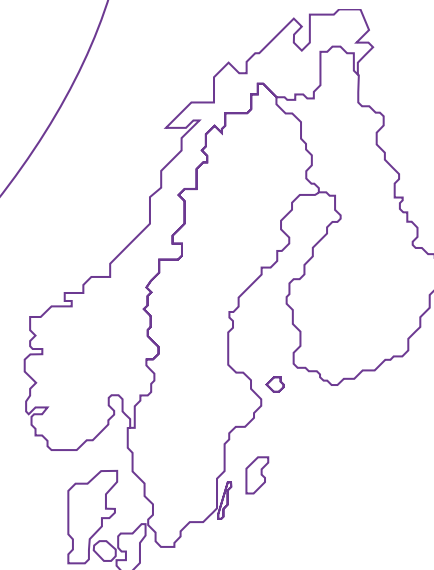


Asta Sihvonen-Punkka
The Nordic TSO Strategy Steering Group, Fingrid

Solutions for a green Nordic energy system – Strategies to meet the climate challenge

Nordic TSO webinar 11th of March 2022

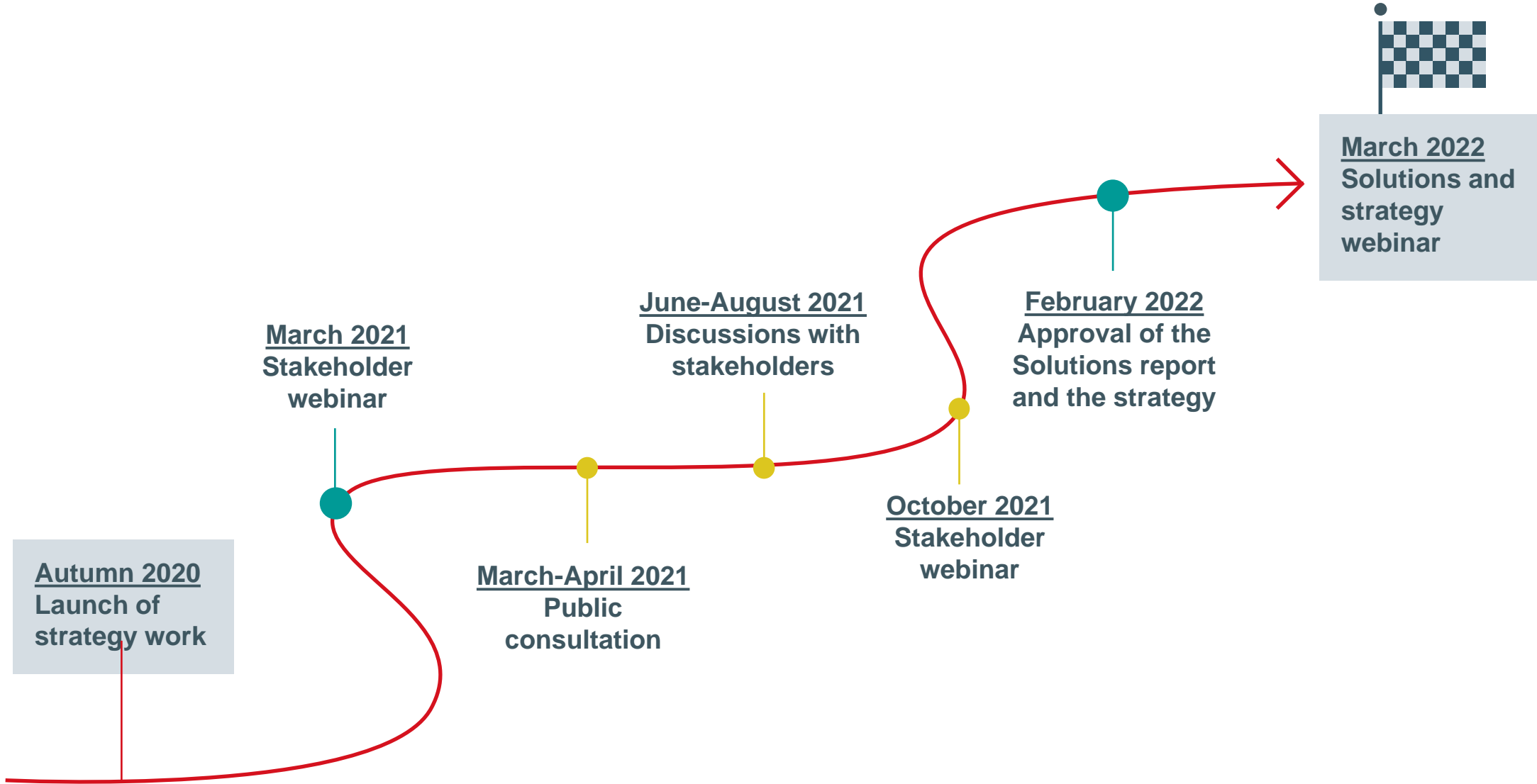


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Agenda for the Nordic TSO webinar 11th of March 2022

9.00 – 9.10	Welcome and opening	Asta Sihvonen-Punkka, Chair of the Nordic TSO Strategy Steering Group
9.10 – 9.30	The current Nordic TSO projects responding to the energy transition challenges – results of the latest Solution report	Johannes Bruun, Director, Electricity Market, Energinet
9.30 – 10.00	Nordic TSO strategy for the development of wind and sector integration – what is needed and where does the implementation start from?	Jussi Matilainen, Nordic TSO R&D
10.00 – 10.10	A short break	
Commenting presentations and discussion		
10.10 – 10.25	How does the strategy support the wind development in the Nordics and its neighbouring regions	Daniel Kulin, Strategic Analyst, Swedish Wind Energy Association
10.25 – 10.40	The common goal and the needed measures of cleaning energy consumption through electrification and sector integration	Mikko Lepistö, Energy Manager, SSAB Europe Oy
10.40 – 10.55	Questions and discussion	Moderated by Richard Rebhan, Svenska kraftnät
10.55 – 11.00	Closing remarks	Asta Sihvonen-Punkka, Chair of the Nordic TSO strategy steering group

Webinar guidelines

- All microphones are automatically set to “MUTE”
- All cameras are automatically set to “OFF”
- To comment or pose a question you can either
 - Write in the “CHAT” window
 - Use the “RAISE HAND” feature, your microphone and camera will be available for use accordingly
- When speaking, please
 - Turn your microphone and camera “ON”
 - Start by introducing yourself
 - Remember to turn your microphone and camera “OFF” afterwards

Thank you!



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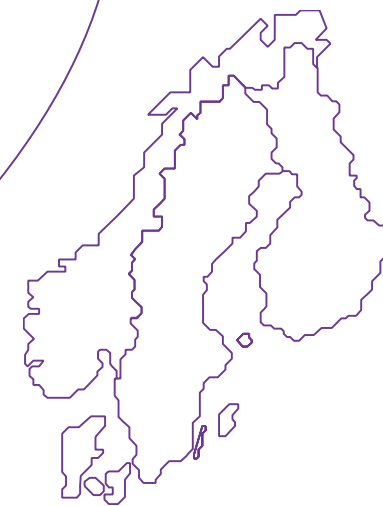
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 SVENSKA
KRAFTNÄT

Solutions for a green Nordic energy system

Strategies to meet the climate challenge



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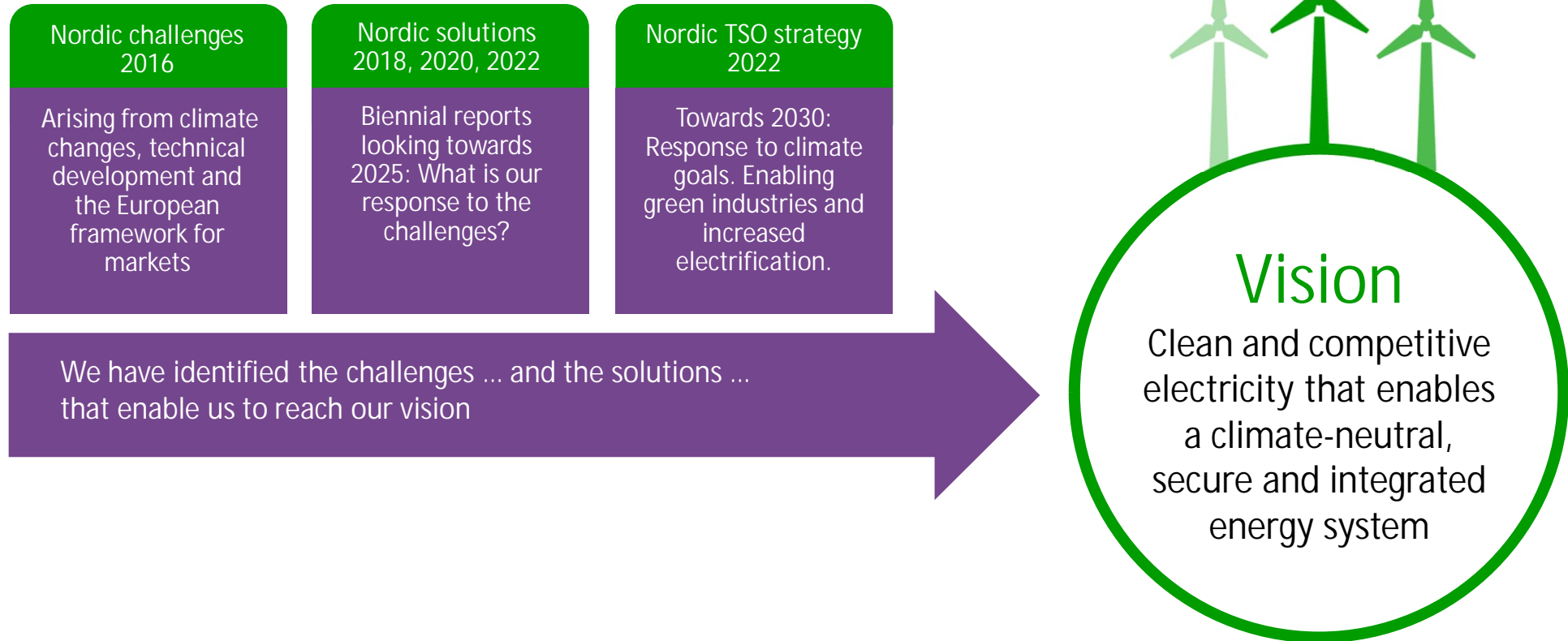
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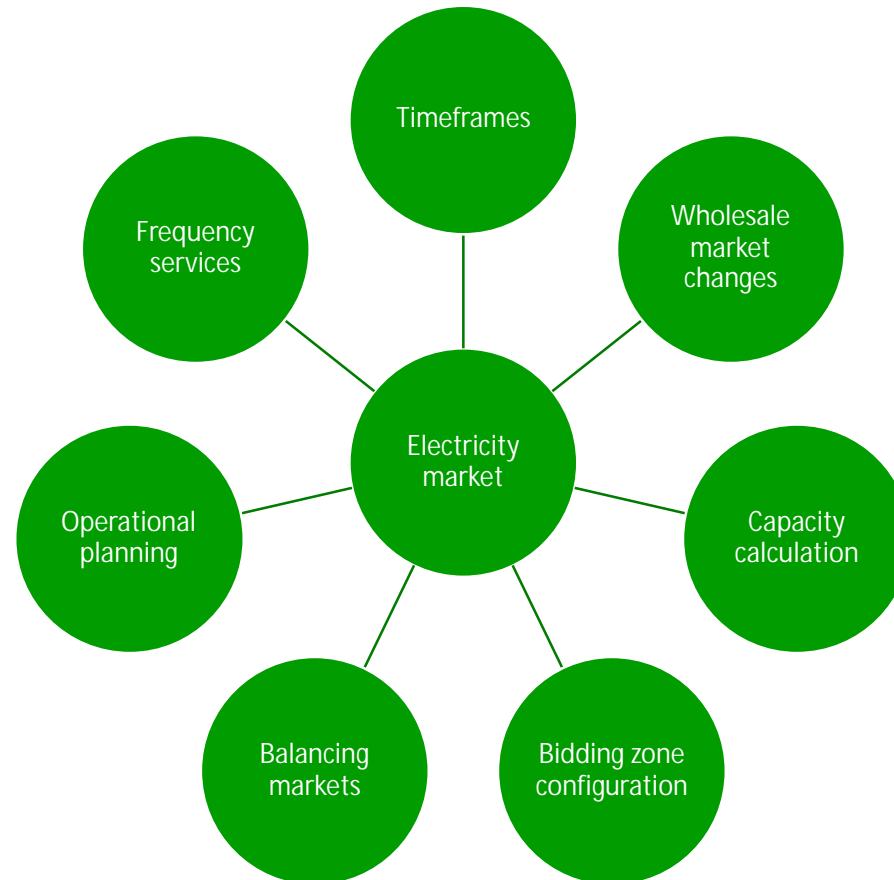


**SVENSKA
KRAFTNÄT**

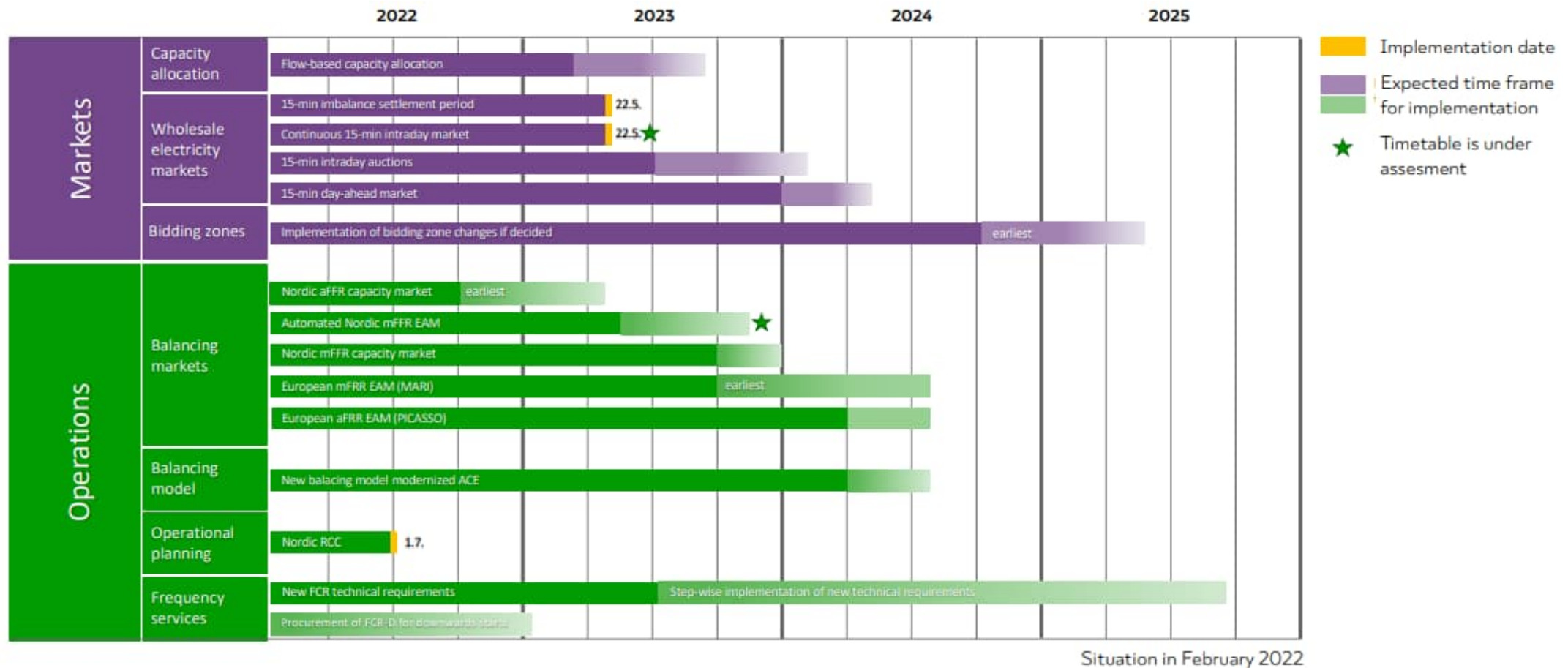
From challenges to solutions...



Modernising the Nordic electricity market



What we are doing and when



The solutions will challenge us all

Harmonised
European
balancing market

More actors at the
market

Larger playing
field for everyone

Finer 15 min
time resolution

More transactions

Less time to act in

More volatile
system

More demanding
task to balance
the system

Room for more
and new actors
and products

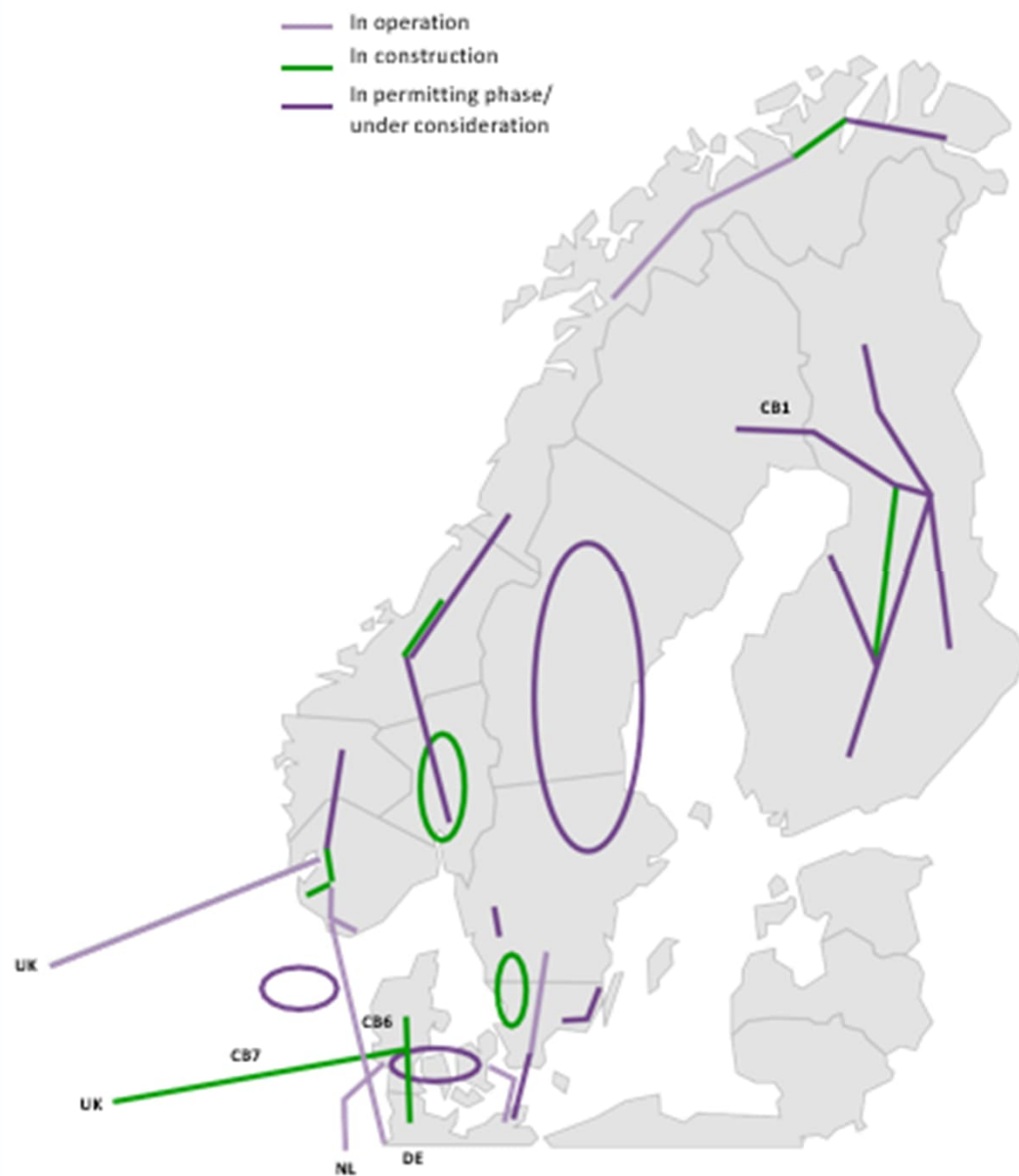
IT complexity

Interdependencies
between TSO's
and market actors

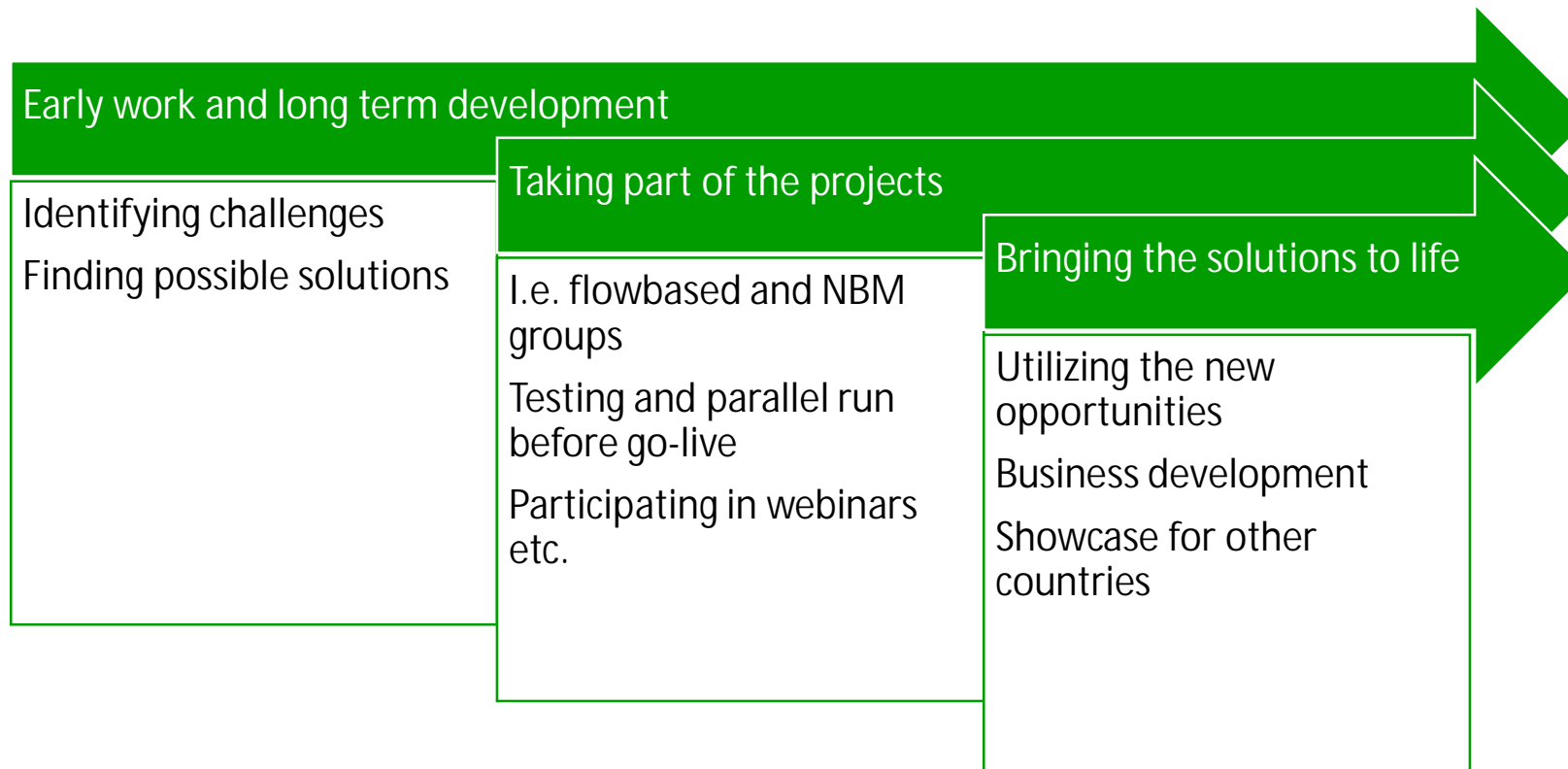
More action in
less time calls for
more
automatization

THE GRID WILL BE DEVELOPED TOO

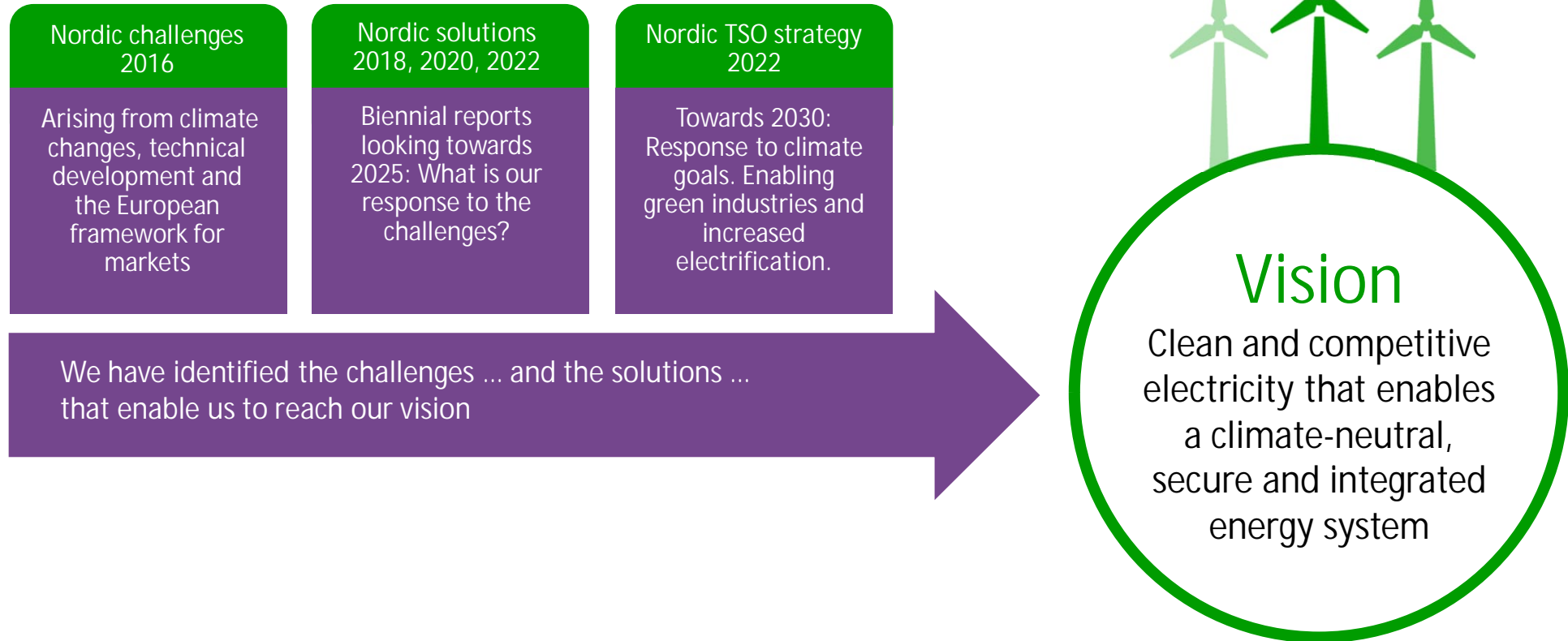
- Since last report several links has gone live, including
 - NSL
 - The Swedish south-west link
- And more internal Nordic reinforcements will soon come
- Including EU co-funding of Aurora-line and Viking Link



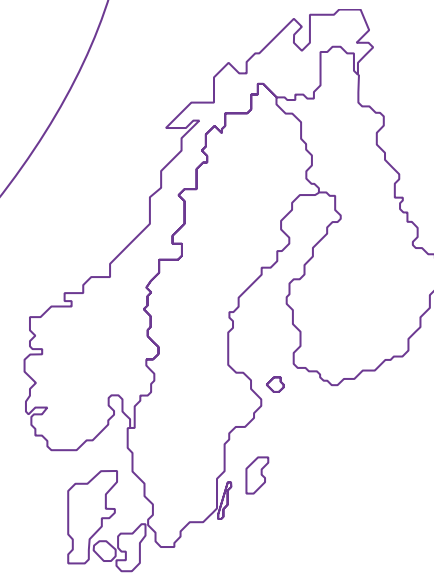
Stakeholders have played a vital part in creating the solutions



...And From solutions to strategy



Strategy for the Nordic wind power and sector integration development

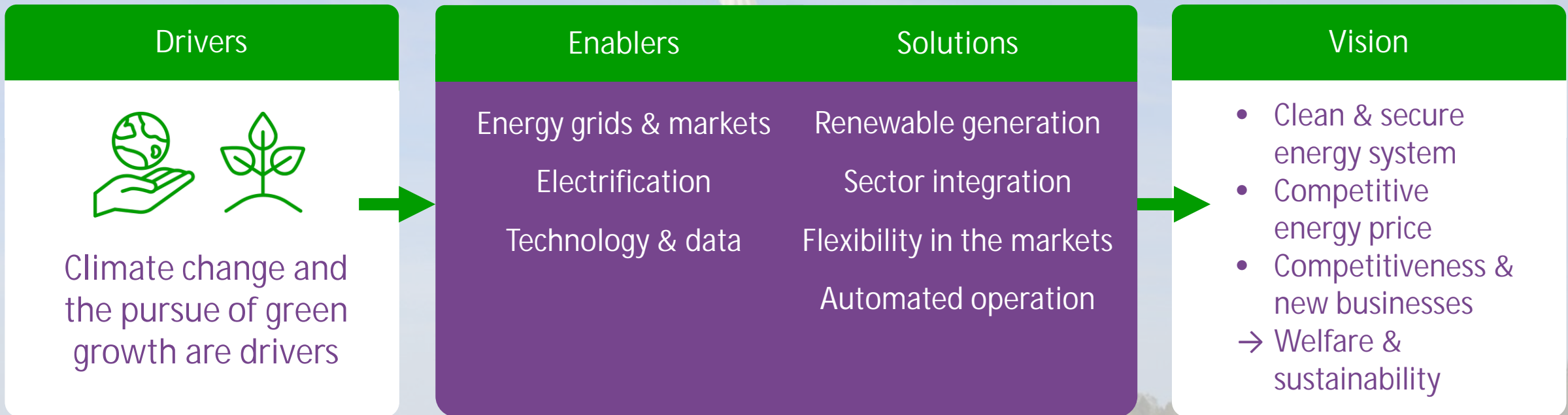


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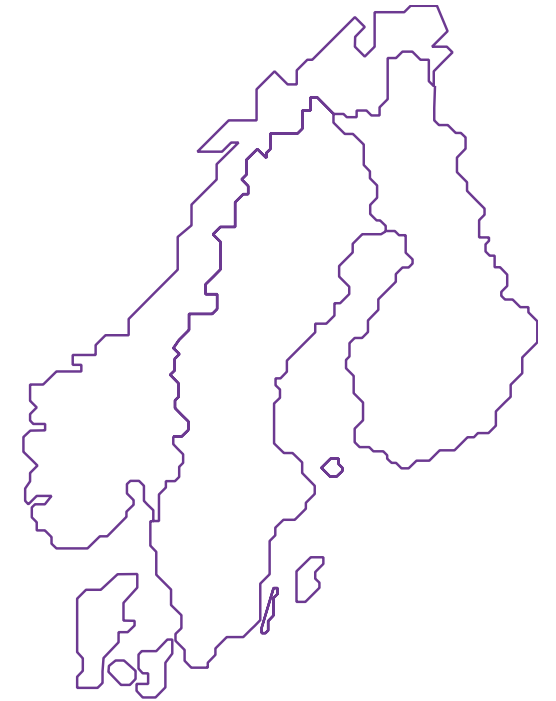
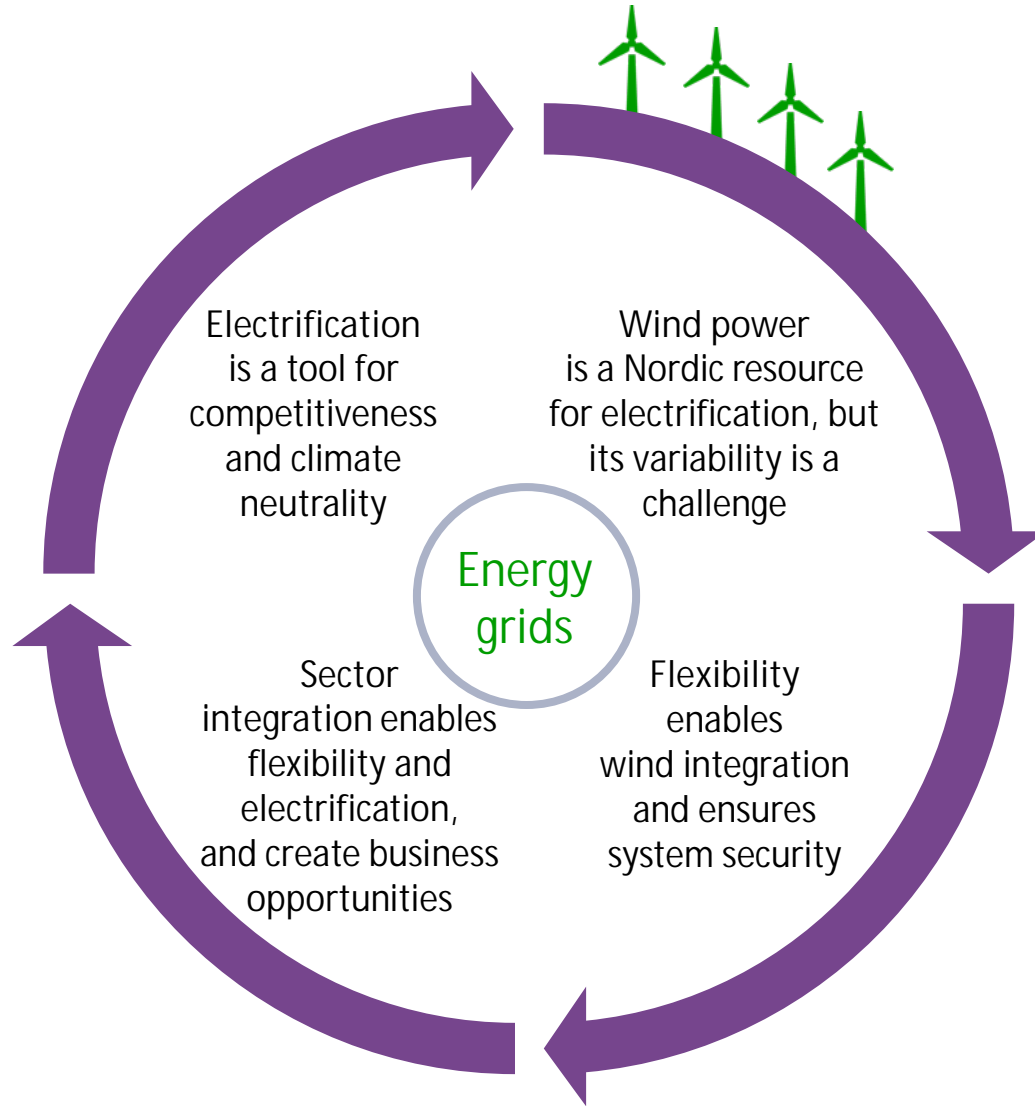
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Technological
Development



Towards climate goals



Nordic vision 2030

Clean and competitive
electricity that enables a climate-neutral,
secure and integrated energy system

Adequate infrastructure

enabling an integrated market for
renewable energy resources, as well as
direct and indirect electrification

Secure power system and integrated market

with market design supporting flexibility
and secure system
operation, and with a level playing
field for all technologies

Optimised energy system

in which infrastructure is based on
climate-neutral electricity and on the
needs of stakeholders

Good cooperation among stakeholders – Excellent conditions for wind – Easy access to advanced markets – Trustworthy basis for green investments.

Nordic roadmap 1/3

Vision: Clean and competitive electricity that enables a climate-neutral, secure and integrated energy system

Adequate infrastructure

enabling an integrated market for renewable energy resources, as well as direct and indirect electrification

How to ensure adequate energy infrastructure for all players with a reasonable cost?

- Build adequate infrastructure including the Baltic Sea and North Sea regions
- Speed up connection to grid
- Optimal utilisation and performance of existing system
- Use the full transmission technology mix for further grid expansion

Nordic roadmap 2/3

Vision: Clean and competitive electricity that enables a climate-neutral, secure and integrated energy system

Secure power system and integrated market

with market design supporting flexibility and secure system operation, and with a level playing field for all technologies

How to ensure secure power system and to form integrated energy market?

- Ensure market access and financial incentives for all energy resources to provide adequacy, flexibility and system services
- Develop the requirements for new energy resources to ensure their flexibility and the system security
- Create tools to monitor flexibility and also forecast it at a Nordic level
- Introduce offshore bidding zones and integrate offshore solutions into the electricity market

Nordic roadmap 3/3

Vision: Clean and competitive electricity that enables a climate-neutral, secure and integrated energy system

Optimised
energy system

in which infrastructure is based on climate-neutral electricity and on the needs of stakeholders

How can the Nordic TSOs contribute to the development of optimised energy system?

- Develop tools and create cooperation models for holistic energy system planning
- Use ambitious wind power and electrification scenarios in system planning

Summary of the strategic themes

Adequate infrastructure

- Build adequate infrastructure including the Baltic Sea and North Sea regions
- Speed up connection to grid
- Optimal utilisation and performance of existing system
- Use the full transmission technology mix for further grid expansion

Secure power system and integrated market

- Ensure market access and financial incentives for all energy resources to provide adequacy, flexibility and system services
- Develop the requirements for new energy resources to ensure their flexibility and the system security
- Create tools to monitor flexibility and also forecast it at a Nordic level
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Optimised energy system

- Develop tools and create cooperation models for holistic energy system planning
- Use ambitious wind power and electrification scenarios in system planning

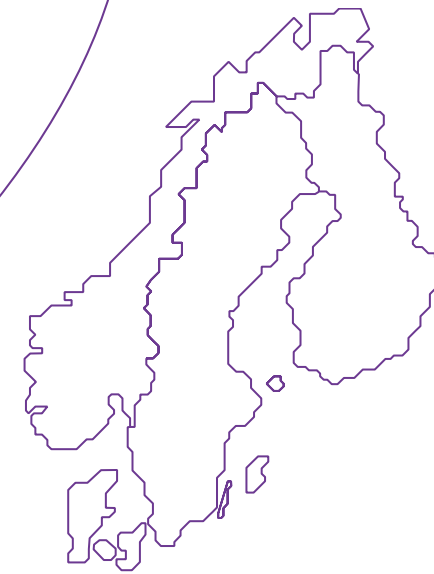
The key messages

- Broad cooperation across all energy sectors and stakeholders is vital
 - Nordic TSOs must develop and maintain adequate infrastructure for effective markets and renewable energy sources
 - All sources of flexibility – in consumption, energy storage and generation – are needed for balancing and congestion management
 - Easy and equal market access and proper incentives for all energy resources are required to provide adequacy, flexibility and system services
- Power system planning, including the Baltic and North Sea regions, must consider all energy sectors and types of infrastructure to enable optimisation of the entire energy system
 - There needs to be streamlined processes to make the grid capacity and grid connections available in time.

Implementation Plan

Nordic TSO strategy

February 2022



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Background for the Implementation Plan

The Nordic TSOs are currently working on projects that are prerequisites for enabling the growing amount of wind generation in the electricity system and creating economic signals and incentives for flexibility and energy sector integration.

Especially the Nordic Balancing Program which will introduce 15-minute imbalance settlement period and markets supporting it as well as accession to the European balancing energy markets will be key to enabling such developments.

Additionally, the increased coordination of operational planning among the Nordic TSOs through the Nordic Regional Coordination Centre and the new coordinated capacity calculation will benefit the region through improved utilisation of the Nordic transmission network.

The Implementation Plan of the Nordic TSO strategy presents the prioritized measures under the selected strategic themes that the Nordic TSOs plan to initiate working on to start paving the way for wind development and sector integration.

The Implementation Plan – like the strategy itself – contains measures that the Nordic electricity TSOs jointly need to work on: what is there for the TSOs and what is there for their Nordic cooperation.

The progress of Implementation Plan will be monitored and updated at least on an annual basis. Therefore, it is possible to take into account the developments in the sector as well as newly identified tasks.

Adequate infrastructure

Strategic theme	Description of the measure	Timetable (responsibility)
Build adequate infrastructure considering the Baltic Sea & North Sea region	<ol style="list-style-type: none"> 1. Intensify the medium-term system planning cooperation in the Nordics 2. Enlarge grid planning into the Baltic Sea level 3. ENTSO-E Ten Years Network Development Plan and Nordic Grid Development Perspective (NGDP) 	<ol style="list-style-type: none"> 1. Start in 2022 (NPG) 2. TYNDP2022 (NPG, Baltic Sea Steering Group) 3. Updated every second year (NPG)
Use the full transmission technology mix for further grid expansion	Share best practices on the opportunities of using new transmission technologies to provide more grid capacity (planning perspective)	Start in 2022 (NPG)
Develop the requirements for new energy resources to ensure their flexibility and the system security	Analysis of the effects of increasing share of converter connected generation and providing solutions to ensure a secure low-carbon power system. Work covers ancillary services, updates to grid connection requirements, investments in power system components etc.	Focus area for joint Nordic work 2022-2024 (RGN and NPG)

Secure power system and integrated market

Strategic theme	Description of the measure	Timetable (responsibility)
Ensure market access and financial incentives for all energy resources to provide adequacy, flexibility and system services	<ol style="list-style-type: none"> 1. Nordic Balancing Model Programme (NBM) <ul style="list-style-type: none"> • Nordic aFRR and mFRR capacity markets • Nordic mFRR Energy Activation Market and automation of balancing process • European balancing platforms accession (MARI and PICASSO) • ACE-based balancing 2. ENTSO-E European Resource Adequacy Assessment including a regional focus 3. Pre-study on adequacy 	<ol style="list-style-type: none"> 1. 2022-2025 (NBM program) 2. 2022 (NPG) 3. 2022-2023 (RGN, NPG, MSG)
Ensure market access and financial incentives for all energy resources to provide flexibility and system services	<p>Reserve market development</p> <ol style="list-style-type: none"> 1. FFR and FCR market design and integrated Nordic market - A feasibility study 2. Defining reserve needs and creating a good visibility and transparency to build capability 3. Introduce a solution for including wind and solar power to the various markets of ancillary services 	<ol style="list-style-type: none"> 1. H1/2022 (MSG) 2. 2022-2023 (RGN, MSG) 3. 2022-2024 (MSG)

Secure power system and integrated market

Strategic theme	Description of the measure	Timetable (responsibility)
Optimal utilisation and performance of the existing system	<ol style="list-style-type: none"> 1. Flow-based capacity calculation methodology to be implemented in the Nordic Capacity Calculation Region. It enables the optimal use of available transmission capacity in different markets without compromising the system security. 2. Explore the ways to utilise the system closer to its limits 	<ol style="list-style-type: none"> 1. Ongoing (CCM project) 2. 2022 (RGN)
Introduce offshore bidding zones and integrate offshore solutions in the electricity market	<p>Offshore market design</p> <ol style="list-style-type: none"> 1. The Nordic TSOs to contribute to the ENTSO-E work 2. Work on the principles to integrate offshore wind to the power system (Baltic Sea, North Sea) 	<ol style="list-style-type: none"> 1. Ongoing (MSG) 2. 2022-2023 (MSG, NPG)

Optimised energy system

Strategic theme	Description of the measure	Timetable (responsibility)
Develop tools and create cooperation models for holistic energy system planning	Include other energy sectors (hydrogen grid and district heating) into the Nordic power system planning where relevant	Start in 2022 (NPG)
Use ambitious wind power and electrification scenarios in system planning	Update Nordic Grid Development Perspective (NGDP)	Ongoing, annually (NPG)

Nordic TSO groups in different areas

- Nordic Planning Group (NPG)
- Regional Group Nordic (RGN); system operation
- Nordic Market Steering Group (MSG)
- Nordic IT Group (NIT)
- Nordic R&D Group (NRD)
- Nordic Balancing Model Programme (NBM)
- Capacity Calculation Methodology (CCM) project

For more information, please visit

www.energinet.dk

www.statnett.no

www.fingrid.fi

www.svk.se



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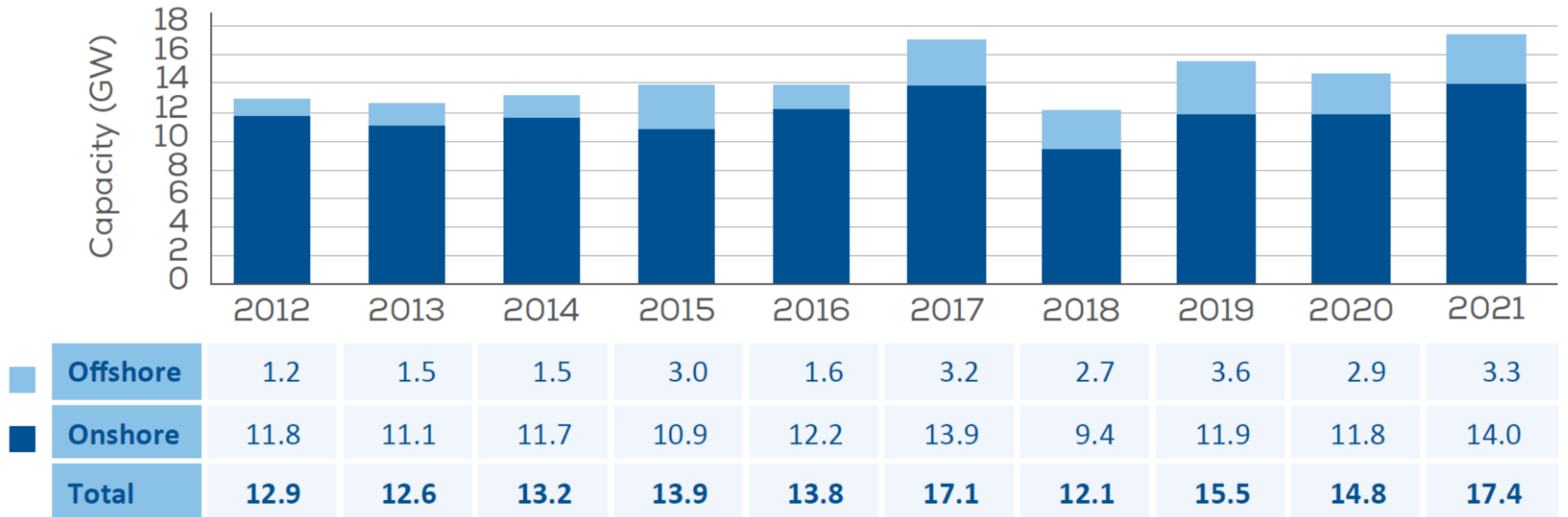
How does the strategy support the wind development in the Nordics and its neighboring region

Daniel Kulin, Swedish Wind Energy Association

Thank you!
First the outlook figures =)

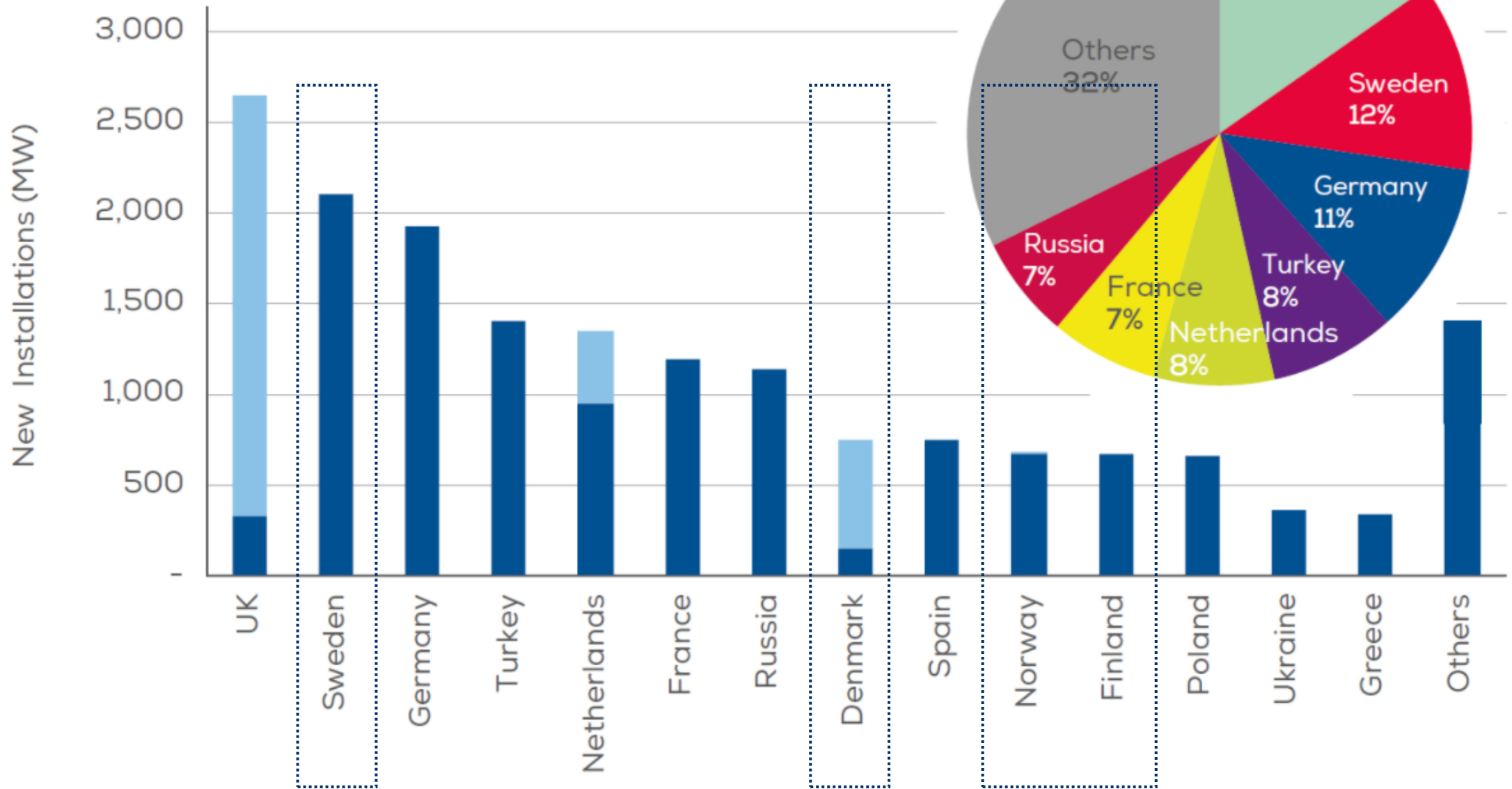
Europe

Annual new wind installations in Europe, 2012-21

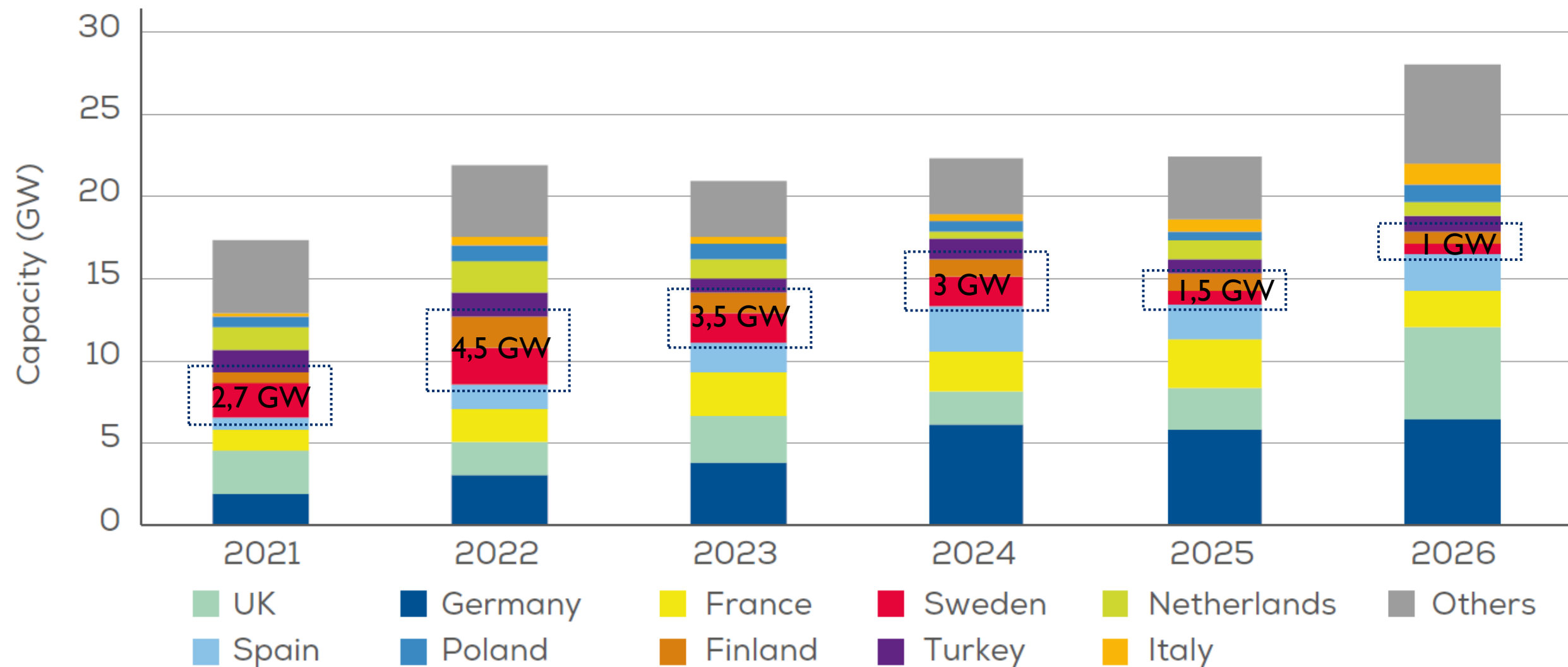


Source: WindEurope

New onshore and offshore wind installations in Europe in 2021



New installations per country – WindEurope’s Realistic Expectations Scenario



Source: WindEurope

This TSO strategy?

First things first...



Worth to highlight:

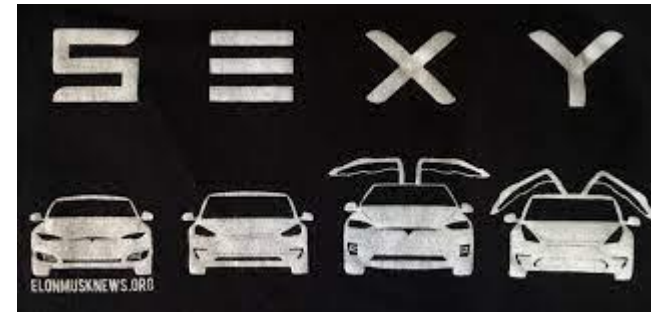
- Focus on the REAL development, wether you like it or not...
 - Transition is REAL
 - Wind is already second biggest power in Nordic system and is claiming that spot in all nordic countries within 5 yrs... And it is no stopping there...
 - Off shore wind is REAL
 - Solar enegy is REAL
 - Higher electricity demand is REAL

2 Warnings

1. Efficient use of the grid is not the demand from the market...
("optimal utilisation and performance of the existing system")
 - Rather: Progressive, proactive capacity increasing investments
2. A little less conversation and a little more action...
 - You have a lot to prove!
 - Congestion-/bottle neck incomes **MUST** be converted to capacity proactively (catch 22)
 - New technology and off shore solutions (sub marine cable)

Wish list: solutions

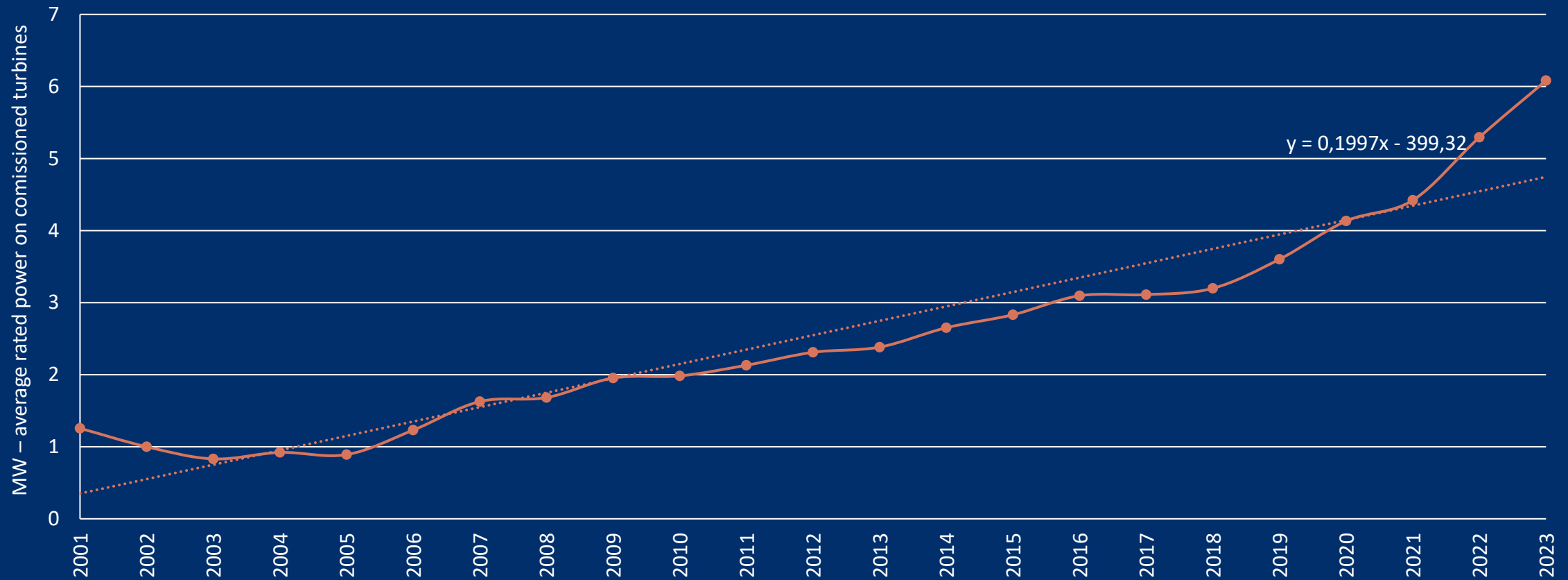
- Highlight the need of political leadership. This challenge is not only a TSO challenge.
 - Give relations/order/extent of the transition!
 - E.g. one "nordstream pipe" is 600 TWh. Norway exports 800 TWh/y
 - Dare to be inspiring!
 - Local acceptance is key. Electrification is:
 - Dare to be demanding!
 - Politicians must mandate your work
 - Don't take no for an answer



Technology development?

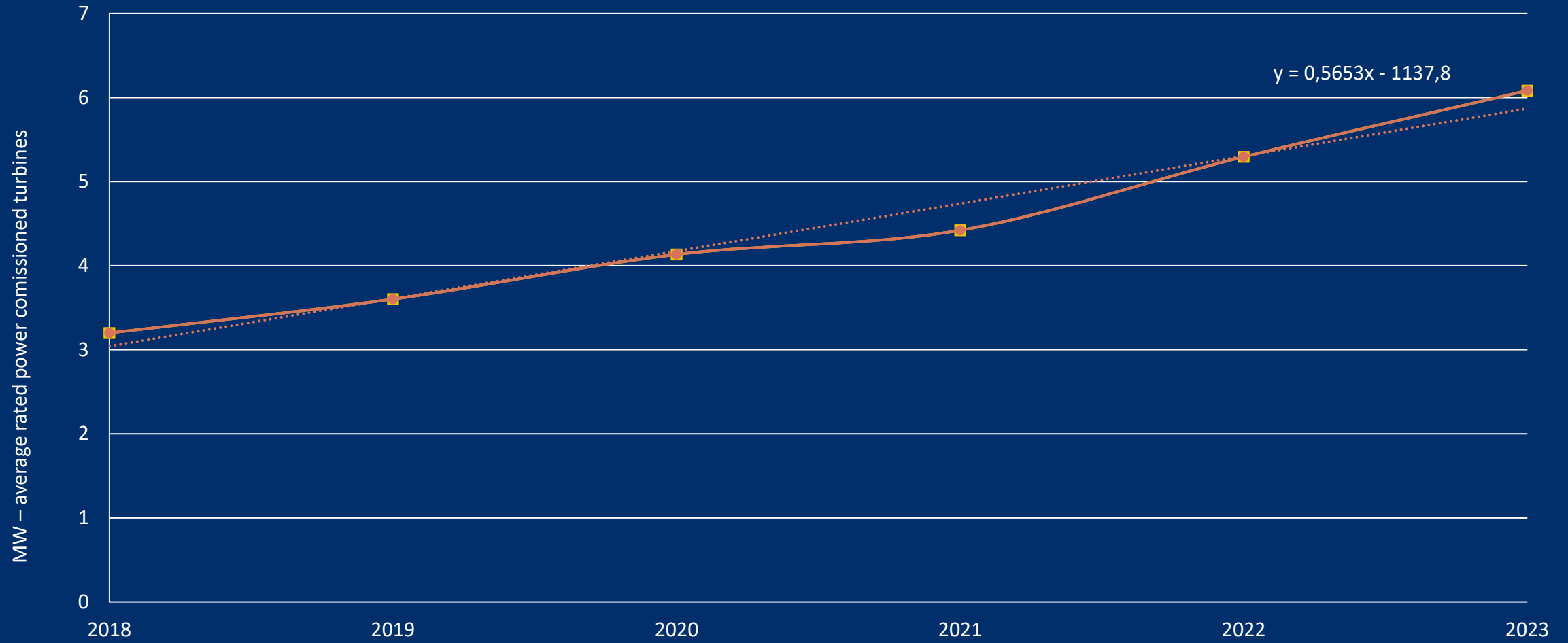
Technology development over 20 years for commissioned wind turbines in Sweden.

Power rating on installed turbines are up 0,2 MW/year over the last 20 years – and increasing.



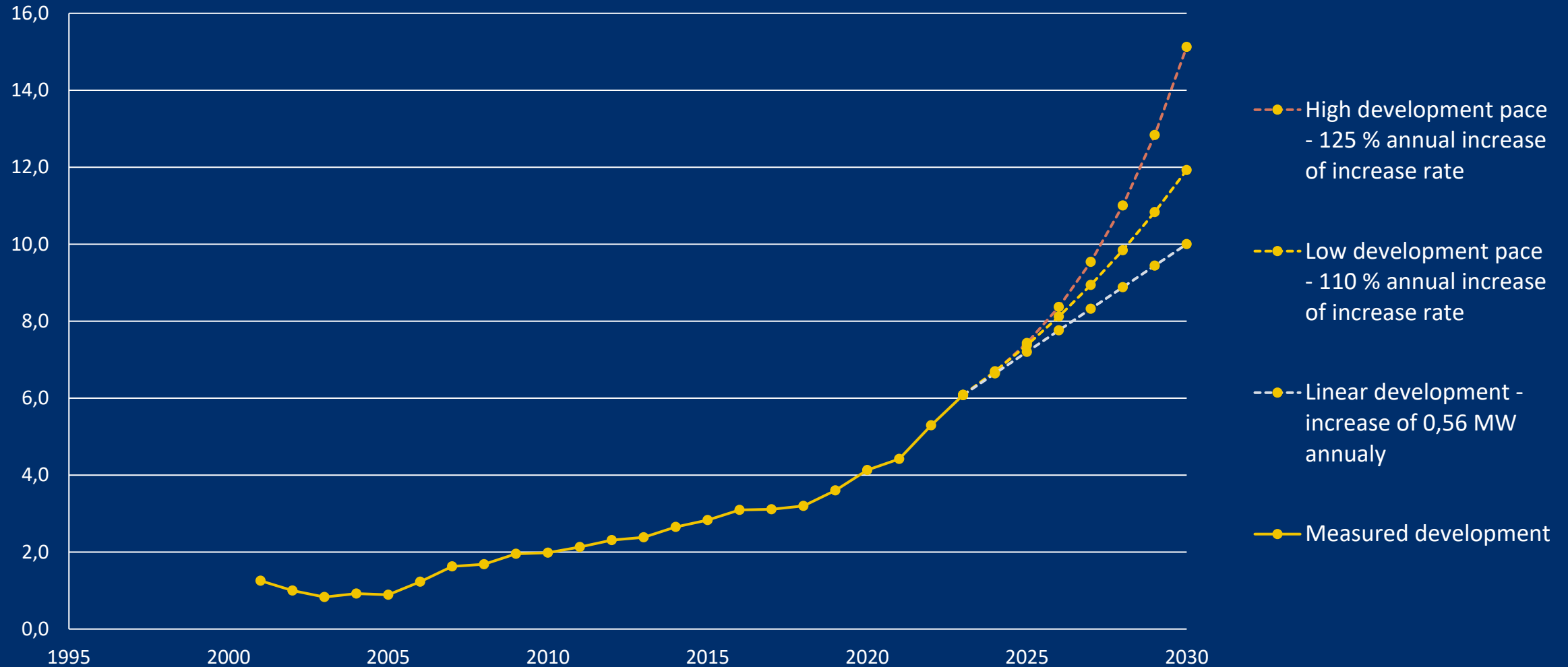
Technology development the last 5 years

Power rating on installed turbines are up 0,57 MW/year over the last 5 years.



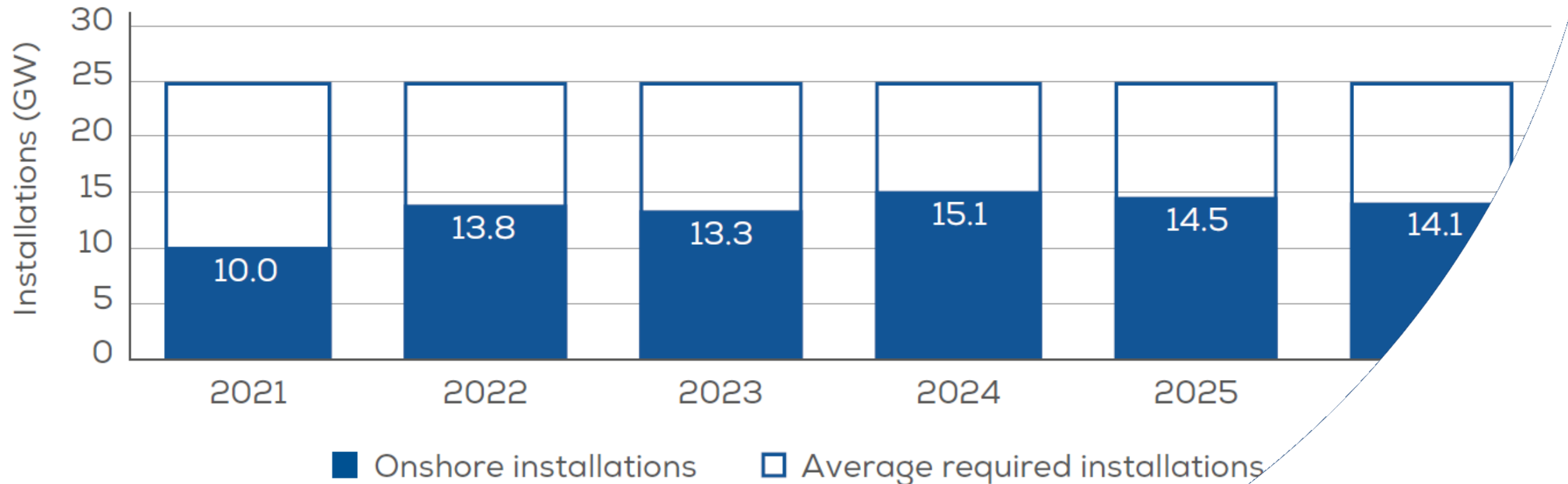
Technology development scenarios

Might the linear trend from the last 5 years continue, or is the historic increase in increased power to remain?



So... How does the strategy support the wind development in the Nordics and its neighboring region?

EU-27 Expected and required onshore wind installations - WindEurope's Realistic Expectations Scenario






Thank you!

Daniel Kulin, Swedish Wind Energy Association





Needed measures of cleaning energy consumption through electrification

Mikko Lepistö, SSAB Europe Oy

Where we are

Climate challenge → CO2 emissions decreasing → Electrification

Nordic competitiveness key issues:

- ▶ Stable geopolitical area
- ▶ Excellent conditions for wind power
 - Space to increase onshore wind power
- ▶ Large amount hydro power for balancing
- ▶ Strong electricity grid
- ▶ Advanced electricity markets

Competitiveness - Where the cheapest stable energy is

Comments on the report

Great three goals!!!

▶ 1) Adequate infrastructure is needed

- Something has to come first
- Power grid construction takes time
- Too strong power grid is not a real risk

Even speed up projects

▶ 2) Providing a secure system and integrated markets

- Strong infra is best the basis for integrated markets
- Transparent and well-functioning market
- Large "one price" price areas – market really works!

Keep consumers focus on consumption

▶ 3) Optimise energy infrastructure

- Cross-border optimization , Dynamic grid operation, Sector integration, Demand response, recovery of waste heat , Electricity-hydrogen mix

Cost efficiency

TSO's role

- Seems that big investments is coming - for each sector

TSO's have now very big role to play for Nordic area future!

Concluding remarks

- Solutions will challenge us all
- Nordic TSO strategy focuses on wind and sector integration → what Nordic TSOs need to do together
- Support to strategy and its goals!
- Need to take into account even higher electricity demand
- Investments into transmission capacity needed, financing to be addressed, too
- Need political leadership!
- Excellent conditions for wind → space to increase onshore wind
- Wind and hydro is a good combination in terms of balancing
- We are having the right elements but the pace of doing needs to be accelerated
- TSOs have a big role to play for the future of the Nordic area