Accelerating the Energy Transition: **Optimised power grids for a clean and green future**

30th October 2020

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Enabling Network Technology throughout Europe

AGENDA

Welcome & Introduction by Susanne Nies, Chair of currENT | General Manager Germany, Smart Wires

Opening Statements:

- **Henriette Nesheim,** Policy Officer, Unit B1, Directorate General for Energy (DG ENER)
- **Alberto Pototschnig,** Deputy Director, World of Practice, Florence School of Regulation (FSR)
- **Marie Hayden**, General Manager Europe, Smart Wires
- **Giles Dickson,** CEO, WindEurope
- **Hakon Borgen,** Chair RDIC, ENTSO-E | Executive Vice President Statnett

Panel discussion and Q&A session, moderated by Susanne Nies.

CurrENT
Enabling Network Technology throughout Europe

Introduction to currENT

Our vision is a European power network that is the recognised world leader in enabling decarbonisation through the efficient use of modern grid technology.

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UPCOMING WEBINARS

2 Accelerating the Energy Transition**:**
The role that Direct Current (DC) grids can play (December)

3 Accelerating the Energy Transition:
How Dynamic Line Ratings optimise the grid (January)

4 Accelerating the Energy Transition:
Vision for the future grid (February/March)

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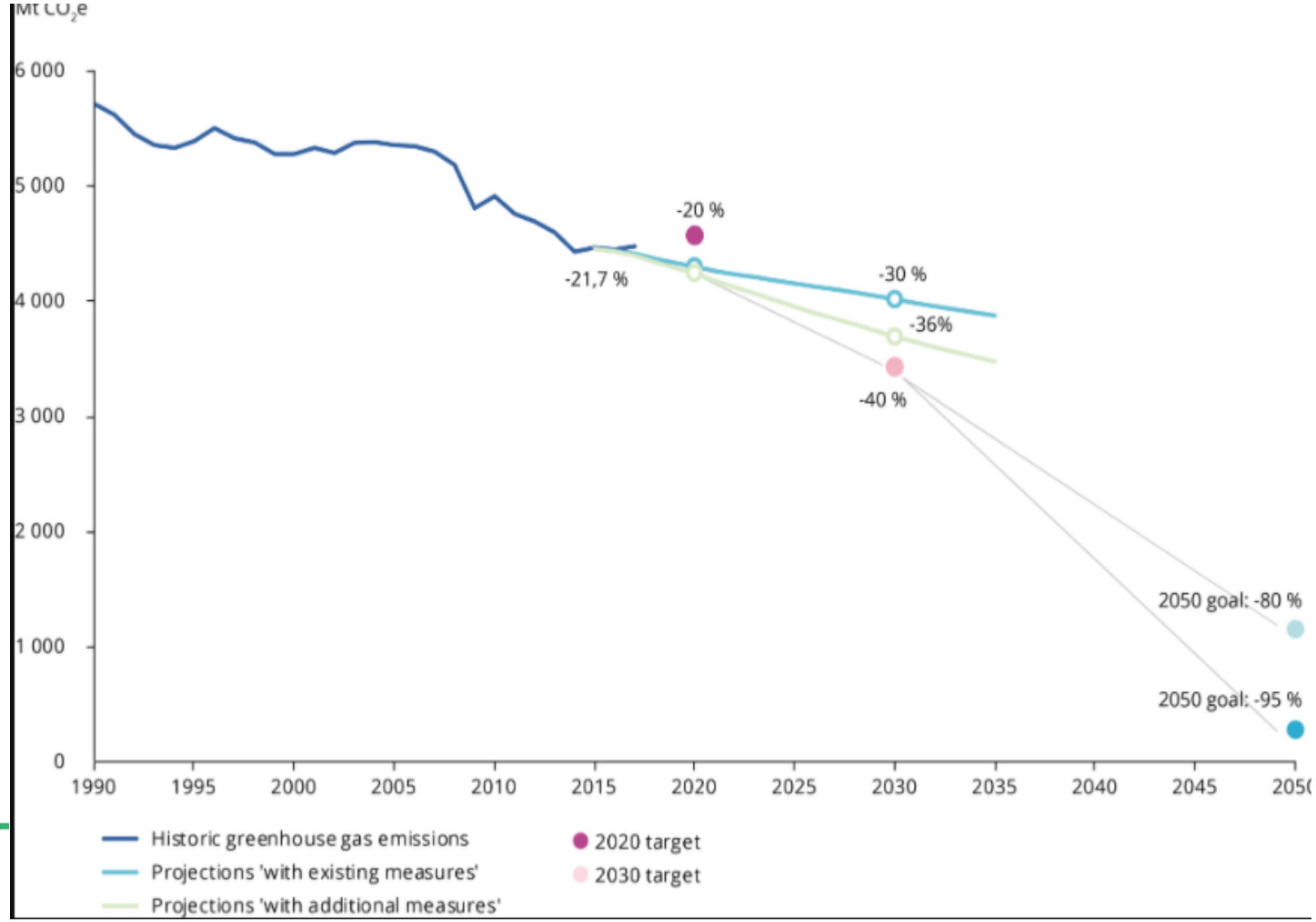
How optimisation of existing infrastructure can further enable the uptake of renewables

The Uptake of Electricity and Renewables

Climate neutral 2050
2-3x more electricity needed 2050

Large scale electrification
Key role for electricity infrastructure



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Optimised power networks as a key enabler for the European Green Deal

Henriette Nesheim, Directorate General for Energy (DG ENER)

Alberto Pototschnig, Florence School of Regulation (FSR)

Marie Hayden, Smart Wires

Giles Dickson, WindEurope

Hakön Borgen, ENTSO-E

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Henriette Nesheim

Policy Officer, Directorate General for Energy (DG ENER)

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The role of infrastructure in the energy transition

Update on regulatory framework:

The revision of the TEN-E regulation

Henriette Nesheim

currENT Webinar, *30 October 2020*

The current TEN-E Regulation

- Established a new approach to infrastructure planning by setting a framework for the timely development and interoperability of projects of common interest (PCIs)
- Focus on cross-border electricity and gas networks but covers also smart (electricity) grids and CO2 networks
- TEN-E has been successful in addressing security of supply, energy isolation, improving interconnectivity

A few facts: …

Fourth list of Projects of Common interest

No 2020/389 – 31 October 2019

+ **106 electricity** and **smart grids** projects

+ **32 gas** projects

+ **6 oil** projects

+ **5 cross-border carbon dioxide network** projects

= **149 PCIs**

TEN-E Regulation: implementation of 30 key energy infrastructure projects, further 75 projects expected to be implemented by 2022.

European Commission

CEF Energy – EUR 4.7 billion allocated

Source: INEA, October 2020

European Commission

Revision of the TEN-E

- Energy infrastructure is a key pillar of EU energy policy to deliver the European Green Deal
- The Commission aims to present a legislative proposal by the end of 2020
- Goal: contribute to economic recovery and climate-neutrality by 2050, while ensuring security of supply and facilitating market integration
- Keeping the focus on electricity infrastructure necessary for renewable energy
- The revision will also look into innovative technologies and infrastructure, such as smart grids, hydrogen networks, or integrated offshore grids, and enable energy sector integration
- The revision will also address: governance of the PCI selection process, permitting, public consultation, regulatory provisions

Stakeholder feedback

- Broad support for the alignment of the TEN-E with the European Green Deal and the Paris Agreement
- Simplification of permitting procedure, strengthen its efficiency, acceleration
- Better integration of network plans and stronger oversight of PCI selection procedure
- PCI selection process: enhance transparency and stakeholders‘ participation; simplification
- Infrastructure categories: renewable and decarbonised gases, offshore/hybrid grids, sector coupling, energy storage
- New priority corridors and/or thematic areas related to renewable gases, hydrogen, underground cables, e-mobility and EV charging networks, etc

Thank you

Alberto Pototschnig

Deputy Director, World of Practice,
Florence School of Regulation

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European University Institute

ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES

FSR ENERGY

Florence School of Regulation

The regulatory toolbox: cross-border allocation of costs and incentives

Alberto Pototschnig
Part-time Professor and Deputy Director (World of Practice)

currENT Webinar
Accelerating the energy transition: Optimised power grids for Europe
30 October 2020

FSR suggestions for improving the TYNDP/ PCI selection and implementation processes

CBA	The CBA methodology to be approved by ACER
SCENARIOS	The scenarios for network development planning and PCI assessment to be defined by the European Commission
CBCA	The CBCA to allocate costs across borders in such a way that all involved jurisdictions end up with the same or similar benefit-to-cost ratios
CEF	CEF funding to focus on addressing affordability issues. An affordability indicator to be developed to assess any affordability gap associated with the development of a PCI

Marie Hayden

General Manager Europe,
Smart Wires

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SMART WIRES

REIMAGINE THE GRID

Technology solutions in the context of the climate imperative

Marie Hayden,

General Manager, Europe

October 2020

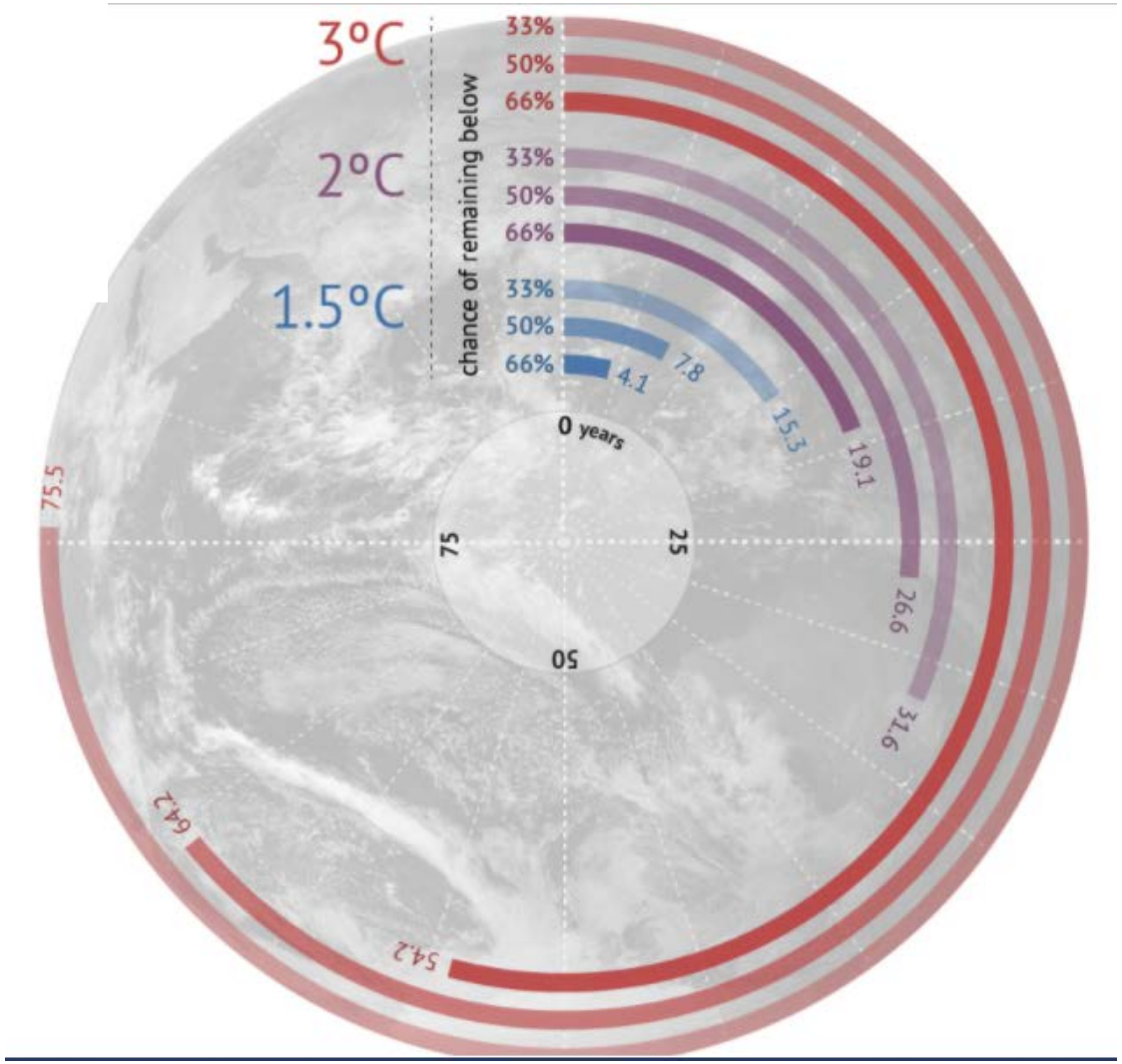
Context of Climate Imperative

Global Carbon Budget

Grid congestion is driving up curtailment of renewable energy and slowing down RES connection every year causing the remaining carbon budget to be used up faster than we can afford to do

Greta Thunberg, Climate Activist

> *At current emissions levels, the remaining budget is **gone within roughly eight-and-a-half years.”***



Source: Carbon Brief

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Challenges Delivering Grid Infrastructure Required For Energy Transition

Grid Development Keeping Pace with RES developments

Congestion and Constraint Levels are Increasing

Uncertainty Over Future Load & System Needs

Making the Right Investment Decisions for Grid Development

Acceptance of Infrastructure

Driving Additional Costs and Delays

Technology Solutions Enabling Transition

Modular Power Flow Control

Reduce Congestion
Fast, Flexible, Secure

Dynamic Line Rating

Flexible and Cost Effective

HVAC & HVDC Infrastructure

Providing for regional transmission of power to maximise use of RES

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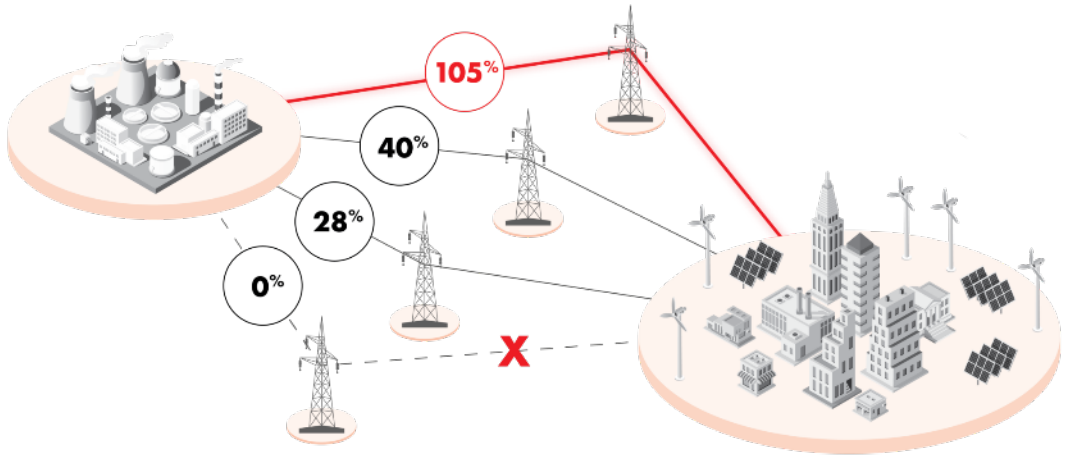
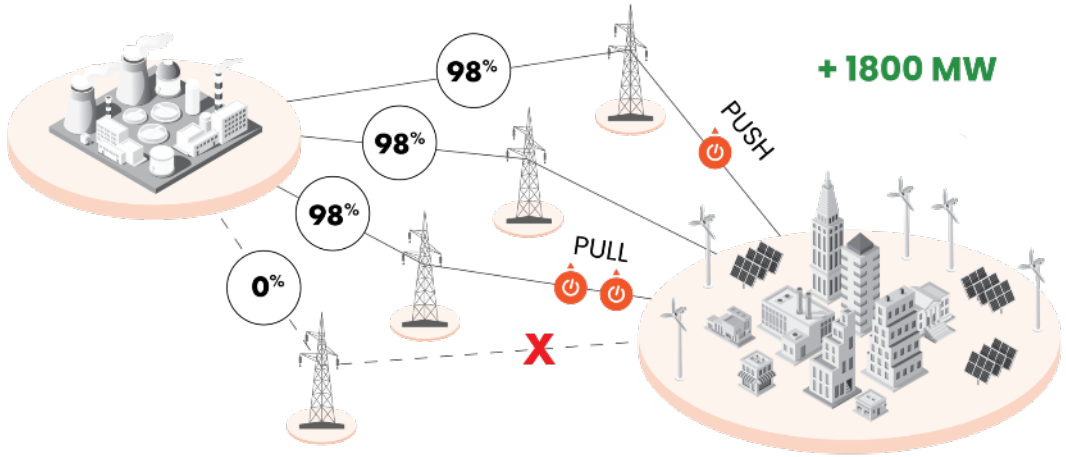
Smart Wires Impact – Improving the Value of the Existing Grid

Before Smart Wires



After Smart Wires



Smart Wires **modular** technology balances flows on the grid to maximise transfer capacity

SMART WIRES
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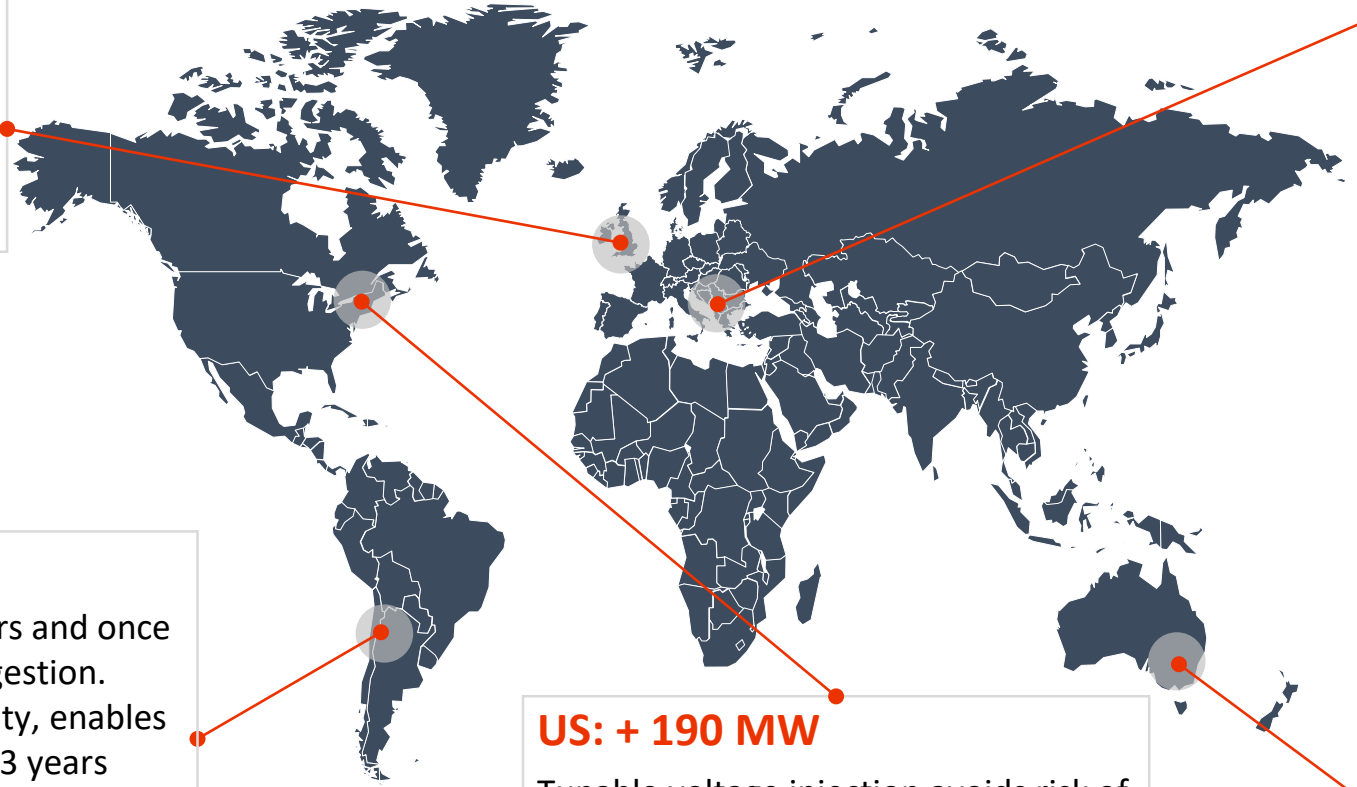
Strategic Applications of Smart Wires

A collection of projects in progress globally

UK: +1.5 GW

Solution provides capacity within 18 months and can easily scale to provide 10 GW+ of increased transfers.



Greece: + 50 MW

Reduce curtailment of existing renewables until new line came in-service. Mobile unit was then easily relocated.

Chile: +3 GW

A 500 kV line was delayed 5 years and once in-service faced immediate congestion. Solution improves system stability, enables 3 GW of renewables to connect 3 years faster, and facilitates the planned conversion from HVAC to HVDC while maximizing the utilization of the corridor.

US: + 190 MW

Tunable voltage injection avoids risk of SSR and associated operational issues while yielding a 70% footprint reduction compared to traditional series compensation.

Australia: +170 – 220 MW

Dialing line reactance in real-time based on how hard the wind is blowing at various locations ensures optimal transfers are possible regardless of operating conditions.

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Key Messages

Maximising Use of Existing Grids should be a Priority

Accelerating the Energy Transition

Rapidly deployable solutions can accelerate progress towards a high-RES grid by reducing CO2 significantly earlier than traditional alternatives.

Cost Efficient

Maximising the use of already built, already paid for grids will save consumers money

Low or No Regrets Options

Modular technologies are scalable and relocatable and increase the robustness of grids against future uncertainties. As well as addressing long term needs they can be used as interim solutions pending the delivery of large infrastructure projects and relocated when the projects are built

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Giles Dickson

Chief Executive Officer,
WindEurope

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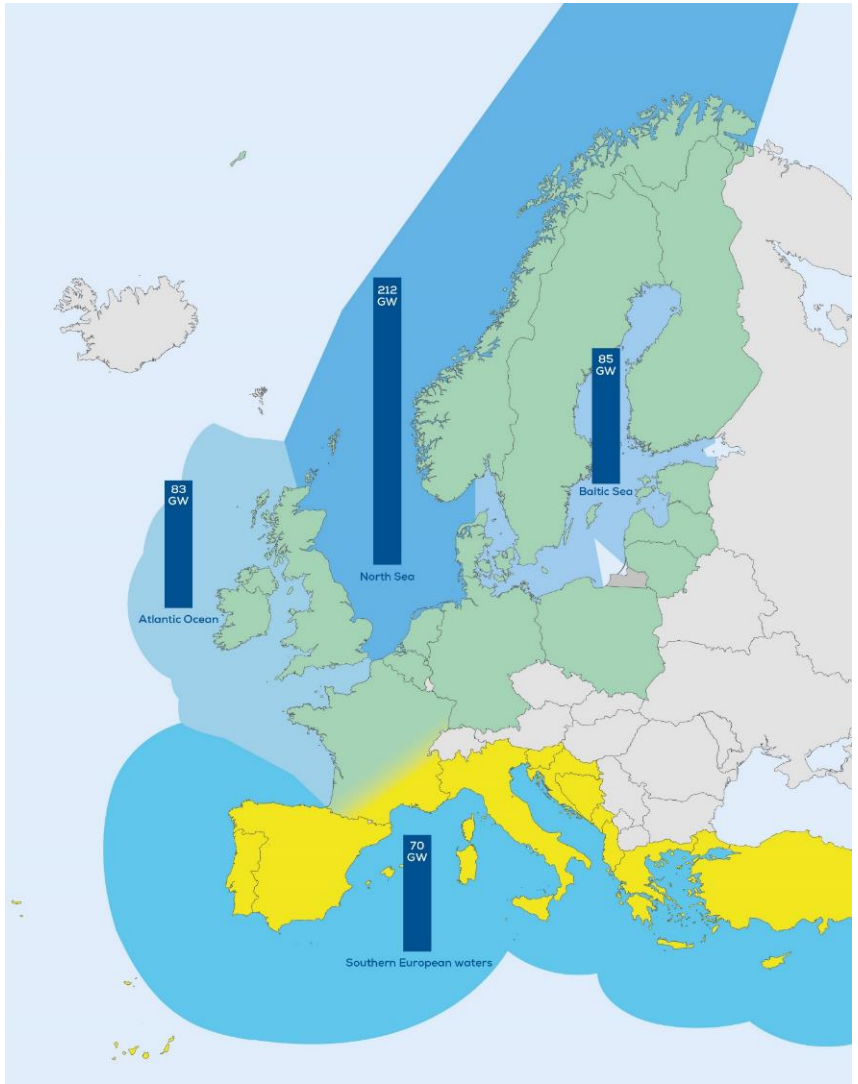
Grid optimisation to build a greener Europe

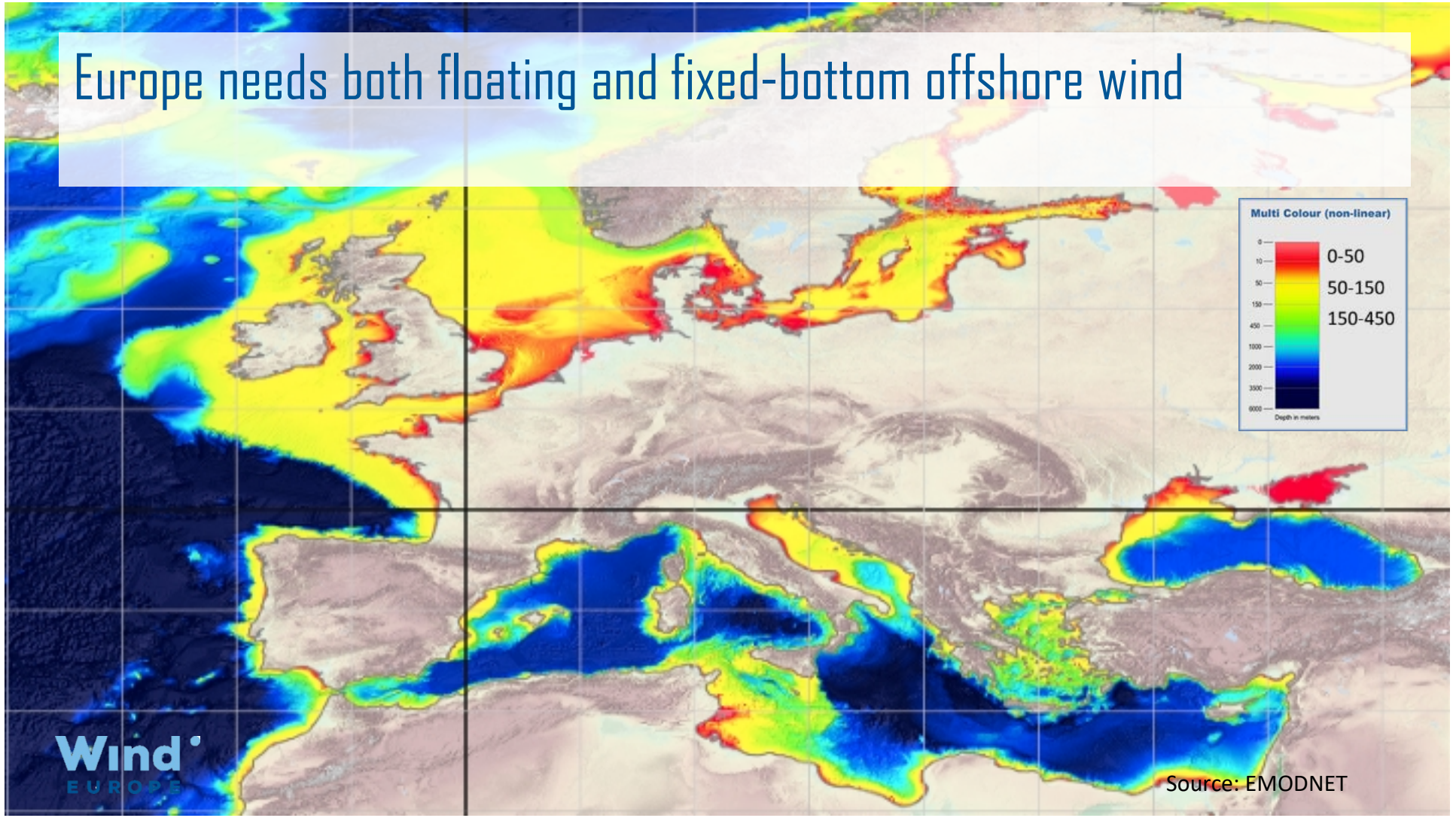
Giles Dickson, CEO WindEurope

Where to do 450 GW



Source: BVG Associates for WindEurope

Europe needs both floating and fixed-bottom offshore wind



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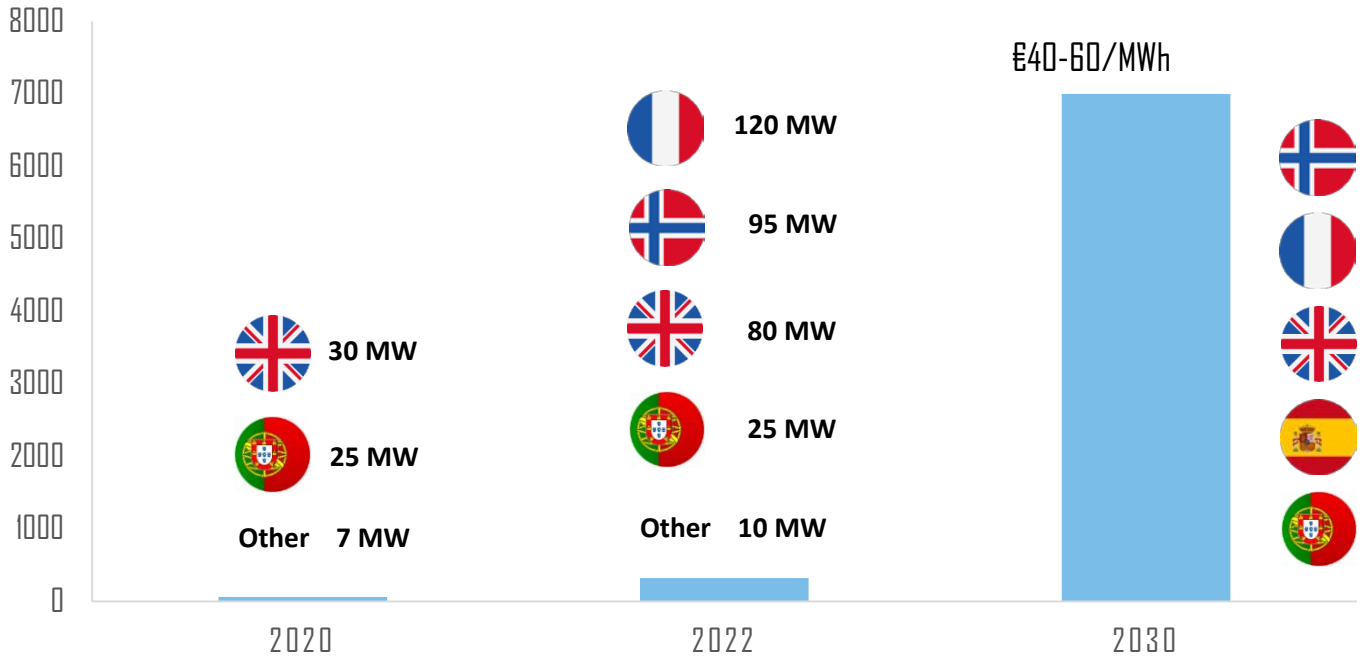
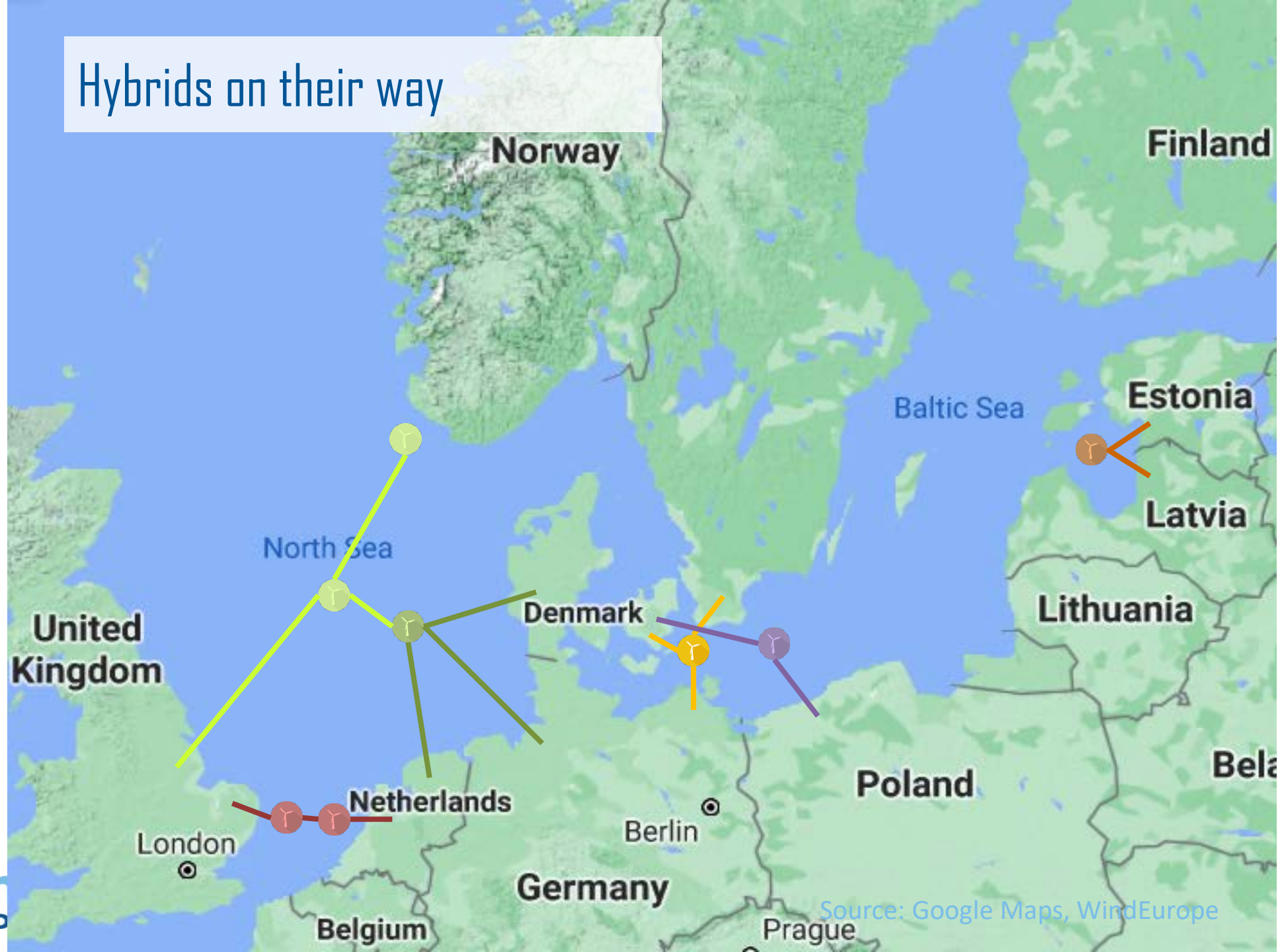
7 GW of floating wind by 2030



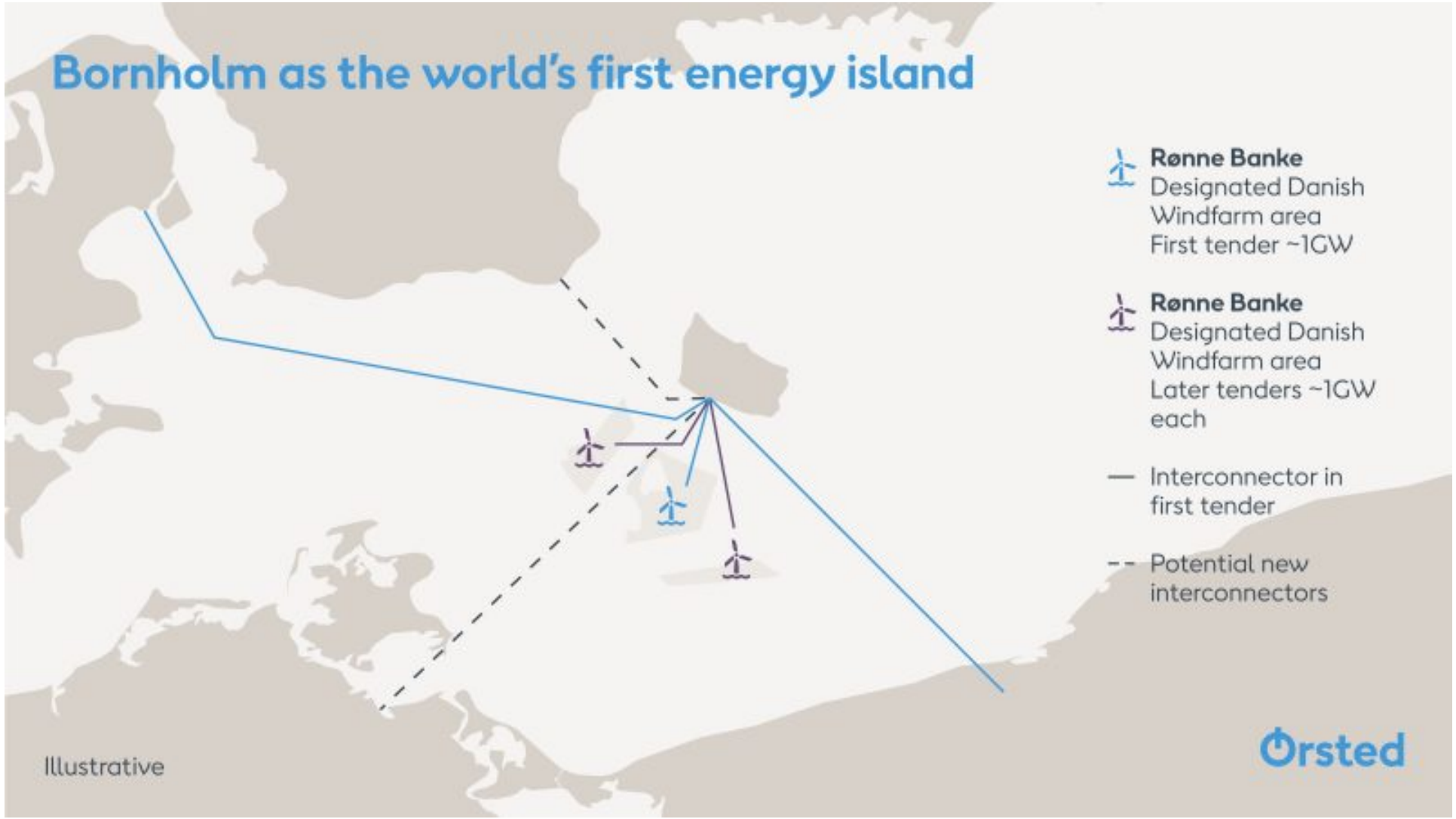
Wind EUROPE

Hybrids on their way



Source: Google Maps, WindEurope

Islands and Platforms in the sea



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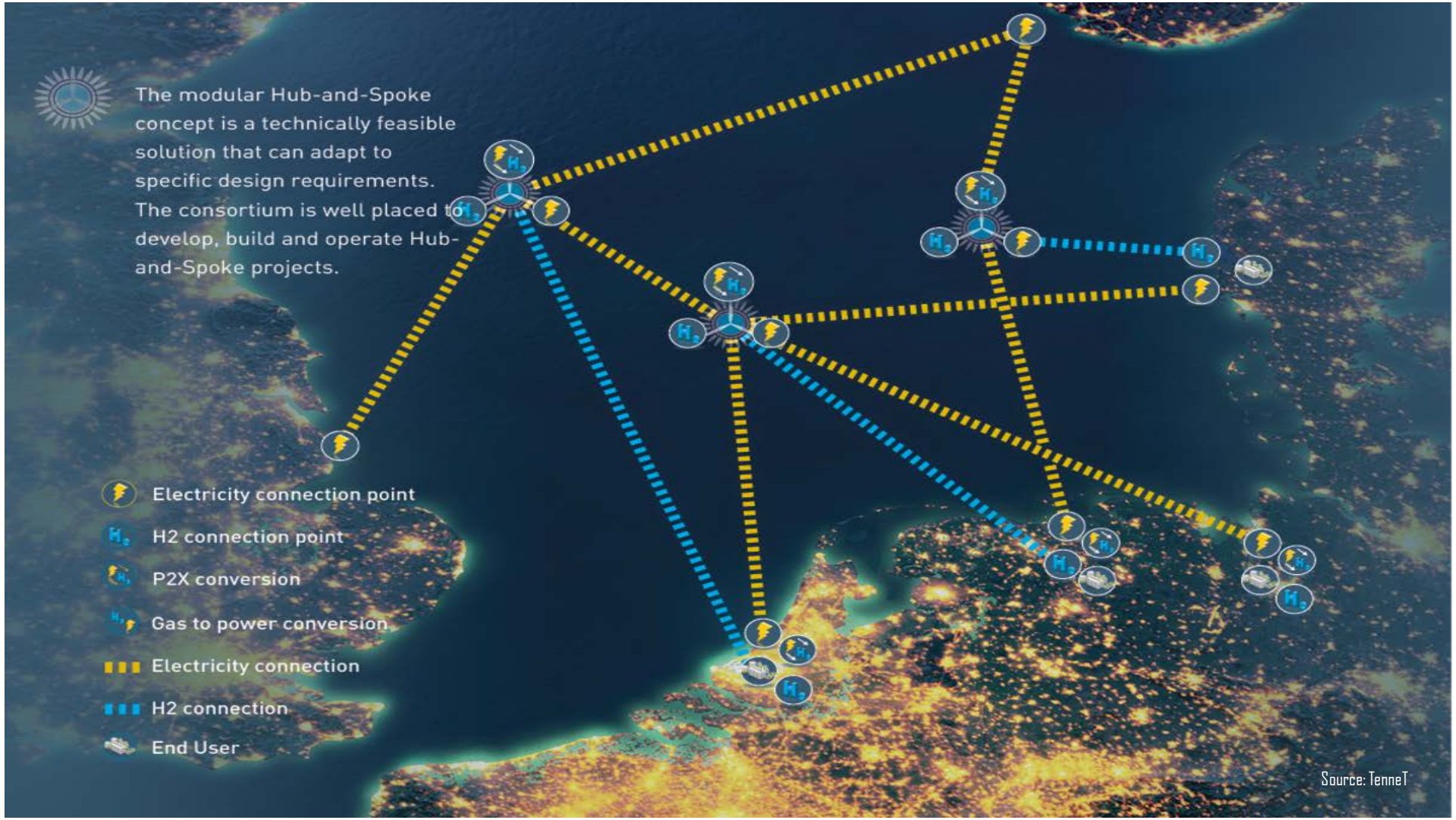
Hubs for electricity and hydrogen



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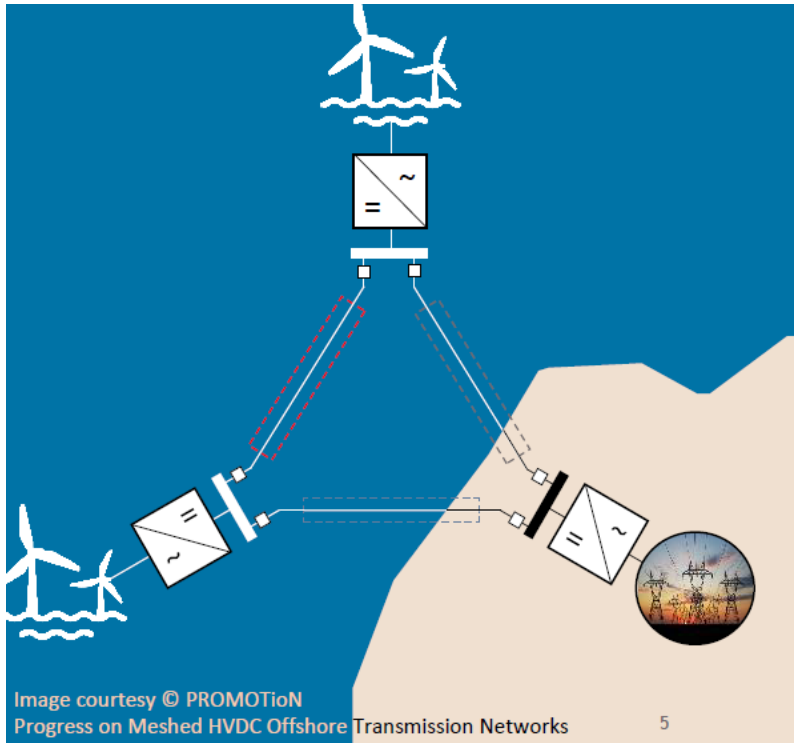
Interoperability of HVDC technologies



- Multi-terminal HVDC systems
  → prerequisite to integrate 450GW of offshore wind
- Multi-terminal but also **multi-vendor**
  → lowest costs, extendable in line with offshore expansion, market open to new vendors
- **Today HVDC technologies from different vendors are not interoperable**
  → R&D support to de-risk offshore grid infrastructure

Wind EUROPE

windeurope.org

WindEurope, Rue d'Arlon 80
1040 Brussels, Belgium

Hakön Borgen

Chair, Research
Development & Innovation Committee,
ENTSO-E

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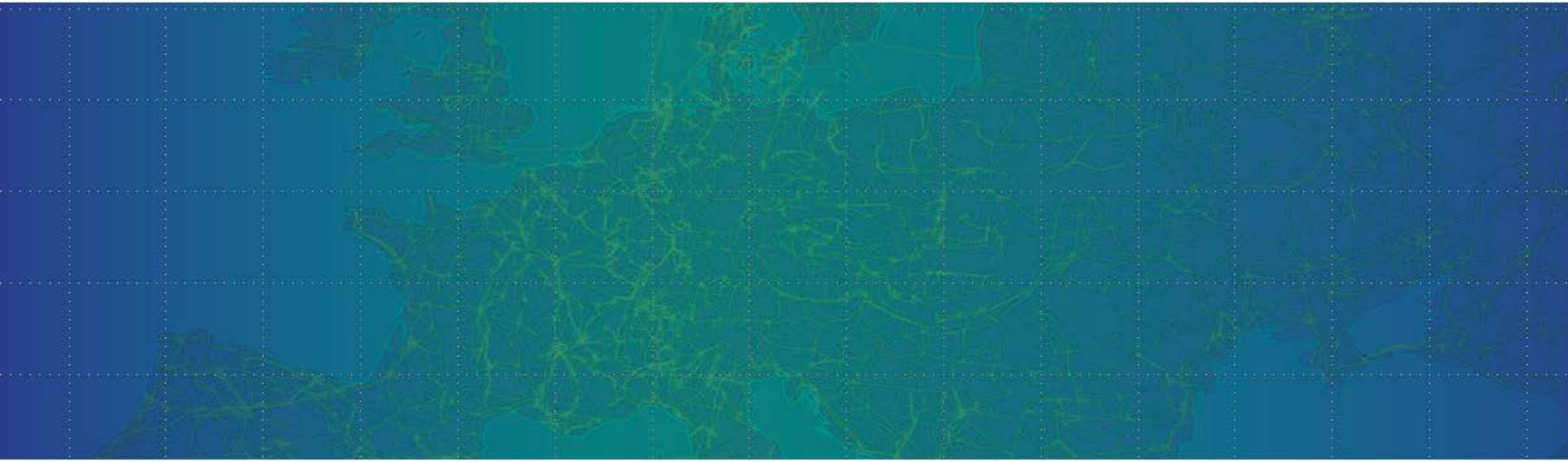

Håkon Borgen
ENTSO-E RDI Committee Chairman

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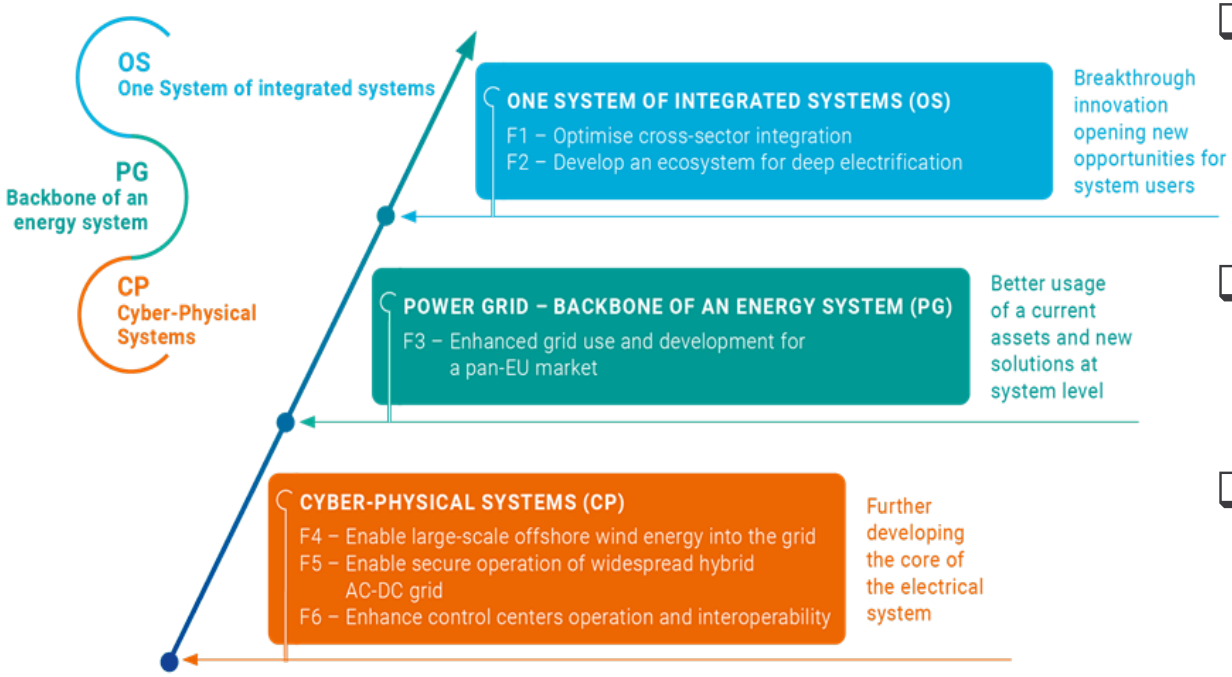
ENTSO-E RDI Roadmap 2020-2030: supporting the Green Deal ambition

RDI Flagships

Accelerate innovation



- ENTSO-E RDI Roadmap 2020-2030 **aims to accelerate innovation** for TSOs in order to reach climate neutrality with high share of RES into the electricity system while **keeping its security of supply**
- **Innovation in regulation is key** to ensure that innovative solutions will become the choice in future developments of the power system
- Achievements and **cooperation among stakeholders** are fundamental to deliver on the energy transition and for **reaching European climate neutrality by 2050**

ENTSO-E and TSOs are committed to ensure the energy transition by building a system of systems with consumers at the heart

Deploying already existing innovative solutions and enable HVDC, AC/DC systems, TSO/DSO interface

Off/onshore grid to integrate 450GW offshore RES

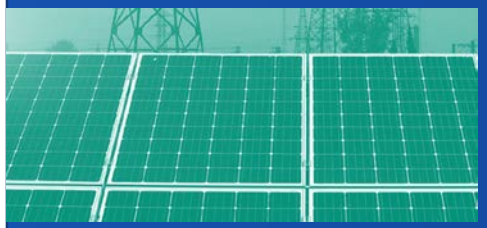
- Multi terminal, multivendor HVDC interoperability
- Cooperation of stakeholders

Power Electronics and AC/DC systems

- Enhance grid flexibility, operation and stability
- Modelling and data exchanges

TSO/DSO and integration of distributed flexibilities

- Ancillary services
- Congestion management



Integration of innovative solutions

- Complement grid development and reinforcement
- Enhance environmental protection and cost effectiveness

Thank you for your attention

Panel Discussion

Including questions from the audience

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Panel Discussion

- What are the **challenges for System Operators** in the near-term (2025) and longer-term (2050)?
- How should we factor the **'cost of delay'** of solutions into social cost benefit analysis and network planning?
- Optimisation of grids – what does it mean? Why is it important now? Is the **NOVA principle** relevant at European scale?
- How to implement the **70% MinRam** in power networks? Can optimisation help?
- What **updates for TEN-E** and for the **uptake of new solutions** in networks are needed in regulation?

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Thank you for your attendance

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