EUROPEAN TRANSMISSION PLANNING WITH OFFSHORE NETWORKS

ESIG Technical Workshop 28th March 2023

Antje Orths

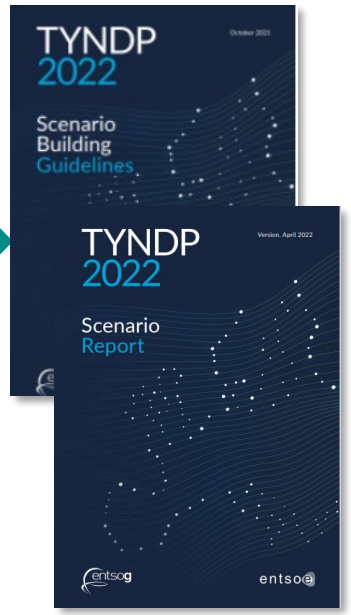
Transmission Planning in Europe

ENERGINET

a 2 year's cycle

2 yrs

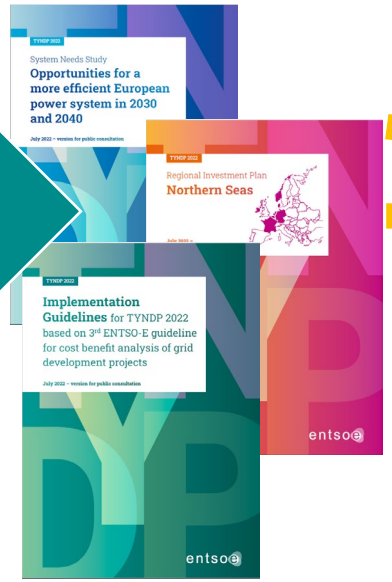
Scenario building



1 yr

Needs Identification

2040



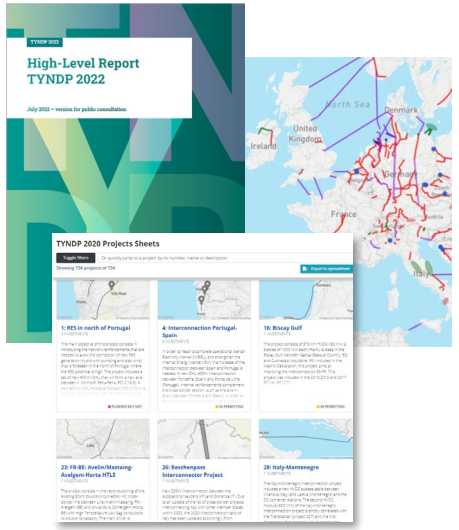
TSO
3PP
TSO
3PP
TSO
3PP

Projects

0,75 yr

Cost Benefit Analysis (CBA)

2030



- Scenarios describe key factors of potential development in technology, economic growth, generation, demand, …..
- across several time horizons
- Combination of bottom-up and top-down scenarios

- Identification of system needs (IoSN): (focus on capacity increases in transmission system)
- Based on: Socioeconomic welfare (SEW), Integration of renewables (RES) & Security of supply (SoS)
- Based on long term scenarios for **2040**

- Cost Benefit Analyses (CBA) of individual projects on mid term time horizon 2030
- Also additional studies on e.g. Interconnection Targets and Impact of "No-Grid development" study

Transmission Planning in Europe

ENERGINET

a 2 year's cycle

2 yrs

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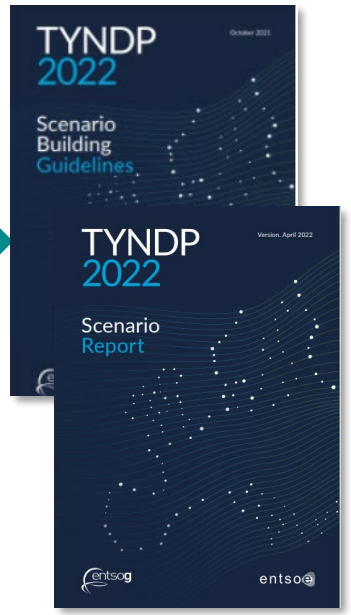

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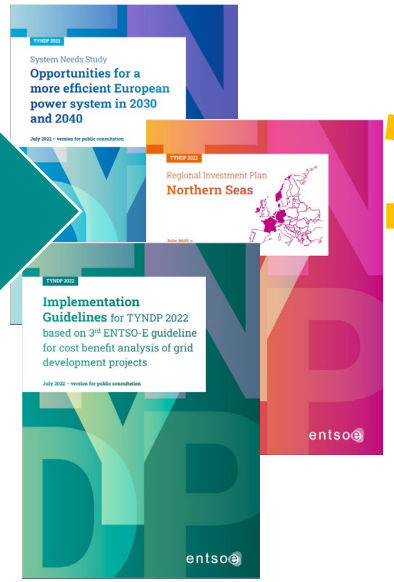

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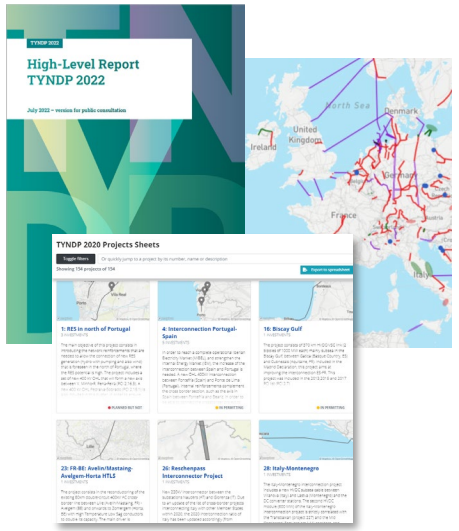


Findings e.g.

64 GW
cross-border capacity increases needed by 2030

164
transmission and storage projects assessed in TYNDP 2022

1,6 million jobs
created by electricity infrastructure projects development in the EU

	2030	2040
Saved TWh curtailments	17	42
Decrease gas dependence for Power TWh/yr	9	75 14% (2021)
Mio t CO2 avoidance	14	31
Annual generation cost decrease (bn € / yr)	5	9

ONDP

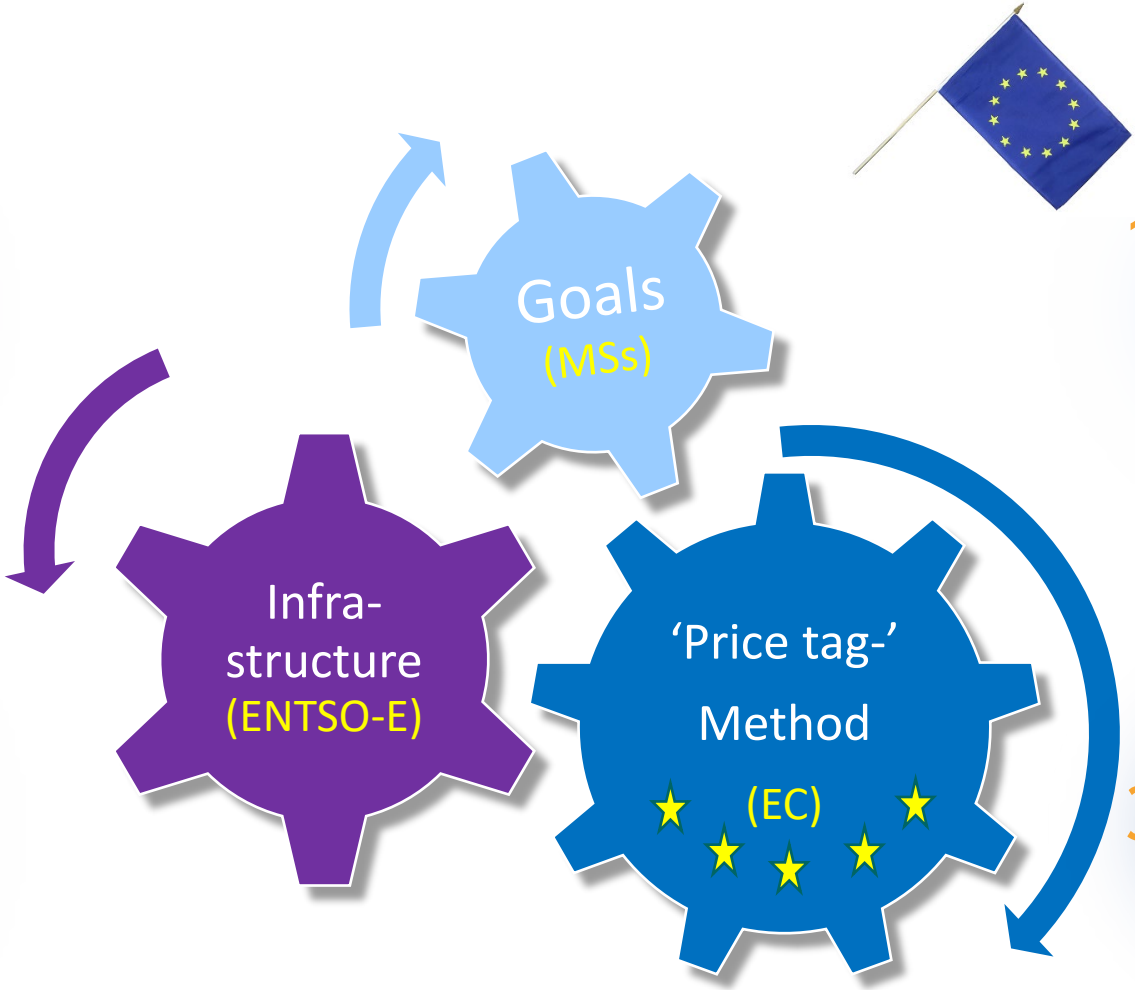
Offshore Network Development Plans

New ENTSO-E mandate derived from new TEN-E regulation.

Strategic ONDPs per sea basin shall provide a high-level outlook on offshore generation capacities' potential and resulting offshore infrastructure needs. First edition by 24/01/2024, based on goals jointly set by the Member States, which are collaborating in TEN-E offshore corridors (by 24/01/23).

REVISED TEN-E: ENABLING INFRASTRUCTURE DEVELOPMENT

TEN-E regulation (EU) 2022/869



Art. 14.1

1) **MS agreements on offshore goals for 2030, 2040 and 2050**

24/01/2023

Art. 14.2

2) **Offshore Network Development Plans**

24/01/2024

Art. 15.1

3) **EC Guidance on specific cost-benefit, cost sharing methodology**

24/06/2024

Art. 15.2

4) **Results of Sea Basins' Cost benefit – Cost sharing calculations**

24/06/2025

Collaboration at all levels is essential to make this a success!

Offshore Network Development Plans: Think European, Coordinate Regionally!

ENTSO-E to develop Offshore Network Development Plans (part of the TYNDP) by January 2024

High-level outlook on offshore generation capacities potential and resulting offshore grid needs

- 2030
- 2040
- 2050

TEN-E Priority Offshore Grid Corridors	Countries involved
1. NSOG	BE, DK, FR, DE, IE, LU, NL, SE
2. BEMIP offshore	DK, EE, FI, DE, LT, LV, PL, SE
3. Atlantic offshore grid	FR, IE, PT, ES
4. South & West offshore Grid	FR, GR, IT, MT, PT, ES
5. South & East offshore Grid	BG, CY, HR, GR, IT, RO, SI

The scope of the Offshore Network Development Plans

The ONDPs, will deliver the following information for each time horizon (2030, 2040, 2050) and sea basin.

- **Overview of the Offshore RES capacity clusters located in the different sea basins.**
  - *How much RES in the different timeframes? Located where? Are there any potential conflicts with other sectors?*
- **Possible configuration of the transmission infrastructure, potentially connecting the different clusters to each other and/or to the onshore systems.**
  - *What are the possible configurations for connecting the different clusters, considering the space available and the relevant technological assumptions?*
- **A high-level overview over related transmission categories, as required in Art. 14.2 of (EU) 2022/869: Offshore grid needs, including the potential needs for**
  - Interconnectors,
  - hybrid projects,
  - radial connections,
  - reinforcements and
  - hydrogen infrastructures.

*What is the amount of investments per category **[km/ number/ €]** needed to integrate the offshore RES potential?*

A15(2) - results of the application of the cost-benefit and cost-sharing to the priority offshore grid corridors

MOVING TARGETS

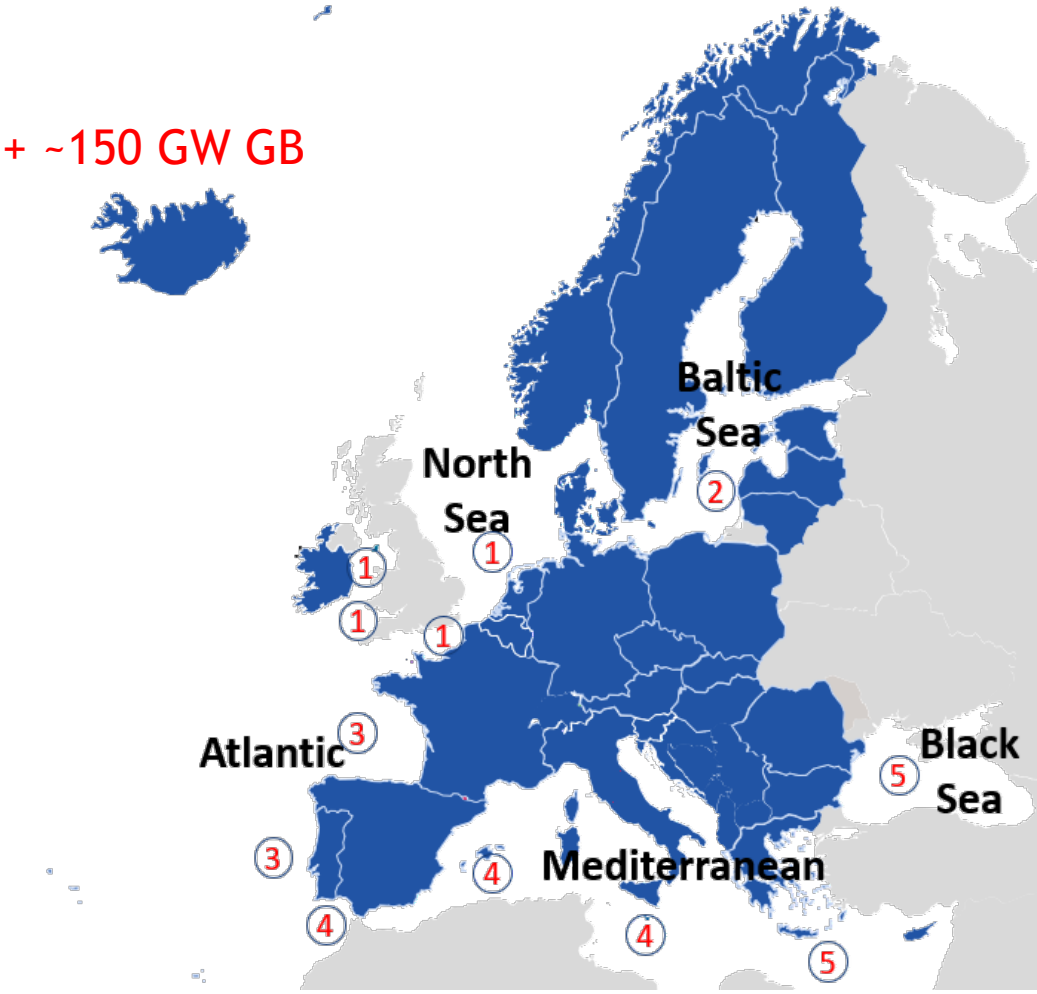
Esbjerg Declaration, 19.05.2022
Joint Offshore Wind
& Combined H2 Target [GW]

Marienborg Declaration 30.8.2022
Sea basin Goals [GW]

Joint Statement Dublin, 12.09.2022
Country Goals [GW]

JOINT NON-BINDING MS AGREEMENTS ON OFFSHORE GOALS - 20.1.2023

	2030		2040		2050	
	min	max	min	max	min	max
NSOG	60,3	60,3	134,9	158	171,6	218
BEMIP	22,5	22,5	34,6	34,6	46,8	46,8
AOG	12,74	14,26	21,74	26,06	29,74	43,06
SWOG	5,15	6,15	6,7	12,6	6,7	20,1
SEOG	8,81	8,81	16,8	16,8	25,9	25,9
Total	109,5	112,0	214,7	248,1	280,7	353,9

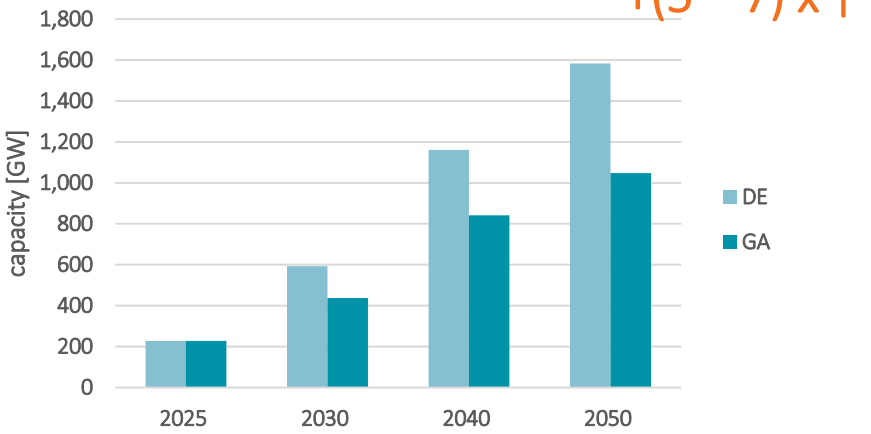


EUROPEAN PRODUCTION CAPACITIES, EU27

ENERGINET

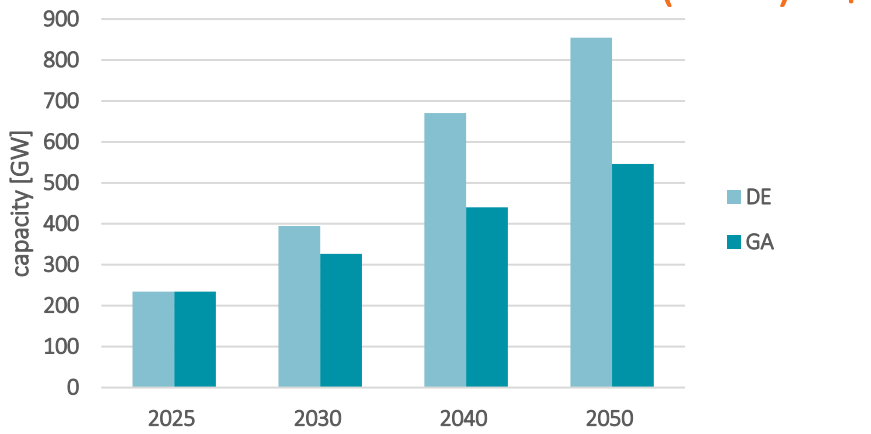
PV Capacity

+(5 – 7) x↑



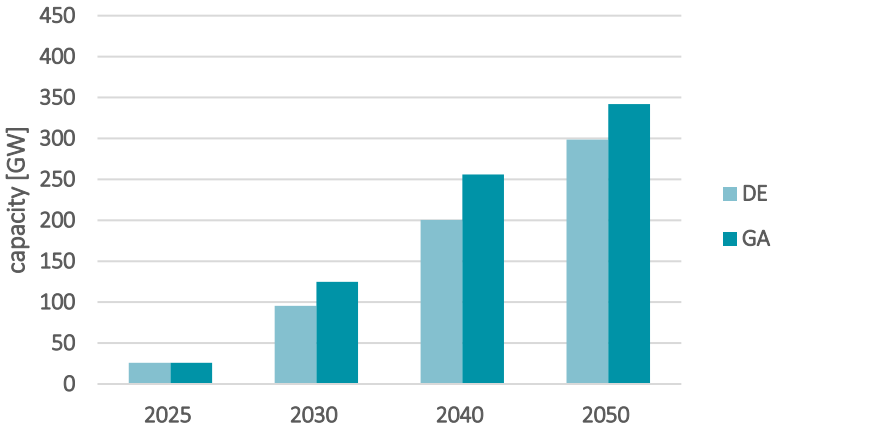
Onshore Capacity

+(2 – 3) x↑



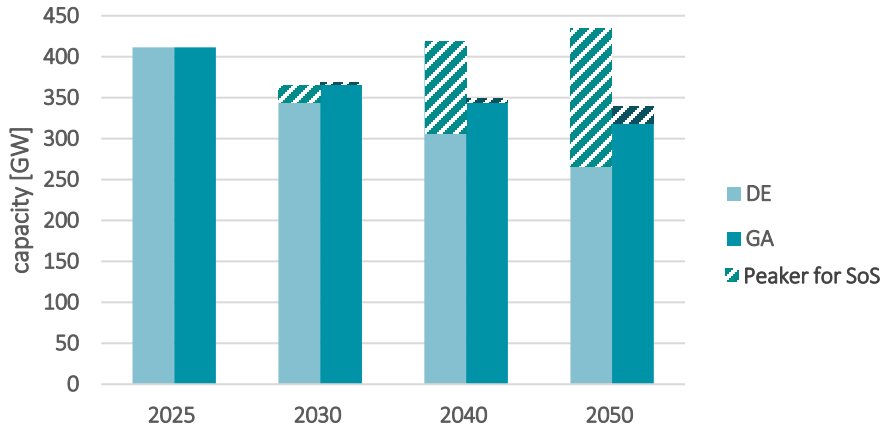
Offshore Capacity

+(12 -13) x↑



Thermal Capacity

~ 1



Huge increase of RES installations expected to fulfill the European Climate targets and to cover the increasing electricity demand

<u>Demand:</u>

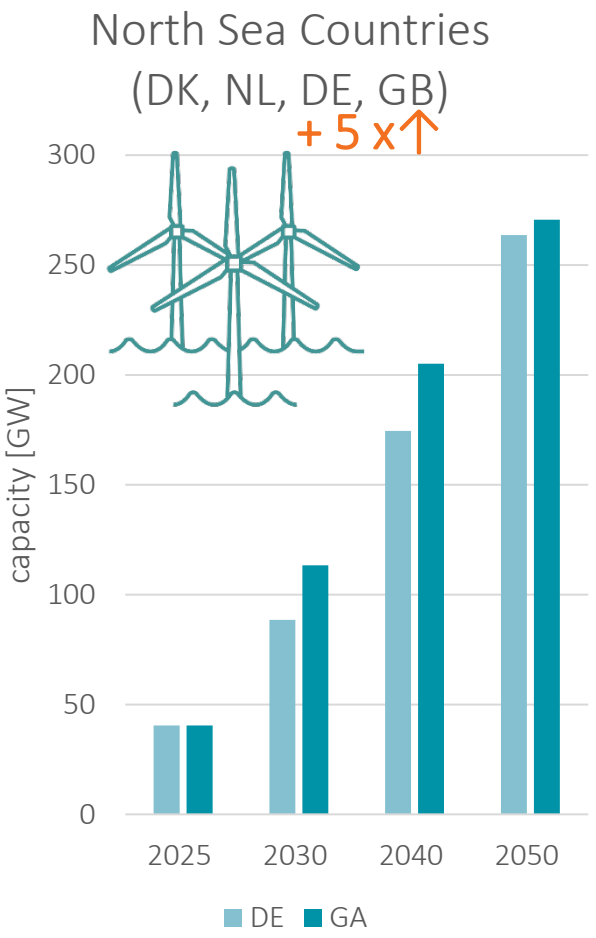
2025 Ref: 2500 TWh

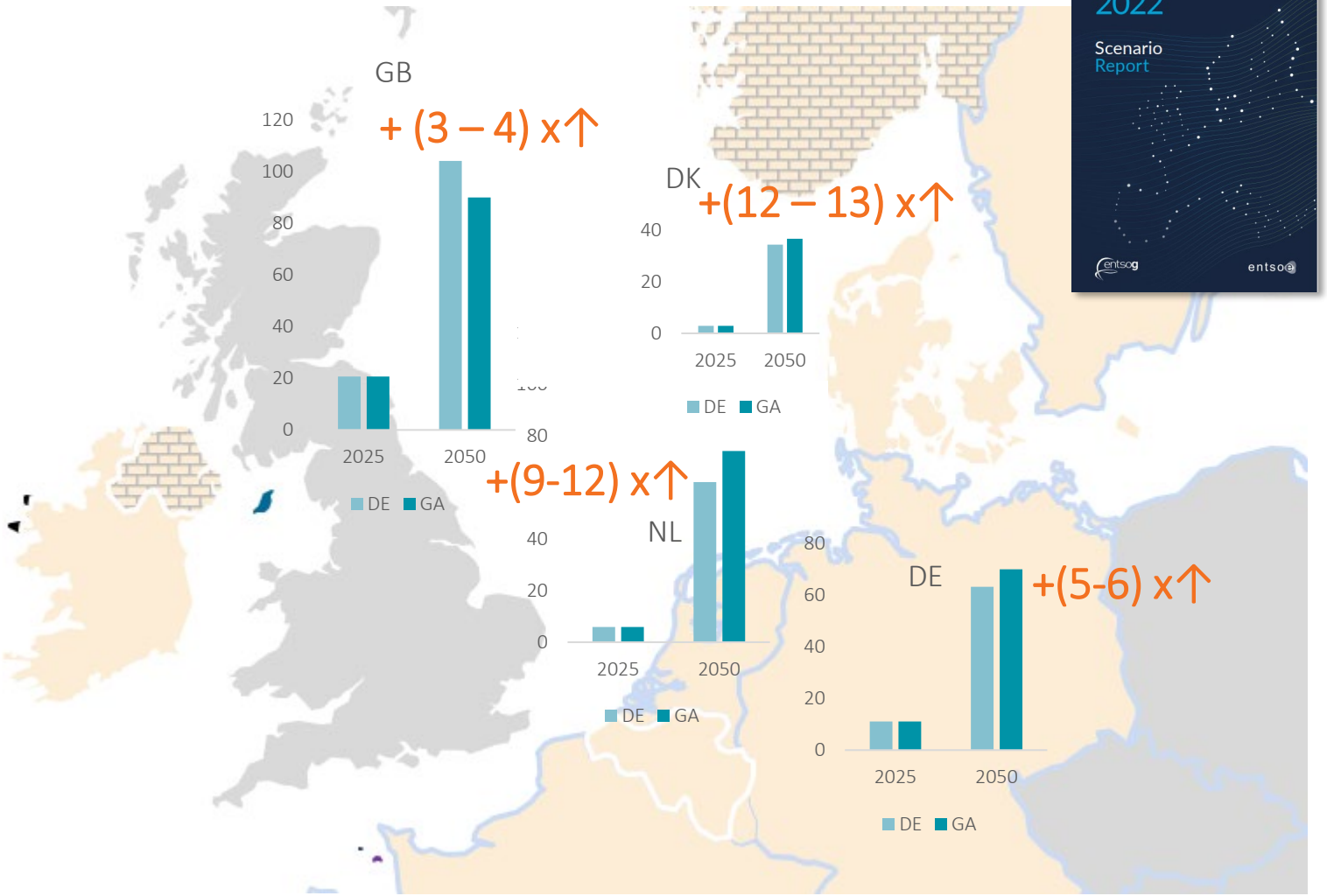
2050 DE: 4000 TWh

2050 GA: 3600 TWh

TYNDP 2022 SCENARIOS:
OFFSHORE RES - INCREASE IN SELECTED NORTH SEA COUNTRIES

ENERGINET





	2030		2040		2050	
	min	max	min	max	min	max
1 NSOG	60,3	60,3	134,9	158	171,6	218

+ ~150 GW GB

OFFSHORE NETWORK DEVELOPMENT PLANS: PLANNING TOMORROW'S OFFSHORE SYSTEMS

Member States' targets and maritime spatial planning (MSP) + TSO technical expertise = Increased visibility on the potential opportunities to develop the offshore systems in the European sea basins

Collaboration of **all stakeholders** (institutional, industrial, NGOs) is critical for the delivery of a high-quality product.

ENTSO-E, together with the European Commission, developed a guidance document for the Member States to help them deliver the **key input data for the elaboration of the ONDPs**.

- **Offshore RES targets in the different time horizons**
- **Locations of above offshore RES in smaller clusters**

ENTSO-E has been supporting the regional cooperation platforms, coordinated by the European Commission, to deliver technical insights on how to ensure optimal development of offshore systems.

National "Government + TSO"- discussion recommended to align ENTSO-E assumptions as good as possible with MSPs and MS views. (ongoing mid Feb)

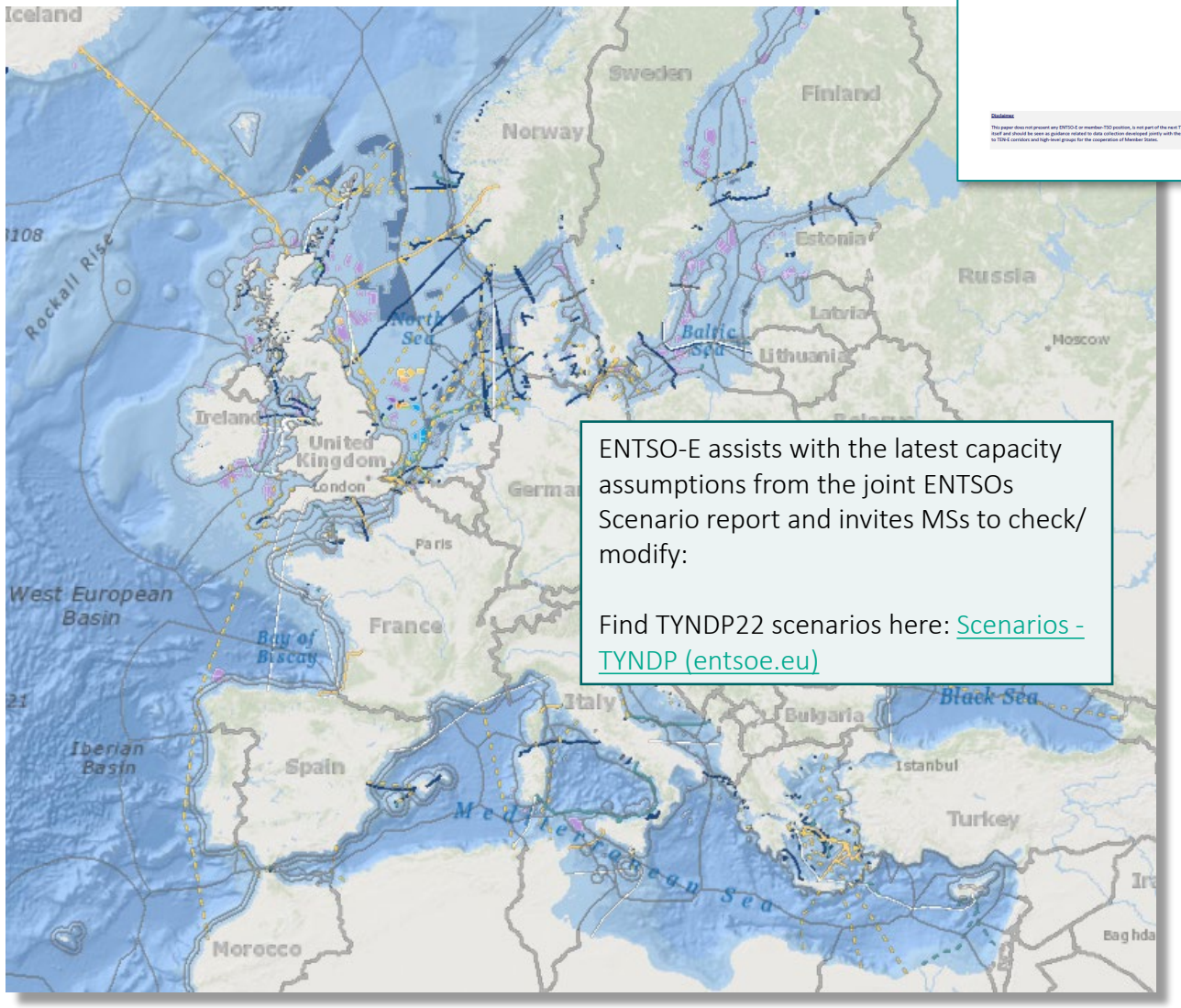
WHAT ENTSO-E NEEDS FROM MEMBER STATES

For each time horizon: 2030, 2040, 2050

- Offshore RES Capacities
- Offshore RES Locations
  -> e. g. necessary for cable lengths

- Maritime spatial plans
  -> what do we have to surround?

See Guidance Document for the Member States



ENTSO-E assists with the latest capacity assumptions from the joint ENTSOs Scenario report and invites MSs to check/ modify:

Find TYNDP22 scenarios here: Scenarios - TYNDP (entsoe.eu)

Source: Global Offshore Renewable Map | 4C Offshore

IDENTIFICATION OF SYSTEM NEEDS – FINDING OFFSHORE HYBRID PROJECTS, TEST OF NEW METHODOLOGY IN THE TYNDP 2022

ENERGINET

52

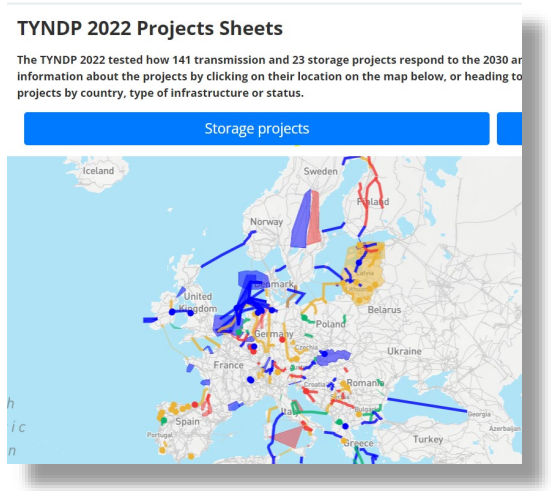
Offshore transmission projects, one third of the total TYNDP portfolio.

+ 17 projects

7 radials

3 hybrids

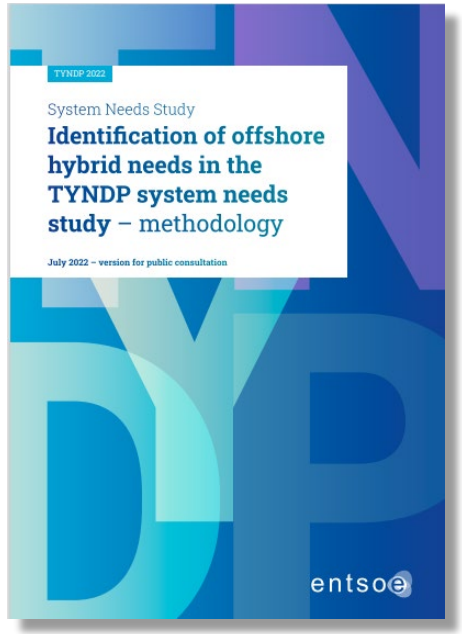
(6 in total)



New methodology to assess needs for hybrid offshore infrastructure.

(Public consultation until September 16th)

1. Are there **systemic needs for hybrids and other solutions** to facilitate achieving the necessary price convergence, CO2 targets, RES integration levels and security of supply criteria?
2. **Can offshore hybrid projects offer higher benefits to the system compared to single purpose solutions**?



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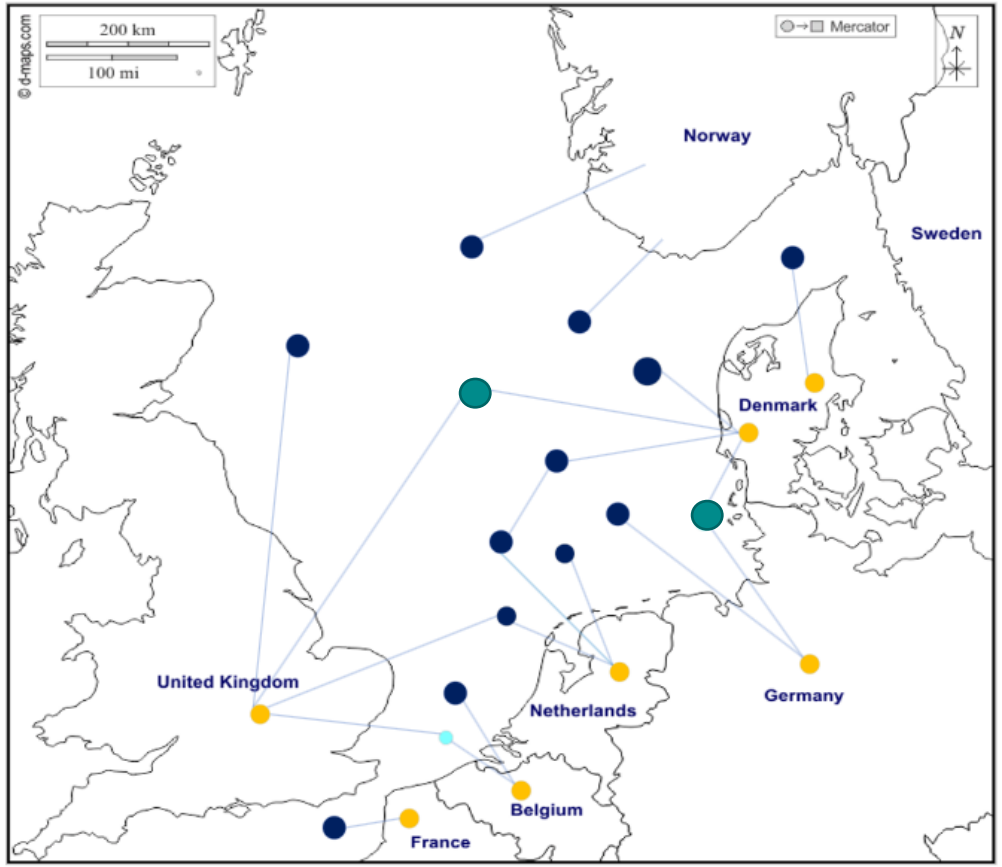
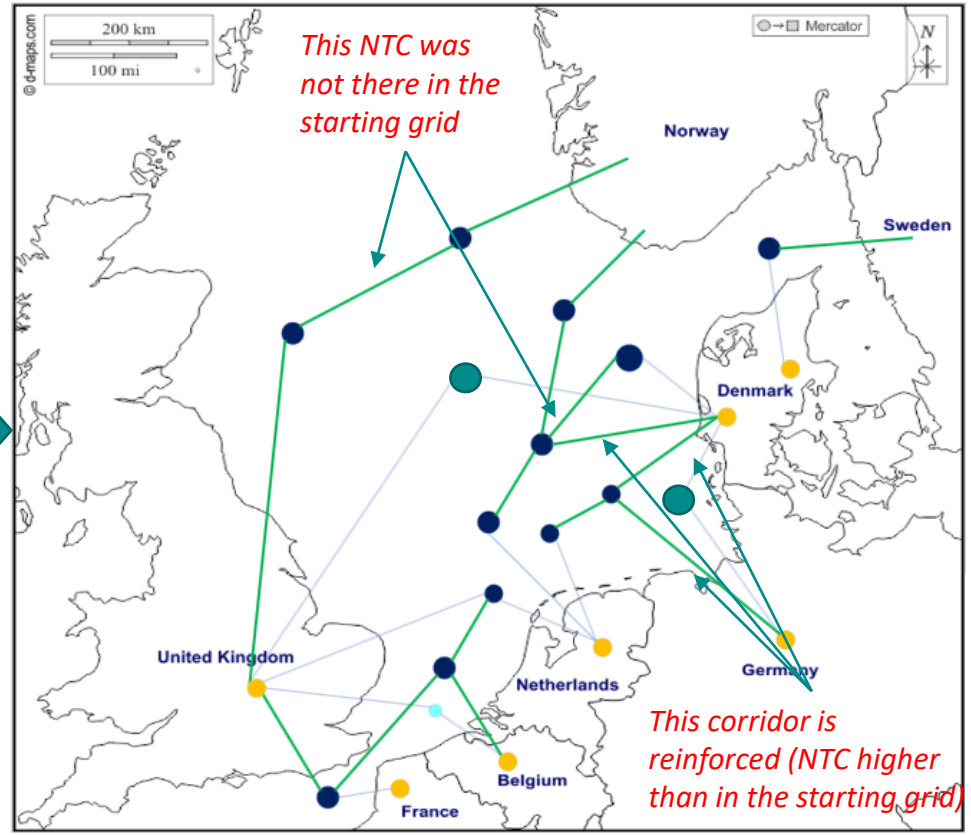
MODEL RUNS FOR 2040 AND 2050





Expandable offshore node

Non expandable offshore node

Onshore node

Transmission capacity declared by TSO in the PEMMDB (starting offshore infrastructure)

Transmission capacity obtained through the model

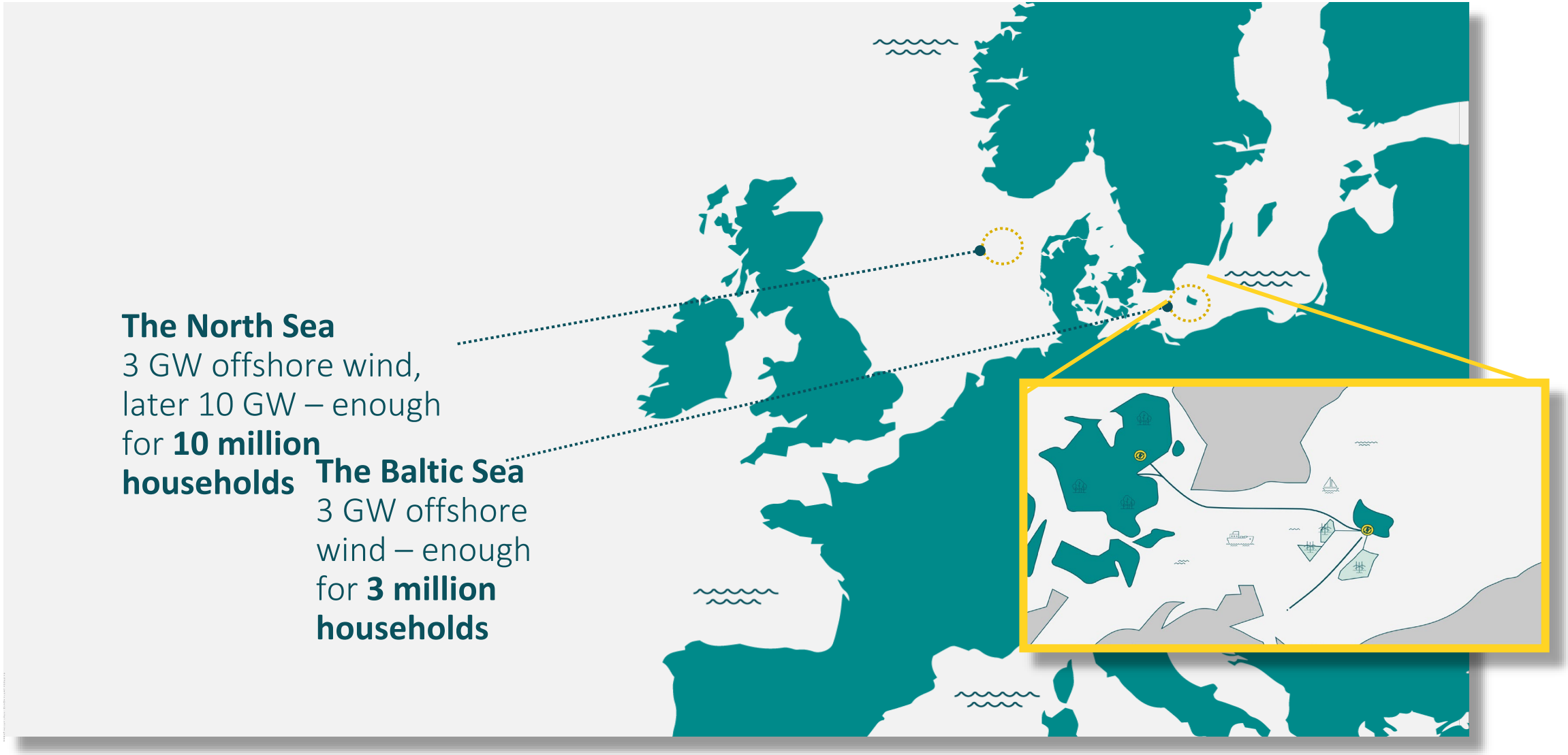
The map is a qualitative representation of the potential structure of the offshore model in the North Sea, not based on the real data gathering

ENERGY ISLANDS IN DENMARK

ENERGINET

The North Sea
3 GW offshore wind, later 10 GW – enough for **10 million households**

The Baltic Sea
3 GW offshore wind – enough for **3 million households**



ENTSO-E'S MESSAGES

Many aspects of offshore development are investigated in ENTSO-E's position papers

Find ENTSO-E's position papers at the dedicated offshore page: [ENTSO-E's views on offshore development (entsoe.eu)]

THANK YOU!

Antje Orths
Convenor ENTSO-E ONDP Group
ano@energinet.dk