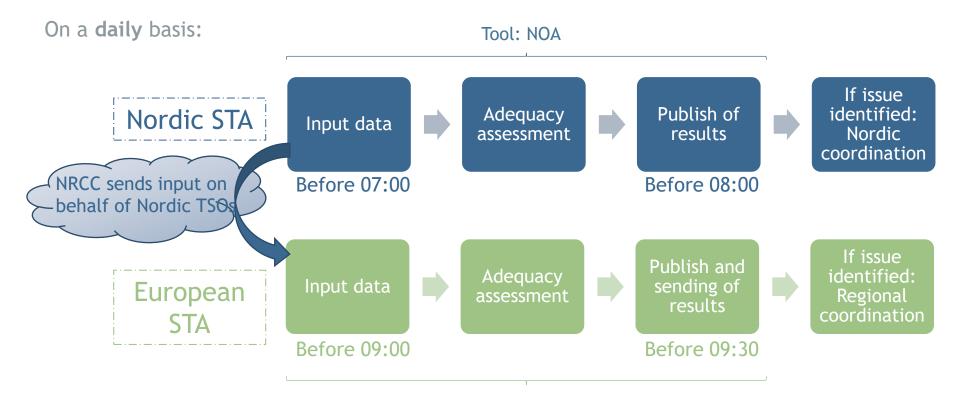
• NRCC performs a daily adequacy assessment (both Pan-European and Nordic) focuses on the next 7 days.





ADEQUACY PROCESS - NORDIC AND EUROPEAN





Tool: Pan European

ADDED VALUE



Winter	ir
Europe	

Highest load in the Nordics - tighter situation



Finland did not count with Olkiluoto 3 last Winter

Drought in Norway last Winter

Close monitoring of STA data

European group for Winter 2022/2023 due to the energy crisis in Europe - neighboring regions affect the operations of the Nordics

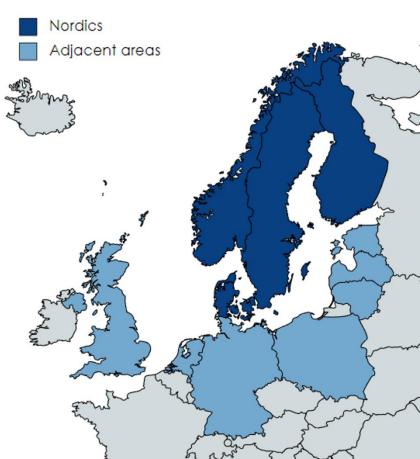
Weekly Operational Planning Teleconference (WOPT)

Meeting every Thursday



Discussion including the adequacy situation, outages in the region, and operational planning for the next week

Forum for the 4 Nordic TSOs to share details, unexpected situations, or coordinate actions to mitigate risks



CHALLENGES

Assessment of the adequacy situation

- How realistic is the issue that has been identified?
- How good/accurate is the data that we have?
- What can we do about the situation?
- How does the TSO want to target the adequacy situation that is foreseen?



FUTURE OF THE SERVICE





 Pan European tool has improved significantly since the service started, which means that soon there will be no need for the regional Nordic tool (NOA)

R5 Energy limitations

- Availability to include scarcity of resources such as gas, hydro or coal
- Go-live expected in November 2023

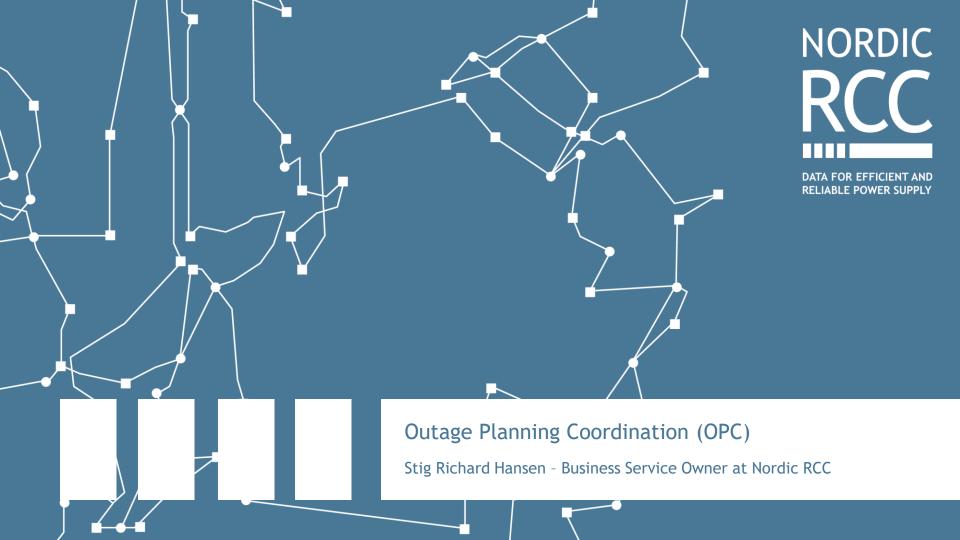


R6 FB in the Nordics

- Inclusion of FB results for the transmission capacity between bidding zones in the Nordics
- Go-live expected in Q1 2024



QUESTIONS?



AGENDA

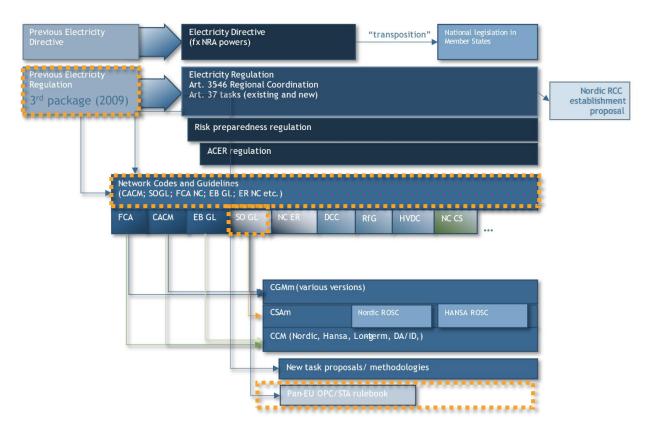


- It all started with an outage that was not a success story
- The success
- Outage planning as the basis the steps in operational planning
- Outage planning Nordic
- Outage planning Pan European
- Next steps
- Questions



QUICK INTRO TO THE CGM SERVICE

- WHAT DOES THE REGULATIONS SAY?





THE STARTING OCCURRENCE OF THE RSC INITIATIVE WAS AN OUTAGE AND A FAILURE



4 November 2006 : major incident on the European electrical grid



Cross zonal incident, starting in Germany: cascading line tripping with consequences for whole of continental Europe

Uncertainties on cross border impacts:

only a national view is not sufficient anymore

Need for an aggregated and shared view of the European electrical grid (coordination between TSOs)

coreso

Recommendations

- #1: ... Simulation of contingencies (tripping of power system elements) located outside the TSO's own control area....
- #3: develop standard criteria for regional and inter-regional TSOs co-ordination approach aiming at regional security management....





380 kV double line Conneforde-Diele cross the river Ems

- Outage planned requested in September
- Security Analysis done but only for the single TSO grid
- Breaker opened at 09:38 PM
- Overload at 10:07 PM on the Landesbergen-Wehrendorf 380 kV line
- 10:10 PM topology changes was done
- 2 sec later the 380 Landesbergen-Wehrendorf kV tripped leading to cascade effect

THE SUCCESS:

Outages are now coordinated

- at least yearly and weekly basis
 - Yearly update of relevant assets
 - Yearly common Unavailability Plan
 - Weekly process
- common structured way
 - based on common business processes
- common rules
 - based on commonly decided Pan European rulebook
 - Continuously updated input to the rulebook (best practice work)
- common IT tools
 - PE OPC tools
 - Regional tools and full transparency on the regional tools (TSOs and RCCs)



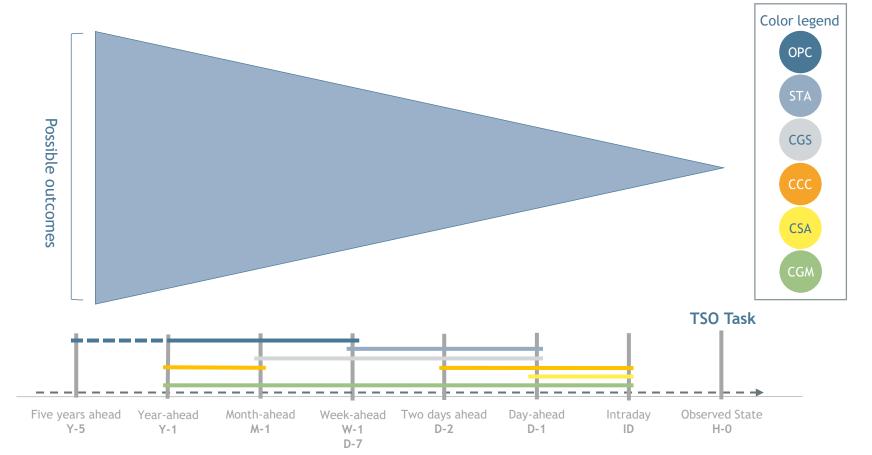


NORDIC SUCCESS

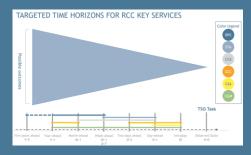
- Quality of the Nordic outage coordination increased
- · Continuity and interfaces between the services
- Improvements of the outage planning coordination
- Nordic structure facilitating the Nordic needs and fitting into the Pan European process and tools
- Nordic engagement in the PE OPC work

TARGETED TIME HORIZONS FOR RCC KEY SERVICES



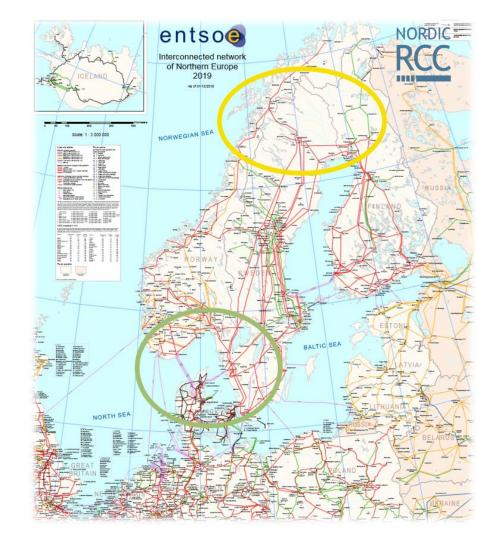


NORDIC OUTAGE PLANNING



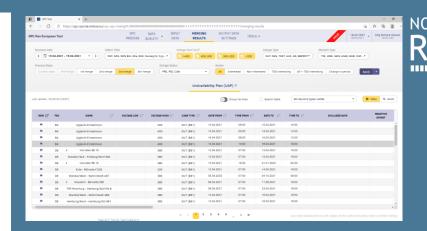
Regional process

- Timewise first operational planning process
- Time horizons added in the Nordic process: Y-5 & W-4
- Nordic coordination in a Nordic regional tool and then forward to PE
- Nordic process focus on
 - · Optimization of the availability of the grid
 - Minimize market impact
 - Through early outage planning focus on security of supply
- Transparency to the market (bidding zones) Nordic focus
- Nordic process for continuously updating of the outages



PAN EUROPEAN OUTAGE PLANNING

- PE OPC project 40 (now 39) TSOs and 5 (now 6) RSCs agreeing
- PE OPC cooperation
 - Organization
 - RCCs cooperation & rotational tasks
 - 10 Y vision & 5 Y roadmap
- PE OPC tool
 - In operation since April 1st 2020
 - Common platform
 - Outage plans, relevant assets, KPIs
 - Close cooperation with PE STA tool
 - Yearly releases and 5 Y roadmap
- PE OPC rulebook
 - Common process
 - · Updated on quarterly basis
- PE OPC Best practice document





NEXT STEPS



Further development of Nordic OPC process

- Structured security analysis of scenarios chosen by expert assessment of the next year outage plan using Nordic CGM
- Security analysis of the next weeks outage plans



Further development of the Pan European OPC process

- Utilize the common OPC and STA platform
- Seamless TSO-TSO outage planning process



NORDIC

Implement elements from the OPC 10 Y vision in practical life

- CGM compliance
 - Ensure direct link btw UnAvailability Plans and IGMs
- Vision: PE OPC tool as the basis for outages in Europe
 - LTCC process to get outages from PE OPC tool
 - Common OPC & STA maps in the tool



QUESTIONS?





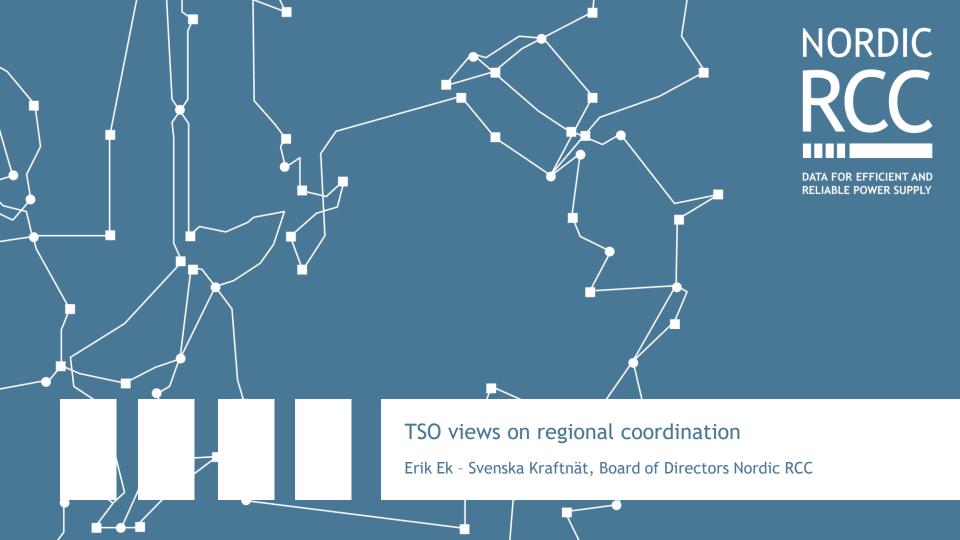
LUNCH UNTIL 13:15

Make sure to be back in time for the next presentation

TSO views on regional coordination by Erik Ek



SESSION 2: STAKEHOLDER VIEWS





QUESTIONS?

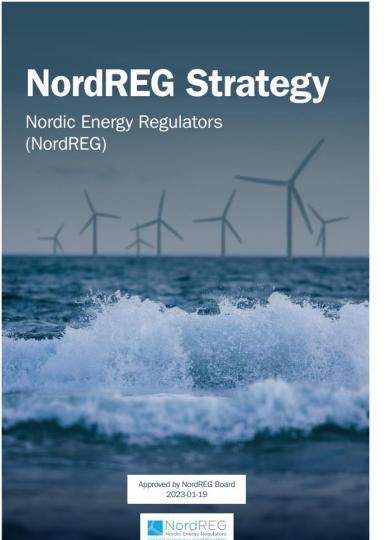
NordREG

NRCC Stakeholder meeting

31 August 2023 Anne-Marie Storm Pedersen Eske Benn Meyer



NordREG Strategy

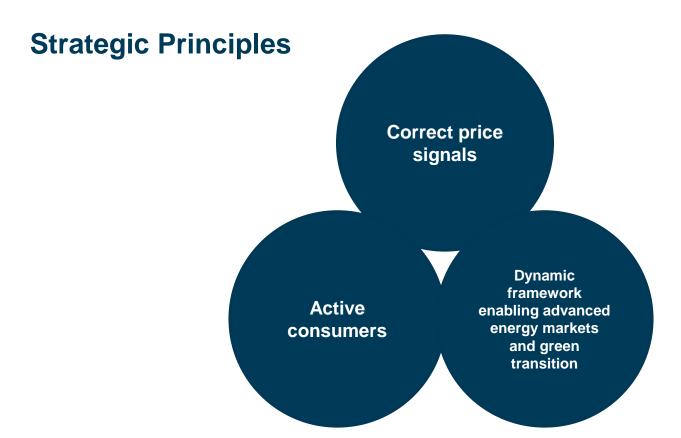


NordREG mission

In cooperation, we actively promote legal and institutional framework and conditions necessary for developing the Nordic and European electricity markets

NordREG vision

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



1. Correct price signals

- 1. Cross border trade of electricity should not be restricted between bidding zones.
- 2. Capacity of interconnectors provided to the market should be based on common and coordinated principles to ensure transparent and reliable information.
- 3. Possible adequacy challenges should be handled by efficient investments in generation and network and/or amending the existing regulation i.e. removing existing barriers that distorts efficient price signals.
- 4. Flexibility of the Nordic electricity system should be increased by continuously identifying and removing barriers to the use of flexibility resources.
- The market design for day ahead, intraday, balancing and forward markets with sufficient and adequate hedging opportunities should be continually reviewed to ensure that the wholesale market is fit for future challenges

2. Active consumers

- 1. Competitive retail markets with low entry barriers.
- Active consumers Access to transparent relevant and accessible information to make well-informed decisions.
- Trustable markets monitoring compliance with the regulation will increase trust in the retail markets and increase activity for suppliers and consumers.
- 4. Consumers own their own data & flexibility and is empowered to make informed decisions.
- 5. Facilitate efficient solutions to handle challenges and opportunities of new technology

3. Dynamic framework enabling advanced energy markets and green transition

- 1. Markets where possible, and efficient regulation of natural monopolies.
- 2. Cost-reflective grid tariffs & connection fees that improves efficiency and provides fair distribution of grid costs.
- 3. Electrification in areas such as transportation and industry.
- 4. Market based procurement of distributed flexibility resources.
- 5. Promote efficient solutions to include hydrogen, sector coupling etc.

NordREG - Organization

NordREG is a voluntary cooperation between the Nordic energy regulators. Decisions are made in consensus and the organisation constitutes of a presidency with a secretariat.

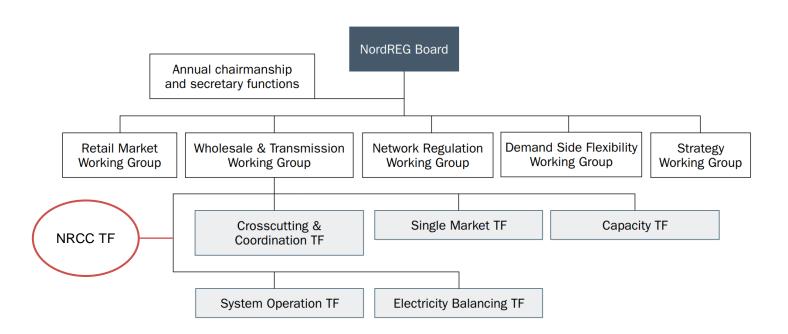
NordREG seeks to facilitate the integration of the Nordic electricity market and the efficient handling and implementation of EU- regulation

The work in NordREG consists of taking common regional decisions within the European Regional Regulatory Forum (ERRF), exchanging best practices and writing common reports.

NordREG aims to reinforce the level of common representation in the cooperation within the Council of European Energy Regulators (CEER) and Agency for the Cooperation of the Energy Regulators (ACER).



The NordREG Organisation



NordREG - Areas of work

The basis for the co-operation within NordREG is to identify areas of work where cooperation can take the following forms:

- Exchange of views
- Working together to map and analyse energy market issues
- Producing reports and statements
- Taking common action to influence the development of the Nordic or the European energy markets



Oversight

A task force dedicated to oversight

The taskforce NRCC TF has been created with the sole purpose of conduction the oversight of the Nordic RCC.

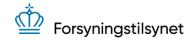
The members of the taskforce are appointed by the national regulatory authorities of Sweeden, Finland, Norway and Denmark. Denmark is chairing the task force.



Cooperation with other task forces and ACER

The new NRCC TF will coorperate closely with other NordREG task forces and ACER when planning and performing the oversight of the Nordic RCC.





Annual oversight

Every year the Task Force will perform an annual oversight. The annually oversight will cover the financial reporting by the NRCC, a review of the annual report by the NRCC, a review of any significant incidents that occurred since last oversight, and two or three chosen subjects.

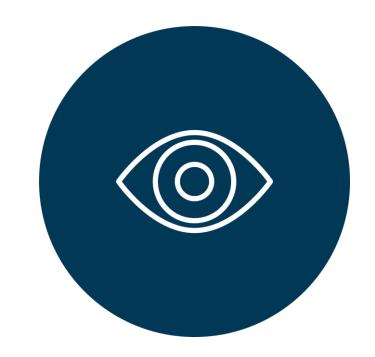
The RCC will be informed of the chosen subjects prior to the oversight.



AD HOC oversight

The Task Force will arrange an ad hoc oversight if:

- An unexpected event with significant consequence occurs and there is reason to believe that a timely and diligent effort by the NRCC could have affected the outcome, or
- One or more NRA becomes aware of possible significant infractions or problems in the strategic or the day-today running of the NRCC.



The result of the oversight

The task force will conclude the oversight by issuing a report containing findings and conclusions.

Any formal reaction will be issued by DUR as the authority with geographical jurisdiction of the RCC.

The outcome of the oversight will be made public by NordREG and the NRAs.



Provisions governing the oversight

The main subject of the oversight performed by the regulatory authorities outlined in **Article 62** of the EU Directive 2019/944 on common rules for the internal market for electricity.

EU Regulation 2019/943 Article 46(2).

The tasks performed by the Nordic RCC according to 2019/943 **Article 37 and 38 and Annex 1**.





QUESTIONS?





15 MINUTE BREAK

Make sure to be back in time for the next session

Group discussions on regional coordination



SESSION 3: GROUP DISCUSSIONS

QUESTION 1

QUESTION 2



What do you think should be the highest priority for regional coordination in the Nordics right now?

What do you see as the biggest challenge for regional coordination in the Nordics?

If time: How can we overcome it?

25 min 5 min 5 min 15 min

