



North Sea
Wind Power Hub
Programme

North Sea Wind Power Hub

TSO perspective on offshore cross-sectoral

Presented by
Tobias Frohmajer
Policy Advisor
TenneT TSO GmbH

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North Sea Wind Power Hub feasibility and preparation studies (1.19-0001-NLDE-S-M-20) is co-financed by the Connecting Europe Facility of the European Union.



Introduction to the North Sea Wind Power Hub

Who we are and the focus of our work

Consortium of leading **TSOs** on offshore developments for **electricity** and **gas** in Europe



- Set out to making the **hub-and-spoke** concept a **reality**
- In **2019** the North Sea Wind Power Hub (NSWPH) received **Project of Common Interest (PCI)** status
- This paved the way for NSWPH to receive **Connecting Europe Facility (CEF) funding**
- Through this CEF funding we have made **substantial progress** in **shaping the hub-and-spoke concept** and making **headway** towards the realisation of the first hub-and-spoke projects in the North Sea.

Our impact over the last four years



Credible voice and knowledge builder in North Sea **offshore wind** development



+40 publications of technical **studies** and discussion **papers**



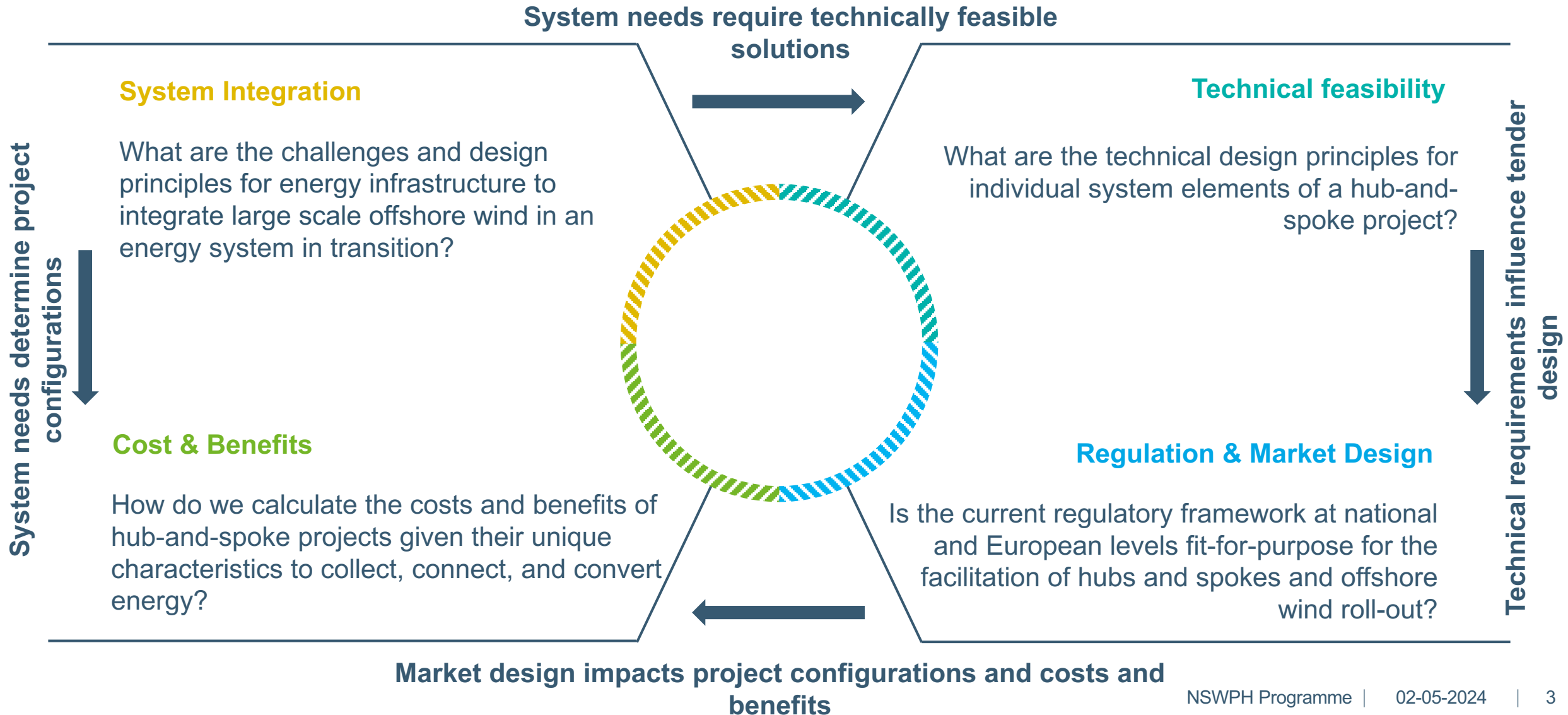
Presentations at **international conferences**



+200 engaged stakeholders across Europe



NSWPH investigated overarching questions in four themes



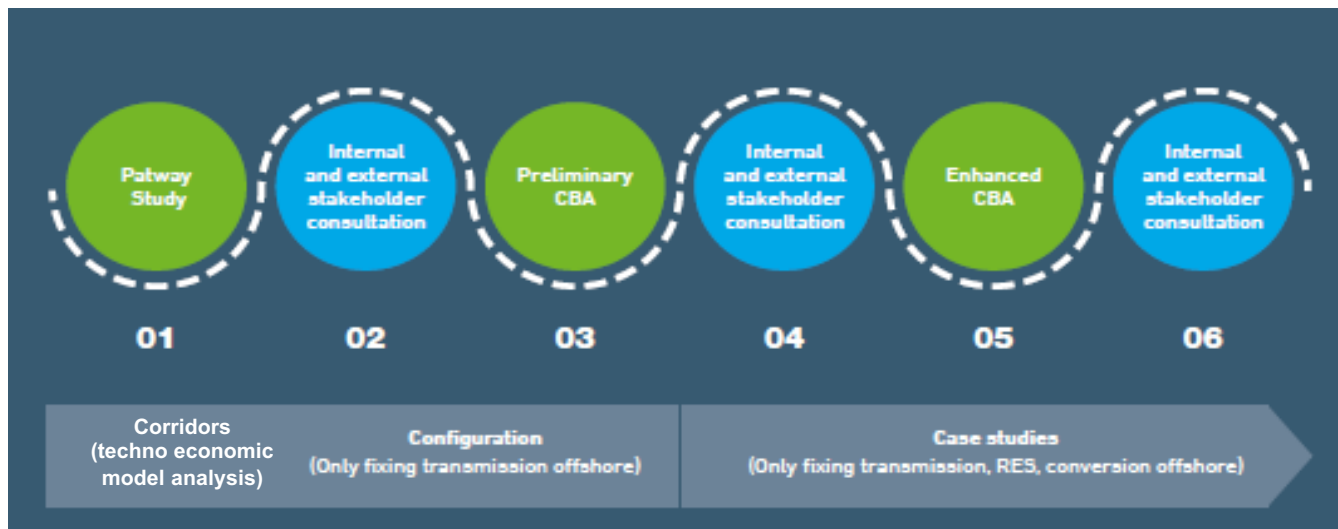
NSWPH – Energy System Planning



NSWPH developed a unique modelling ecosystem that enables flexible analysis of hub-and-spokes projects :

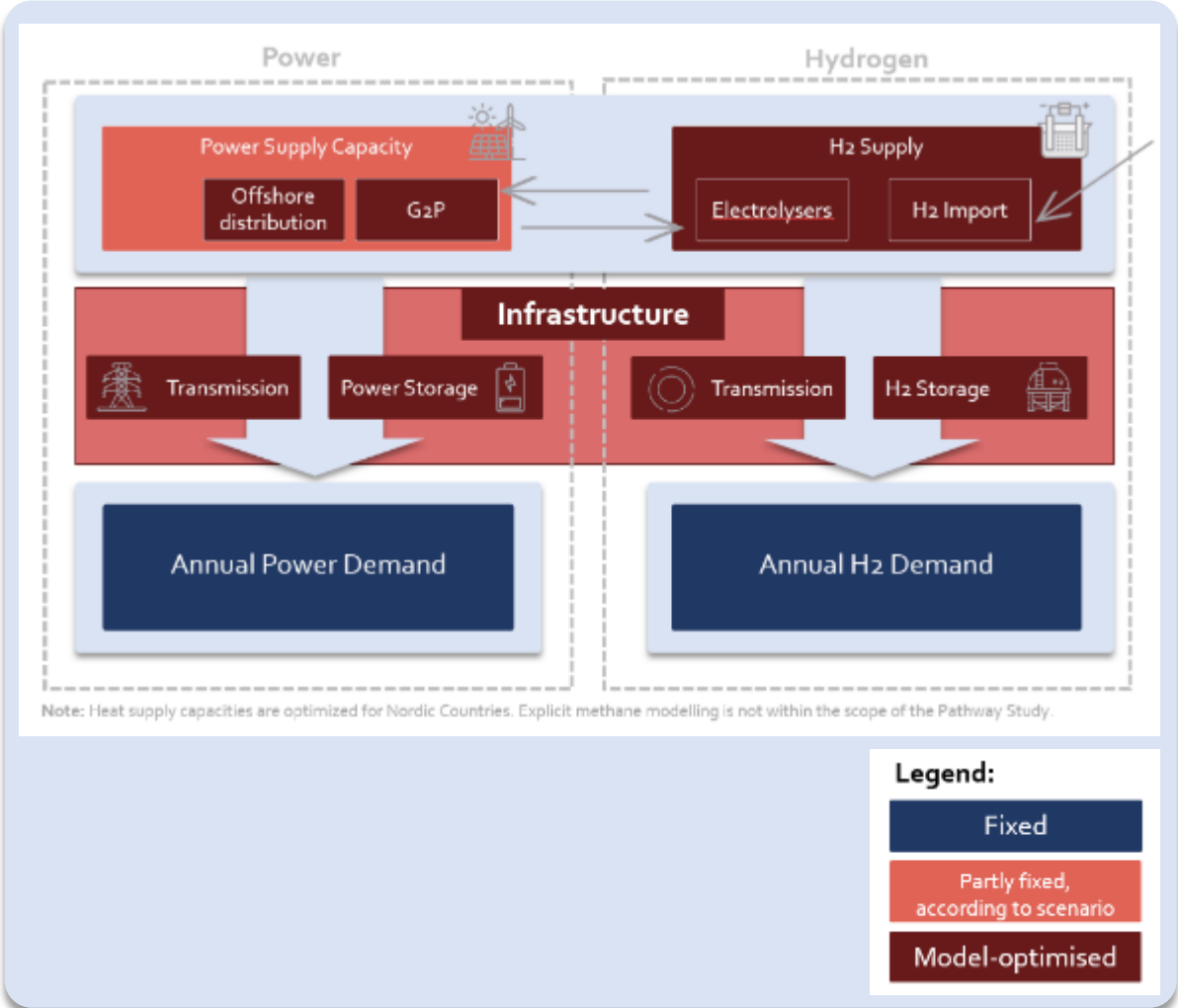
- Innovative data set (based in TYNDP but enriched with a lot of information on H2 side, but also CAPEX estimates, higher regional resolution of the data, also offshore wind data including wake effects)
- Innovative interplay of models (e.g. linking investment with dispatch models - market models and grid models – always considering electricity and hydrogen to very innovative model chains)
- Flexible handling of the data, models and their parametrization in the model chain to make it fit for different questions (Pathway and CBA studies)
- Staking-up these model chains to a process to answer the complex question of "How to integrate 300GW of offshore wind from the north sea into the onshore energy system?"

NSWPH developed a stepwise analysis process with stakeholder consultation as key for success





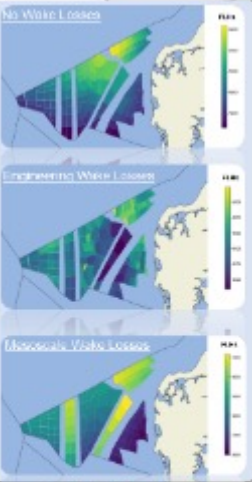
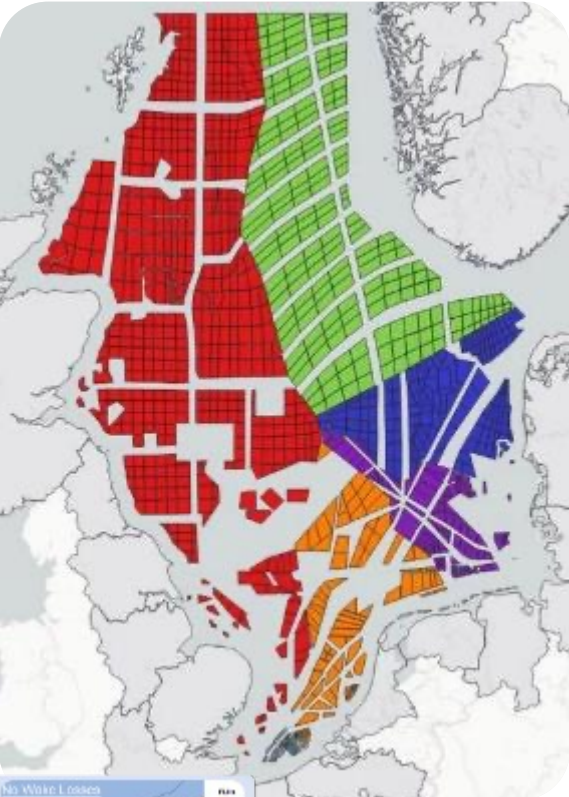
Pathway 2.0 – Implemented Model set-up



Model scope – state of the art sectorcoupled granular model

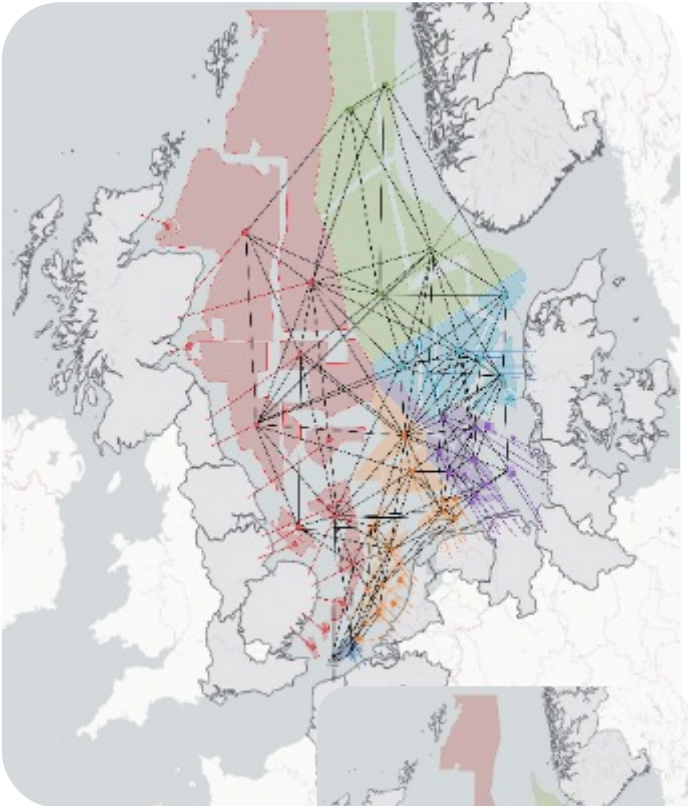


Wind data...

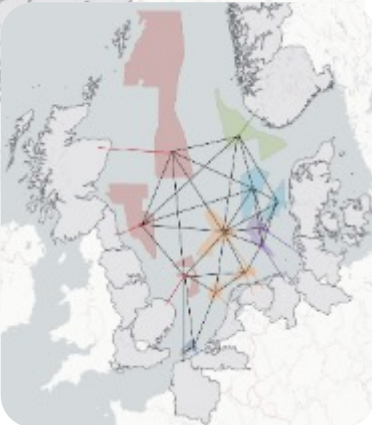


Incl wake losses

Offshore infrastructure (electricity)



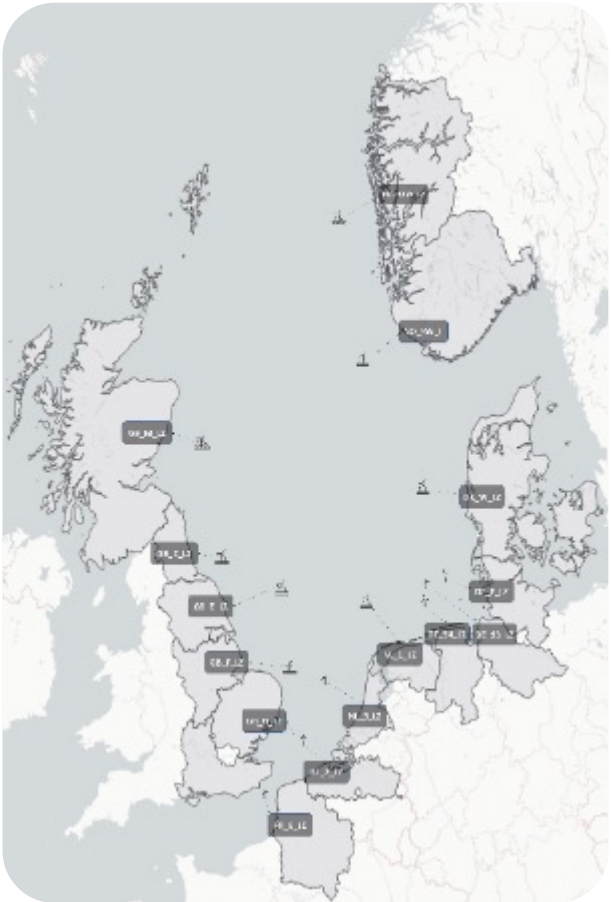
Offshore infrastructure (hydrogen)



+ connections to Northern Africa and shipping

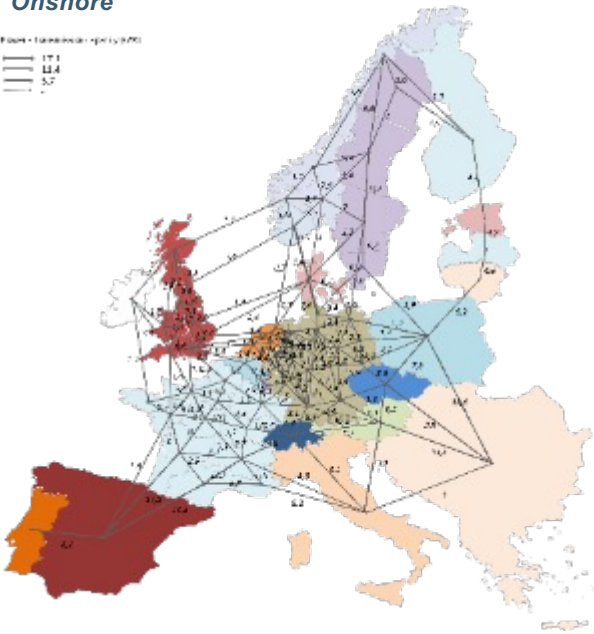
#FreeTheSupplySide
... "How is offshore wind integrated as economic efficient as possible"

Landing zones



Onshore

Power - Transmission capacity (GW)
17.1
13.4
5.7



NSWPH toolbox : System integration

How the NSWPH developed the System Integration toolbox

NSWPH approach and model development

- NSWPH started with the TYNDP scenarios and developed an interlinked / energy vector modelling approach
- Both the input data and model are set-up in a way to explore the roll-out of offshore wind extensively
- The method is a lead ahead of comparable efforts done by for example ENTSO

High level elements considered in model

International cooperation



Multiple energy carriers



Across sectors



NSWPH tools and modular building blocks

1

Design principles of offshore wind completely change due to scale up: important design elements are landing zones with flexible consumption, offshore electrolyses and hubs and spokes to develop far offshore areas.

2

Joint planning and build out of supply and demand is crucial: planning and coordinating internationally, introduces a flexibility need which requires joint build of supply and flexible demand. This applies not only offshore, but also to onshore development (due to e.g. grid constraints).

3

Hubs-and-spoke concepts are optimal across a set of sensitivities: at comparable cost levels hubs-and-spokes enable robustness and resilience, more interconnectivity and re-route options, the system is not flooded with high capacity of one carrier

4

The key drivers for offshore development need to be clear early 2030s: strategic positioning of hubs and spokes, role for flexible demand and electrolysis.



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Any questions?

Thank you!

Visit us at northseawindpowerhub.eu

Contact us at info@northseawindpowerhub.eu

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