Regulatory Roadmap for developing hybrid offshore wind projects between Norway and Europe

Catherine Banet, Professor of law, University of Oslo

DeepWind Conference, 17 January 2025, Trondheim

OCEAN GRID

Grønn plattform

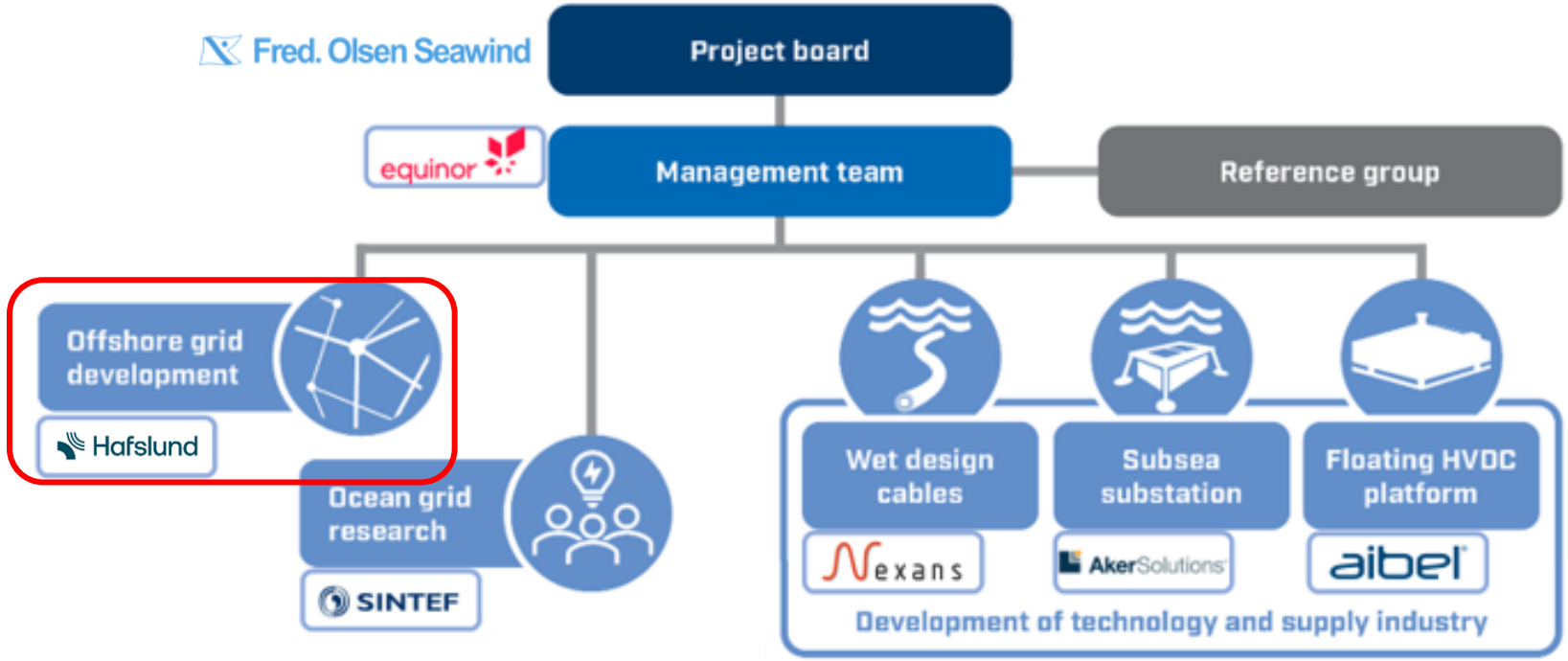
About the Ocean Grid project

17 Partners

36 Months

130.3 Million NOK

5 Subprojects



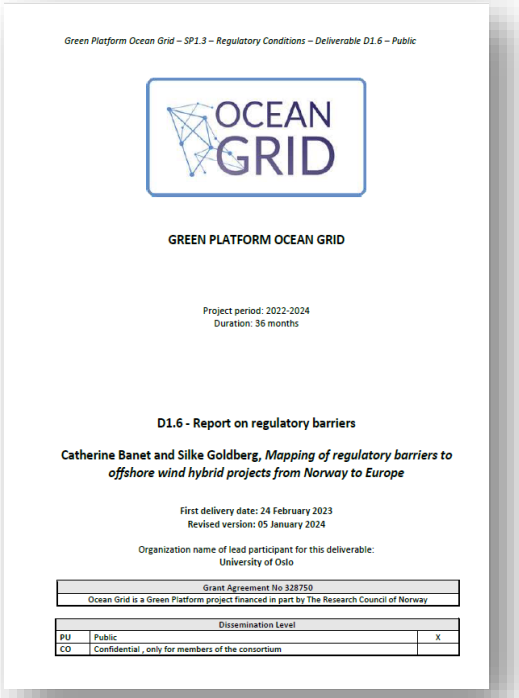
UNIVERSITY OF OSLO · NTNU · Benestad · ABB · Hitachi Energy · AKER OFFSHORE WIND · DNV · Deep Wind Offshore · Å ENERGI

Statnett · SINTEF · AkerSolutions · Nexans · aibel · Fred. Olsen Seawind · Hafslund · equinor

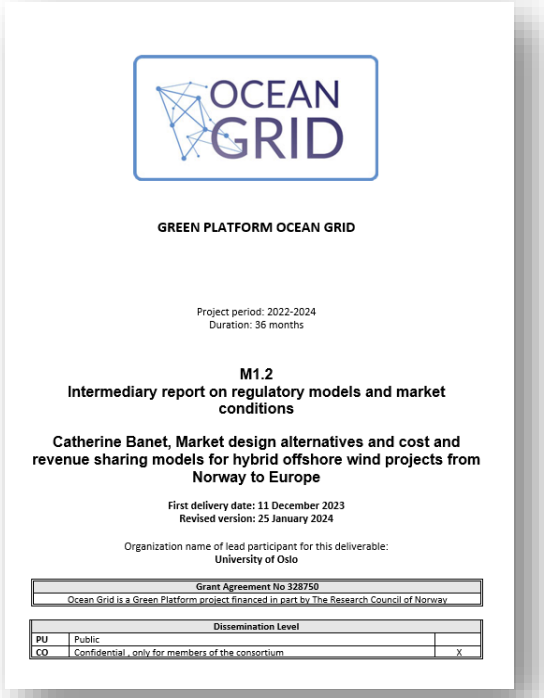
Overview

I. Background for the presentation
II. General context
III. The strategic role of hybrids
IV. Why a regulatory roadmap?
V. Background considerations for the regulatory roadmap
VI. Review of the proposed regulatory roadmap

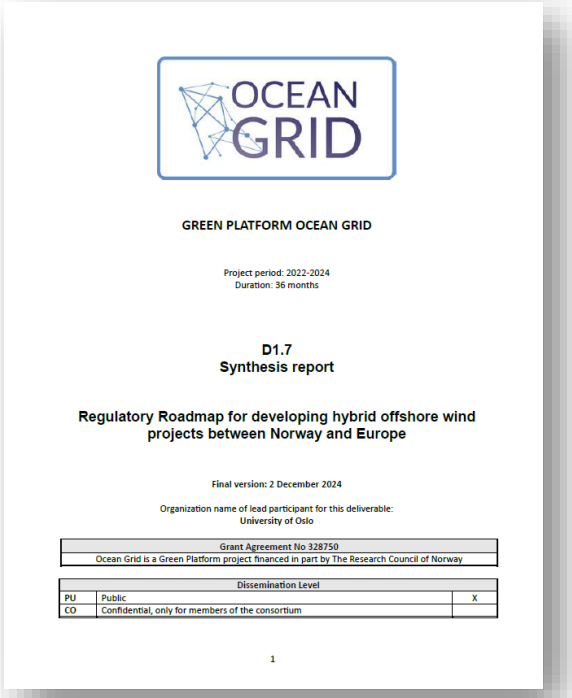
I - Background for the presentation



February 2024



July 2024



Dec. 2024

Available on: oceangridproject.no

II – General context:
A changing offshore wind landscape

Ambitious targets and a pillar in attaining net zero goals:
Offshore Renewable Energy (ORE) Strategy, REpowerEU.

- EU policy targets at EU level: 300 GW of offshore wind and 40 GW of ocean energy installed capacity in the EU by 2050;
- Neighbouring countries of the 5 EU sea basins: joint targets for OW, e.g. April 2023 Ostend Declaration with at least 300 GW by 2050 in the North Seas.
- Cumulative OW goals by MS: 317 GW by 2050 (2023).
- Increased EU RE target in REDIII to at least 42.5% by 203O.

EUROPEAN COMMISSION

Brussels, 19.11.2020
COM(2020) 741 final

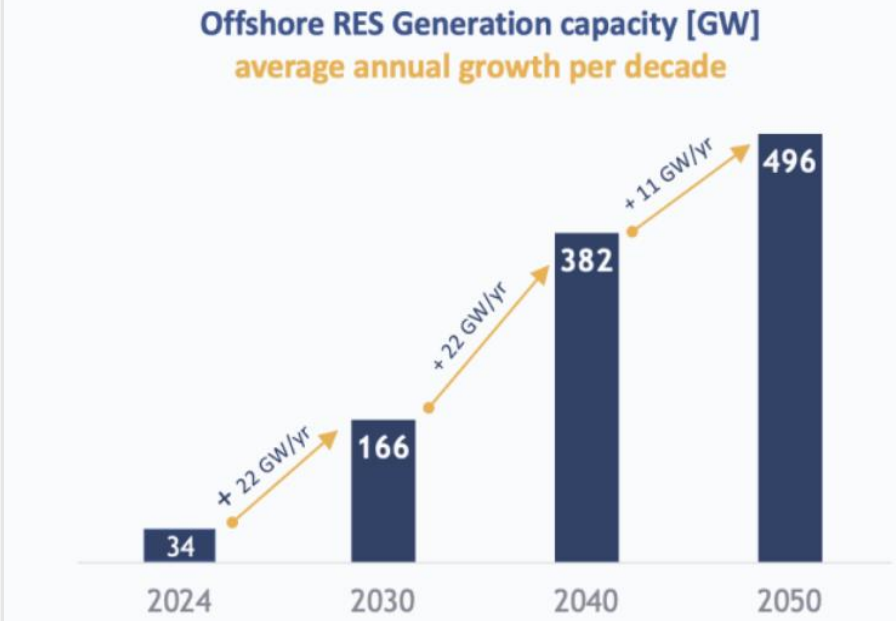
COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future

{SWD(2020) 273 final}

A change of speed in grid development

Need for Speed…for Generation and Transmission



Today's offshore RES is only 7% of offshore RES foreseen in 2050

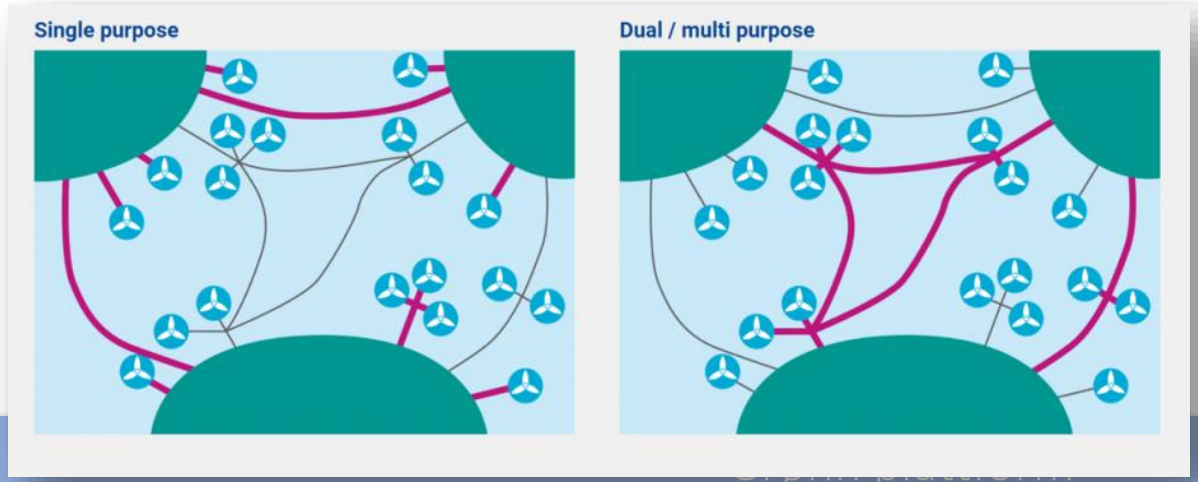
Annual installations of offshore RES and Infrastructure need to accelerate significantly

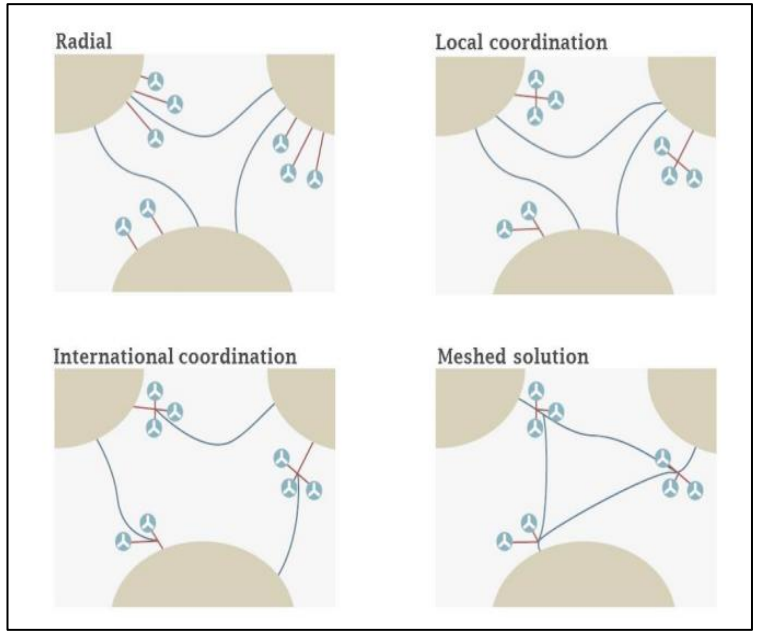
…BUT: average speed in the last 10 years was **+ 2.5 GW/yr**

Source: ONDP 2024

III – The strategic role of hybrids: A change of grid architecture

- **Distinction between alternative grid configurations:**
  - **Radial connection**: single purpose.
  - **Hybrid projects**: hybrid solutions could extend **from dual purpose solutions to multipurpose solutions** (across sectors, with offshore consumption)
  - **Energy hubs / energy islands**
  - **Meshed grid**



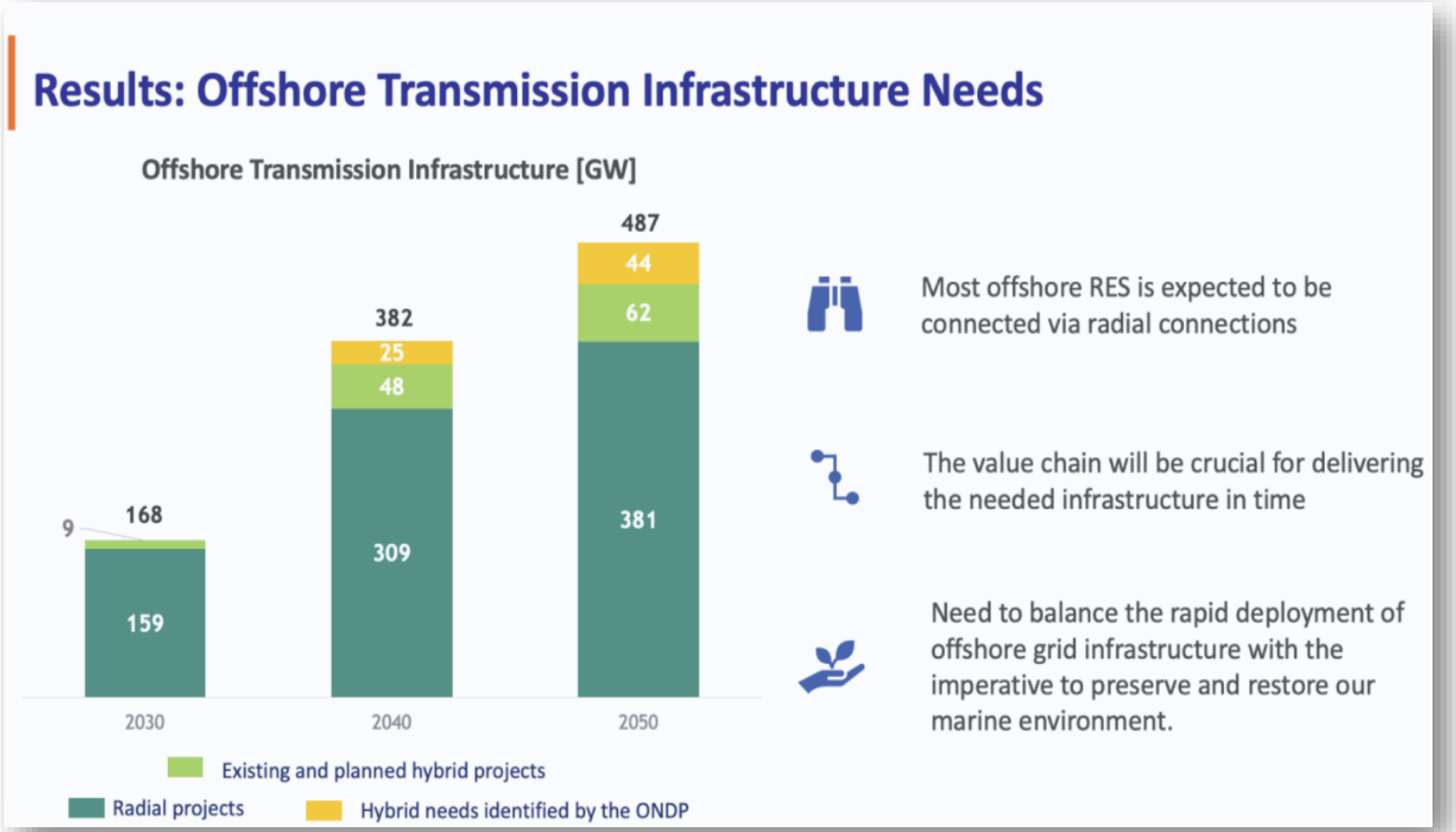


Assumed general pattern of the Offshore Grid Development.

Source: The North Seas Countries' Offshore Grid Initiative - Initial Findings, Final Report Working Group 1 – Grid Configuration, November 2012, p.8

And indeed:

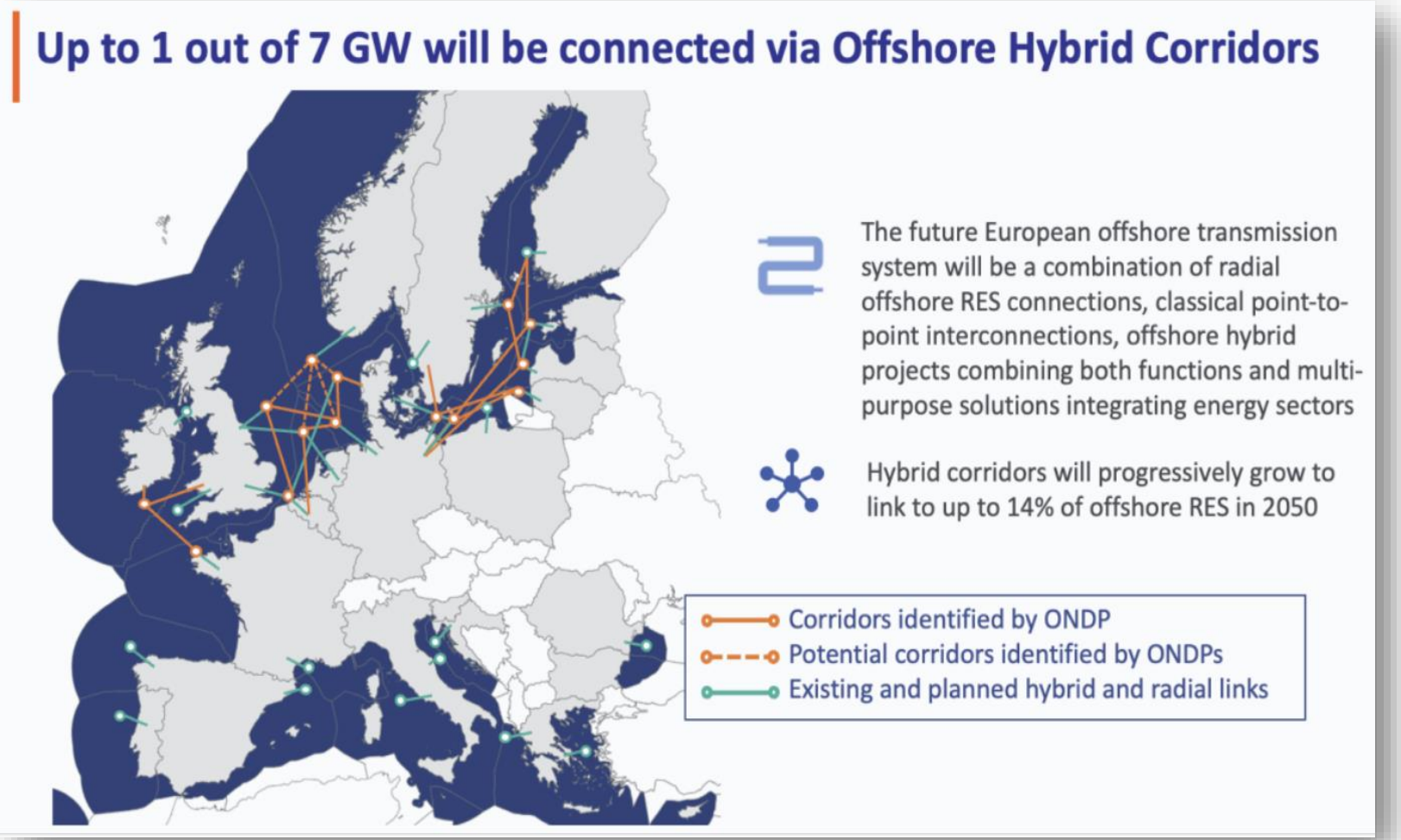
Hybrids: a cost-efficient and sustainable solution



Source: ONDP 2024

First Offshore Network Development Plan (ONDP)

23 January 2024



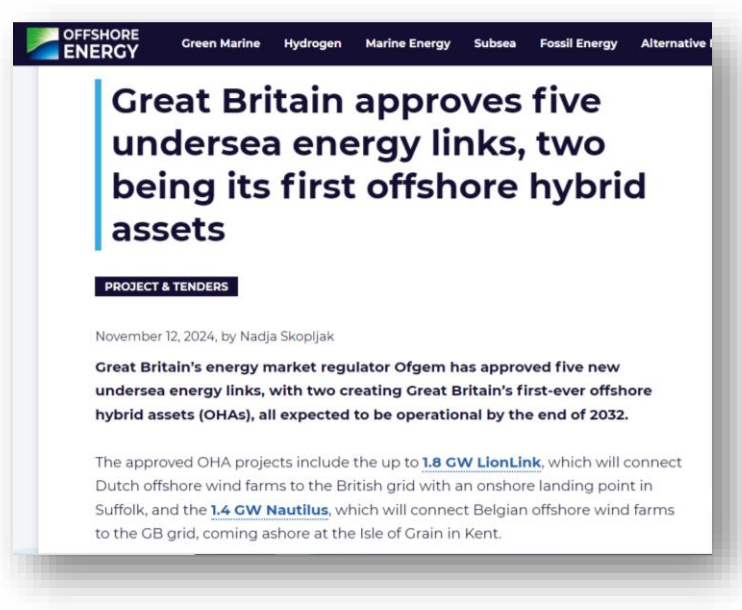
ONDP

TYNDP

NDP/NECPs

Status of hybrid offshore wind projects in Europe

	Hybrid Project Name	Countries	Status
1	Kriegers Flak	Denmark-Germany	operational
2	ELWIND	Latvia-Estonia	cooperation signed. PCI.
3	Lion Link (previously Eurolink)	The Netherlands-GB	cooperation signed
4	Bornholm Energy Island	Denmark-Germany	cooperation signed. PCI.
5	North Sea Wind Power Hub	Denmark-Germany-the Netherlands	cooperation signed. PCI.
6	Triton Link	Belgium-Denmark, including energy islands Energiø Nordsøen (DK) and Princess Elisabeth Island (BEL). (The plan is to connect Triton link to the North Sea Energy Island mentioned above in point 5.)	Cooperation signed. PCI status.
7	North Sea Energy Island	Denmark-Germany-the Netherlands-Belgium	under discussion
8	Nautilus	GB-Belgium (to Princess Elisabeth Island).	under discussion. GB approved. Included in the Belgian Federal Development Plan. PMI status.
9	Baltic WindConnector	Estonia-Germany	under discussion
10	Sørlige Nordsjø II / Sørvest F	From the Norwegian continental shelf	Under discussion. Not yet decided.



Great Britain: Cap and Floor Regime also to apply to hybrid assets

"Cap and Floor" Regime

- Sets a maximum and minimum level of annual revenue which a developer is entitled to retain.
- Allows developers to identify, propose and build interconnectors, subject to Ofgem approval.

Exemptions

- Developers can seek exemptions from regulatory requirements.
- Developers face full upside and downside of the investment.
- Developers usually apply for an exemption from certain regulatory requirements to better enable the business case of their investment.

The Cap and Floor Regime provides regulatory support to project revenues through the floor while sharing in any upside through the cap.

Cap

- Represents the maximum amount of annual revenue that the interconnector is allowed to retain; the licensee must transfer revenue above this level to consumers via the process of Transmission Network Use of System (**TNUoS**) charges.

Floor

- Represents the minimum amount of annual revenue that the licensee is guaranteed to earn (provided that it meets the 80% availability requirement).
- Consumers top up revenue below this level for the licensee via the TNUoS charges.

Duration

- 25 years

Rationale

- Stable revenue stream
- Developers can meet financing covenants required by their lenders
- Incentivises development of electricity interconnection by limiting developers' exposure to electricity market price risk

OHA Pilot Programme

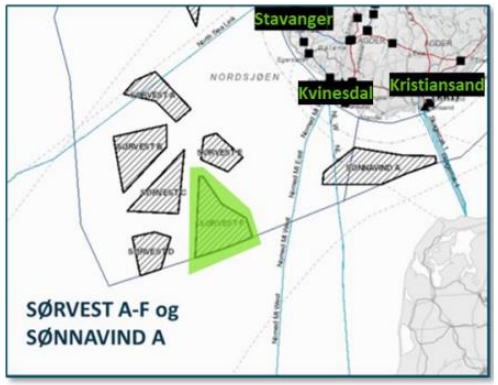
Two existing OHA pilot projects:

- **LionLink** to the Netherlands, a proposed 1.8GW connection to an offshore converter station on a Dutch offshore transmission platform
- **Nautilus** to Belgium, a proposed 1.4GW connection to an offshore converter station on the Modular Offshore Grid 2 (MOG2) energy island

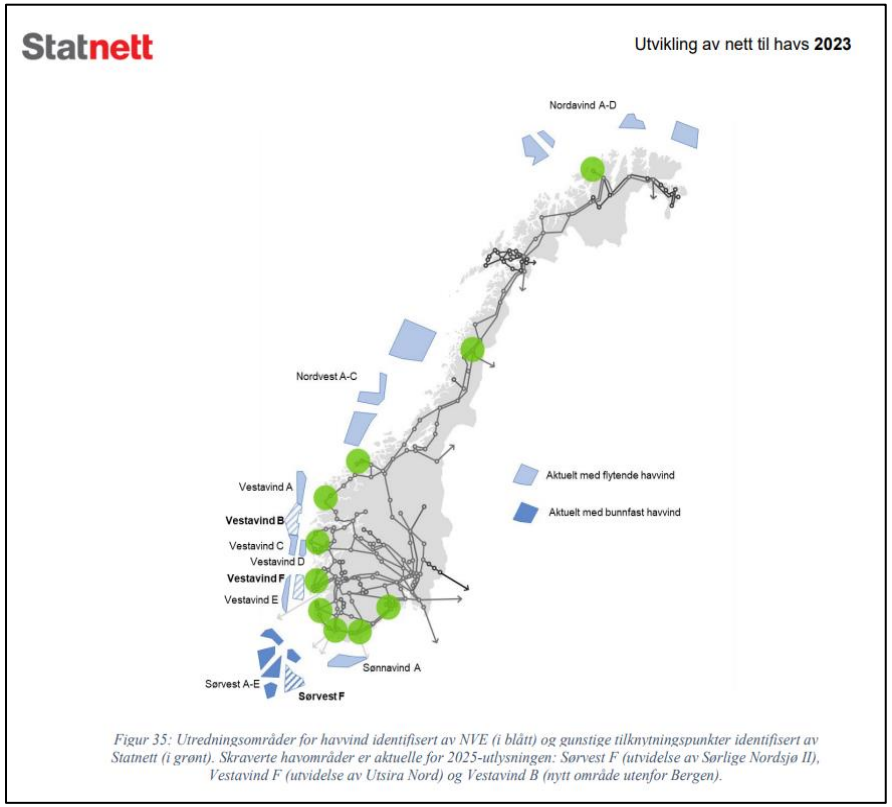
Window 3 of the Cap and Floor Regime was used as a pilot for the Cap and Floor regime applying to OHAs:

- It would work in a similar fashion to the standard Cap and Floor Regime, by providing a cap and floor to regulate revenues.
- Ofgem awarded IPAs to both LionLink and Nautilus.
- Interface with OFTOs?

Hybrids from Norway: where? when?



Figur 36: For utlysningen i 2025 anbefaler vi at havvind fra Sørvest F tilknyttes med en hybrid til Sørlandet.



Figur 35: Utredningsområder for havvind identifisert av NVE (i blått) og gunstige tilknytningspunkter identifisert av Statnett (i grønt). Skraverte havområder er aktuelle for 2025-utlysningen: Sørvest F (utvidelse av Sørlige Nordsjø II), Vestavind F (utvidelse av Utsira Nord) og Vestavind B (nytt område utenfor Bergen).

Statnett, Temarapport: Utvikling av nett til havs, November 2023

IV - Why a regulatory roadmap?

De-risking through law.

Hybrids can develop under today's legislation, but not clear enough to provide certainty for investors, operators and regulators in the long run.

Additional value of our work:

- **A holistic approach, looking at both generation and grid solutions**
- **Both a project specific perspective and a cross-border perspective**
- **A multi-actor approach**
- **Norway/EU/GB**

V – Background considerations for the proposed regulatory roadmap

1. Address **fundamental regulatory barriers** to hybrid offshore wind projects between Norway and Europe
2. Decide on **market design alternatives** for hybrid offshore wind projects
3. Set **market conditions**: map costs and incomes per actor, develop cost-benefit allocation models
4. **Choice of regulatory approach**

1. Address fundamental regulatory barriers to hybrid offshore wind projects between Norway and Europe

- **Legal definition of hybrids**
  - Structure and functions. Possibilities of grid extensions.
  - Alterative models available: central vs asset-based approach, one owner vs multiple owners

- **Jurisdiction over the different parts of the hybrid projects.**
  - Hybrids, energy islands: which jurisdiction (territorial and functional)? Which legislation to apply to which part of the assets?

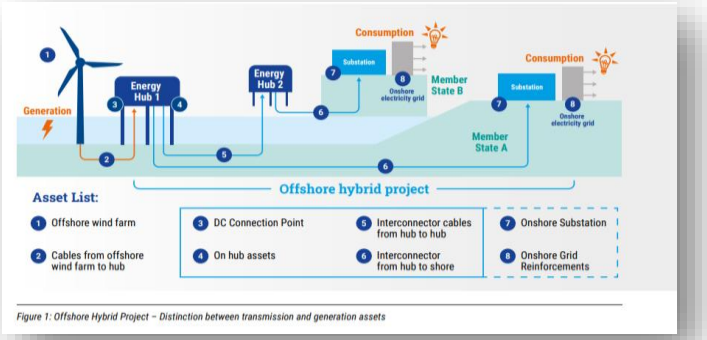
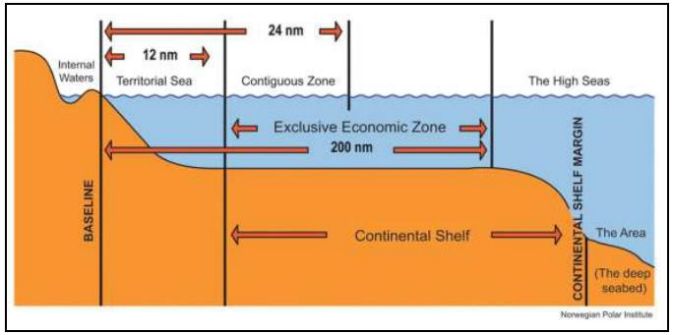
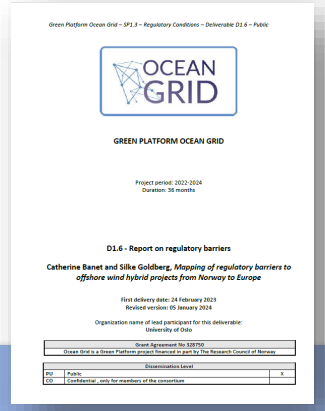


Figure 1: Offshore Hybrid Project – Distinction between transmission and generation assets

Source: ENTSO-E



[Mapping of regulatory barriers to hybrid offshore wind projects between Norway and Europe]


GREEN PLATFORM OCEAN GRID

D1.6 - Report on regulatory barriers

Catherine Banet and Silke Goldberg, *Mapping of regulatory barriers to offshore wind hybrid projects from Norway to Europe*

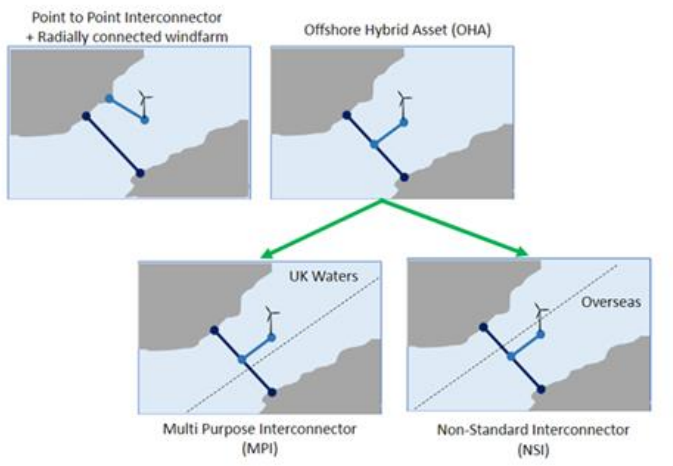
GB: Two types of OHAs

Ofgem distinguished between three types of interconnectors, two of which are classed as OHAs:

- **Standard point to point interconnectors** conducting interconnection activities in GB and the connecting jurisdiction;
- **Non-standard interconnectors (NSIs)** connected to an offshore generator in the connecting jurisdiction but not in GB, and which will conduct interconnection activities in GB and the connecting jurisdiction as well as offshore transmission activities only in the connecting state; and
- **Multipurpose interconnectors (i.e. MPIs)** connected to an offshore generator in GB, which will conduct interconnection activities in GB and the connecting state as well as offshore transmission activities in GB (and optionally in the connecting state).

- The MPI Pilot Scheme was expanded to include NSIs and renamed into the 'OHA Pilot Scheme'.
- Ofgem has proposed that different licensing arrangements apply for NSIs and MPIs.

Figure 1: Schematics demonstrating the configuration of cross-border assets



- **Central EU requirements for advancing hybrids**

EU legislation will play an important role on the regime for hybrid offshore wind projects connected to Norway, particularly on the following points:

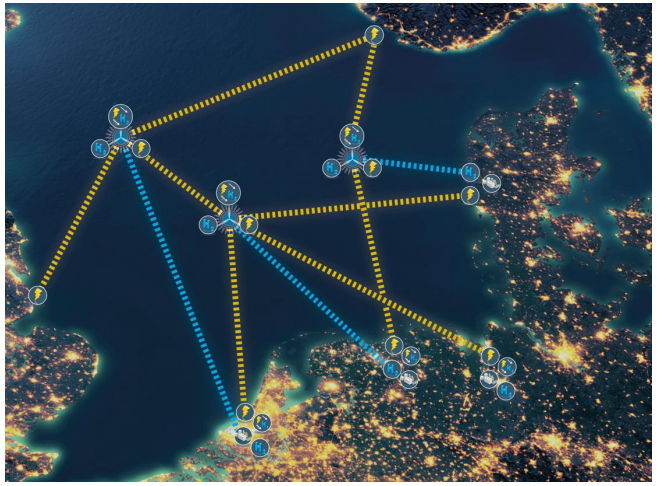
- planning (marine areas, energy grid infrastructures);
- permitting of generation and infrastructure (including rules on strategic impact assessment / environmental impact assessment, auctioning, permit-process timing, etc.);
- market design, including grid regulation;
- financing mechanisms.

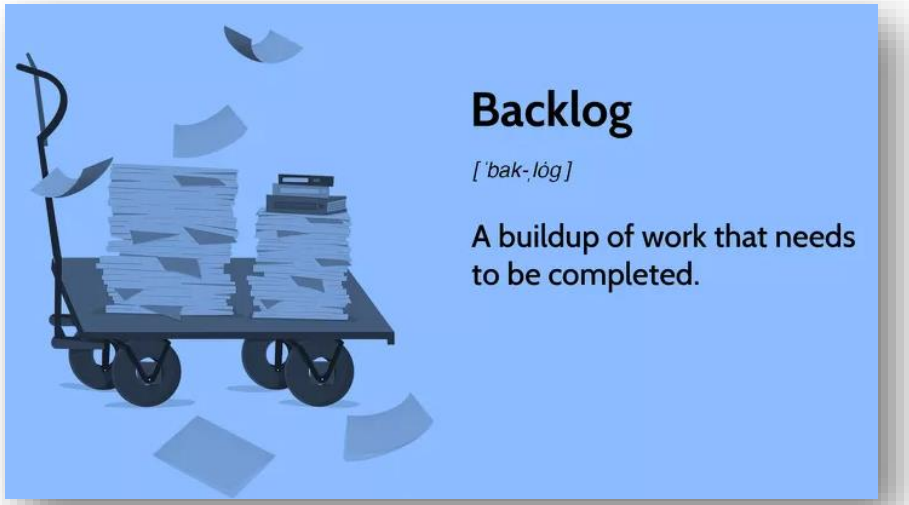
The following EU requirements have been identified as **particularly influential for the regulatory regime for hybrid projects**:

- application of the regime for project of common interest (PCI) or project of mutual interest (PMI) under the TEN-E Regulation, including for planning and permitting (ex: Nautilius);
- unbundling rules;
- capacity allocation, including the so-called 70% rule;
- grid connection;
- metering;
- balancing.

- Legal regime **around the North Seas (EU – Norway – GB)**:
  - How to address the **EEA backlog** and the legal situation with **GB**.
    - See CBA requirements in TEN-E.
    - See what is proposed for the ongoing/proposed hybrid projects. Application of the OHA regime (reg. pilot scheme).

    Ofgem: "*The new connections will keep consumer costs as low as possible through the cap and floor rules which limit revenue for interconnectors*." (12.11.2024) Project developer has 3 years to submit detailed cost information for the Final Project Assessment stage.
  - Available alternatives:
    - Harmonisation
    - Bilateral / multilateral agreements
    - Soft law guidance
  - A form for transnational law?!
  - **What needs to be regulated in legislation vs agreements to move forward?**





2. Market design alternatives for hybrid offshore wind projects

- **A choice of regulatory approach: only one power system:**
  - Is there a need for a dedicated regime for hybrid projects?
  - Same market rules onshore and offshore !!!

- A two-step process:
  - **Market design** alternatives

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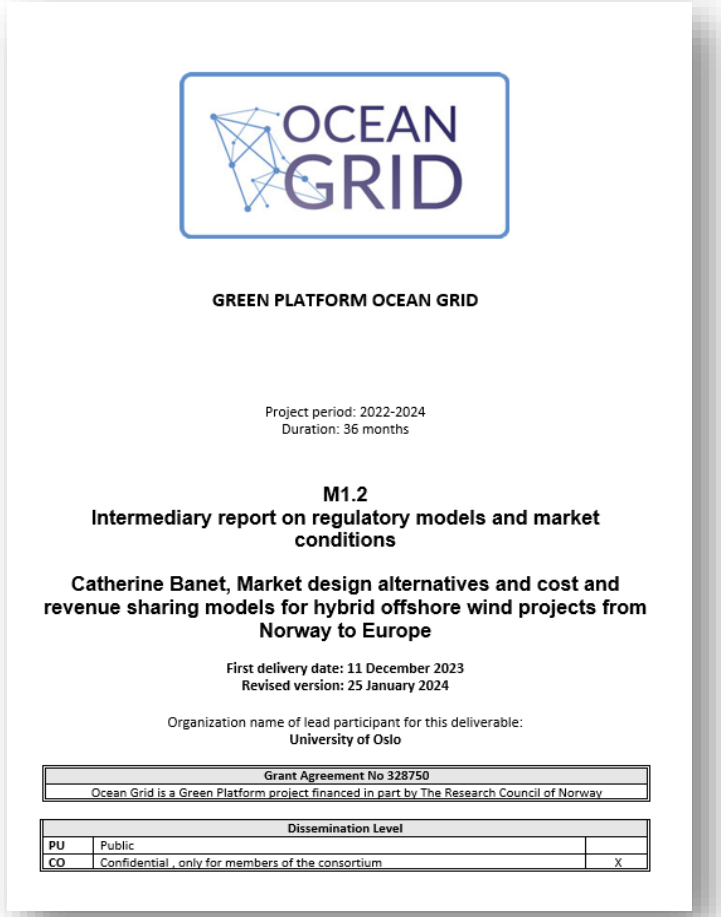
  - **Cost and revenue sharing** models

Market design alternatives and cost and revenue sharing models for hybrid offshore wind projects between Norway and Europe – oceangridproject.no



GREEN PLATFORM OCEAN GRID

Project period: 2022-2024
Duration: 36 months

M1.2
Intermediary report on regulatory models and market conditions

Catherine Banet, Market design alternatives and cost and revenue sharing models for hybrid offshore wind projects from Norway to Europe

First delivery date: 11 December 2023
Revised version: 25 January 2024

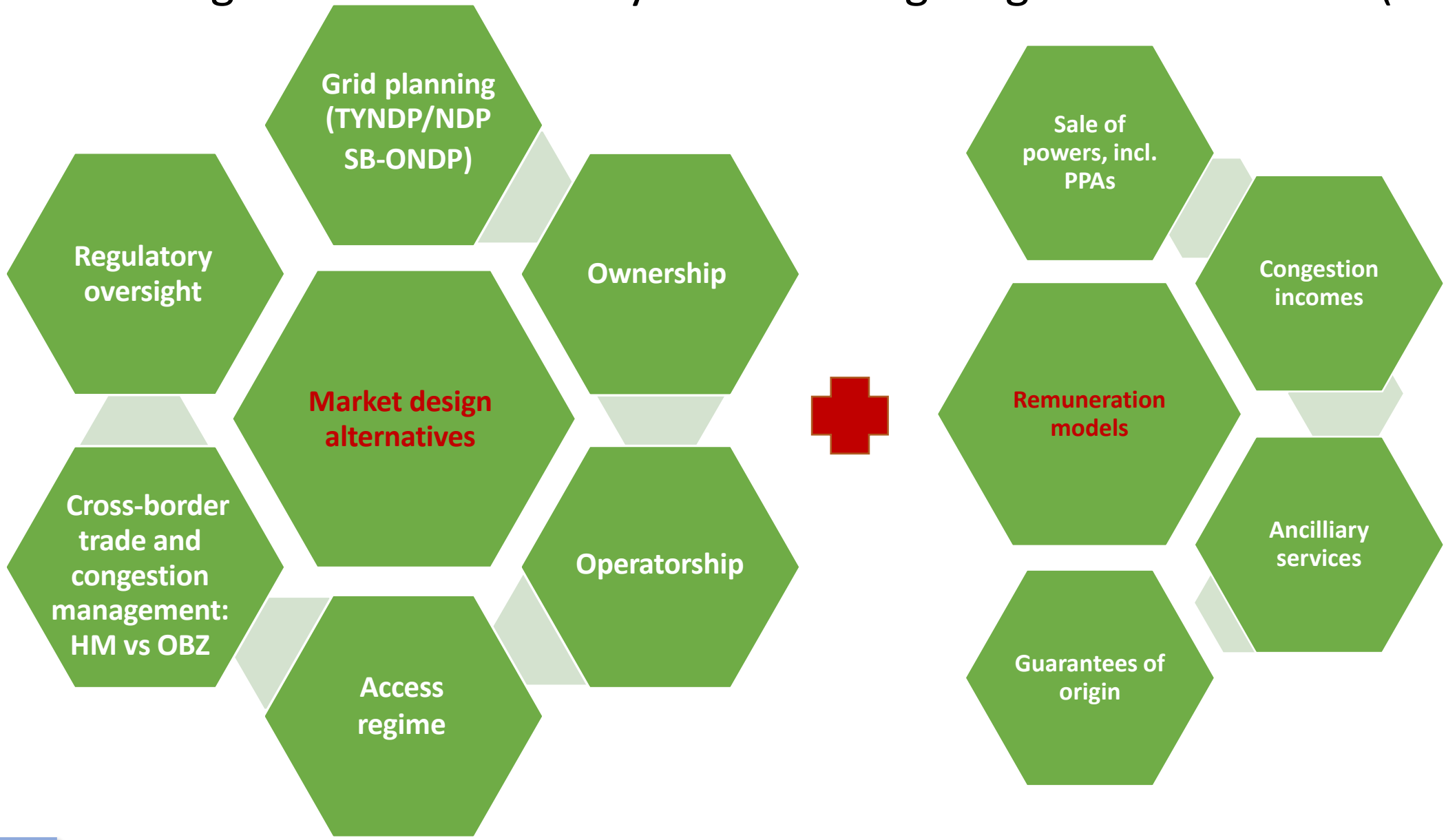
Organization name of lead participant for this deliverable:
University of Oslo

Grant Agreement No 328750
Ocean Grid is a Green Platform project financed in part by The Research Council of Norway

Dissemination Level		
PU	Public	
CO	Confidential , only for members of the consortium	X

July 2024

The building blocks of electricity market design legislation offshore (C. Banet)

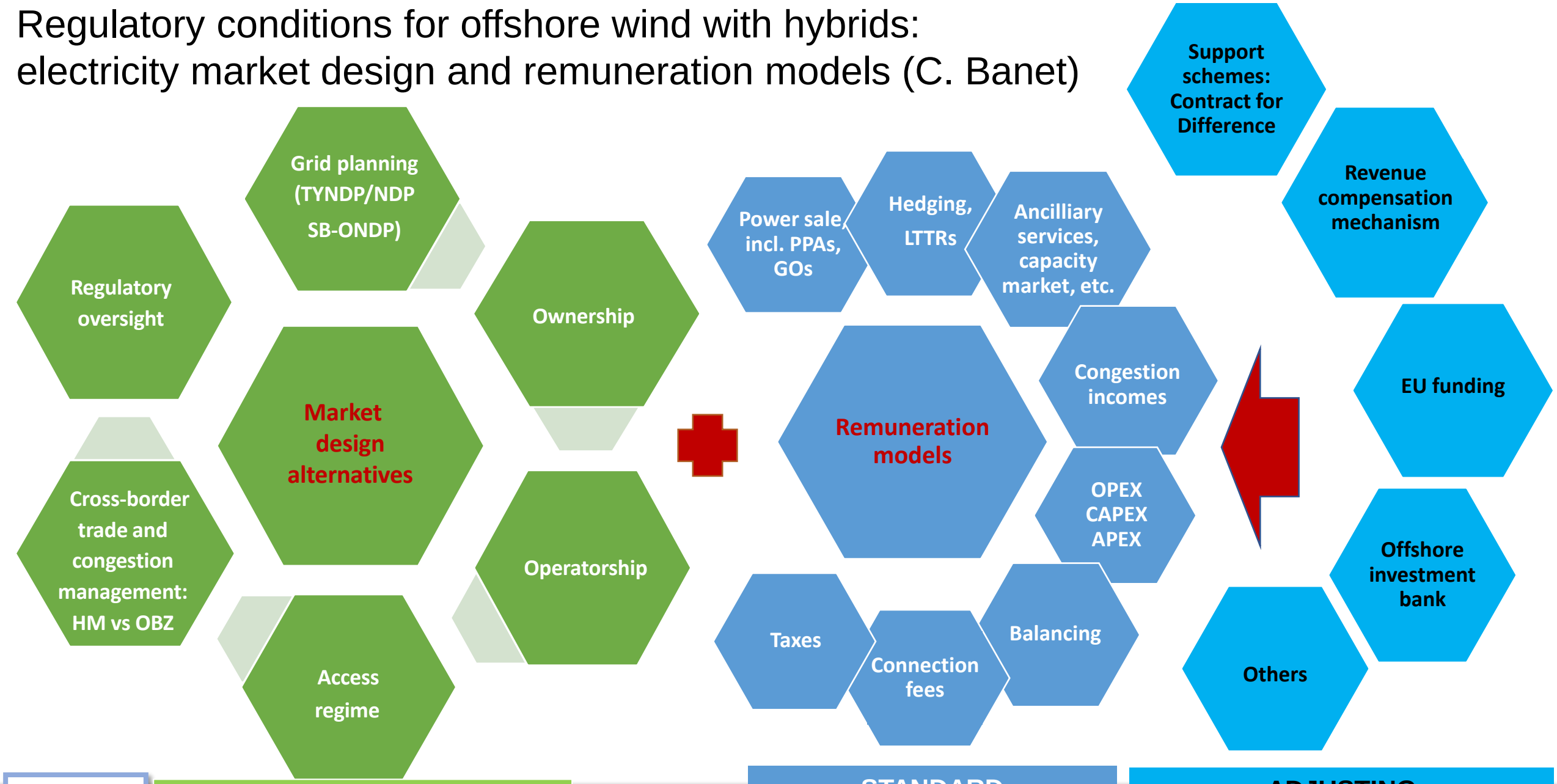


- Cross-border anticipatory grid investments. EC path: EMD reform (Art. 18 El. Reg.) and EU Grid Action Plan. Tariff methodology, guiding principles.
- Grid stability, balancing power
- Operatorship of hybrids and role of TSO/ISO offshore, incl. market dispatch and balancing responsibilities.
- The creation of a dedicated offshore bidding zone (OBZ) to manage structural congestion for hybrids and ensure effective market mechanisms.
  - HM vs OBZ
  - Could be solved under today's legislation.
  - It will probably not be one big bidding zone per sea basin, but several ones, and based on congestion management.
- Challenge: GB outside EU market-coupling
  - TSOs: EU and UK to address inefficiencies
  - Political issue between EU and UK re TCA

3. Costs benefit allocation models

- Next question: how to ensure sufficient revenues to OWFs and fair share of the costs?
  - OW producers may get lower incomes with an OBZ than with the HM approach. Could be compensated.
  - Fairness for final customers (e.g. payment of connection fee).
  - Fairness for all benefiting countries.
- Transparent terms, not indirect support.
- High expenditures: CAPEX and OPEX.
- Volume risk specific to offshore bidding zones.
- **Mitigation instruments**, incl. public support.

Regulatory conditions for offshore wind with hybrids: electricity market design and remuneration models (C. Banet)



Norwegian focus:
Market design and regulatory models for an offshore grid with hybrid projects

- How to incentivise the realisation of socio-economic projects for all actors involved?

- **Market design**
  - Overview of requirements and process for grid planning in the EU, GB and Norway, including anticipatory investments
  - Ownership, operatorship, congestion management, bidding zones, connection rules and supervision

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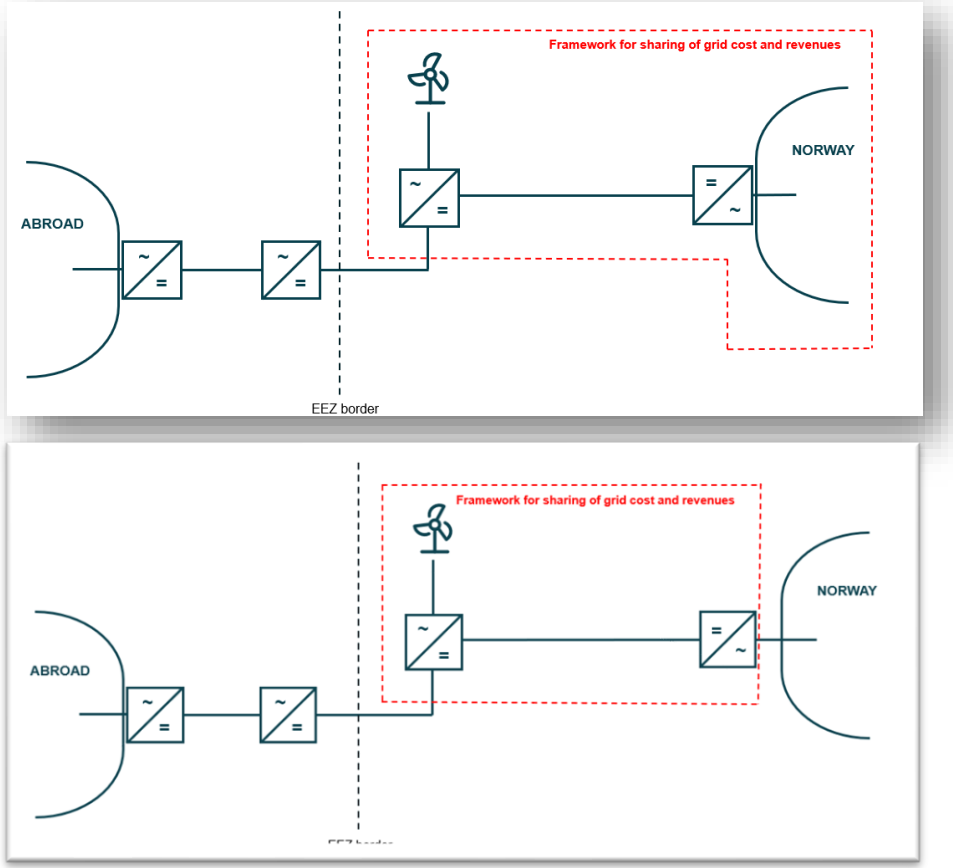
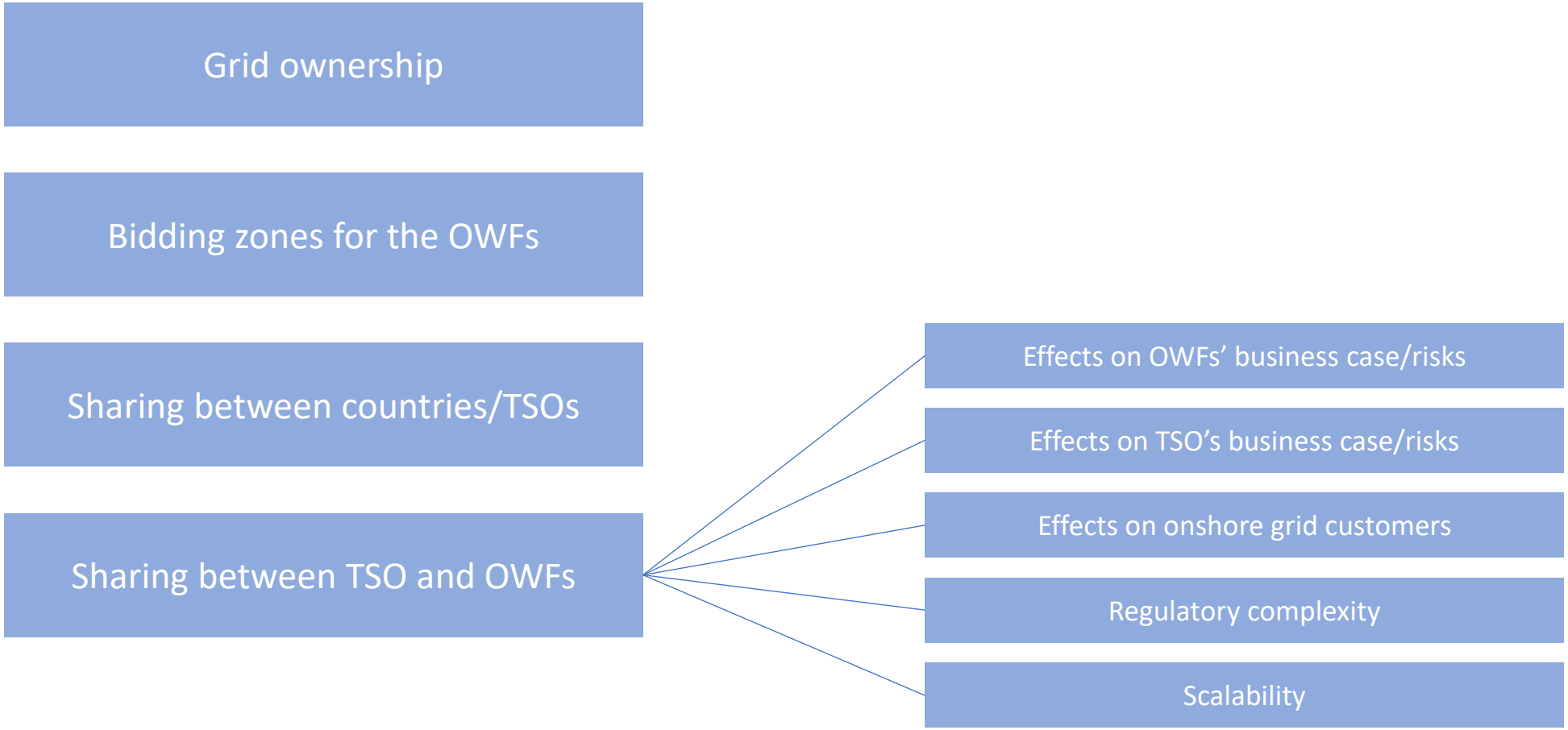
- Assessment of regulatory models for **sharing of grid costs and revenues**, incl. regulatory complexity, scalability and effects on different actors

- Benefits of a multi-actor approach in assessing incentives for realising projects



Illustrations of some regulatory models for sharing of grid costs and revenues

What influences allocation of grid costs and revenues?



OWF = Offshore Wind Farm

Quantitative results – TSO and OWFs combined

NB! The calculations are made for a relative assessments of regulatory models, not for assessments of actual profitability

Effects on TSO:

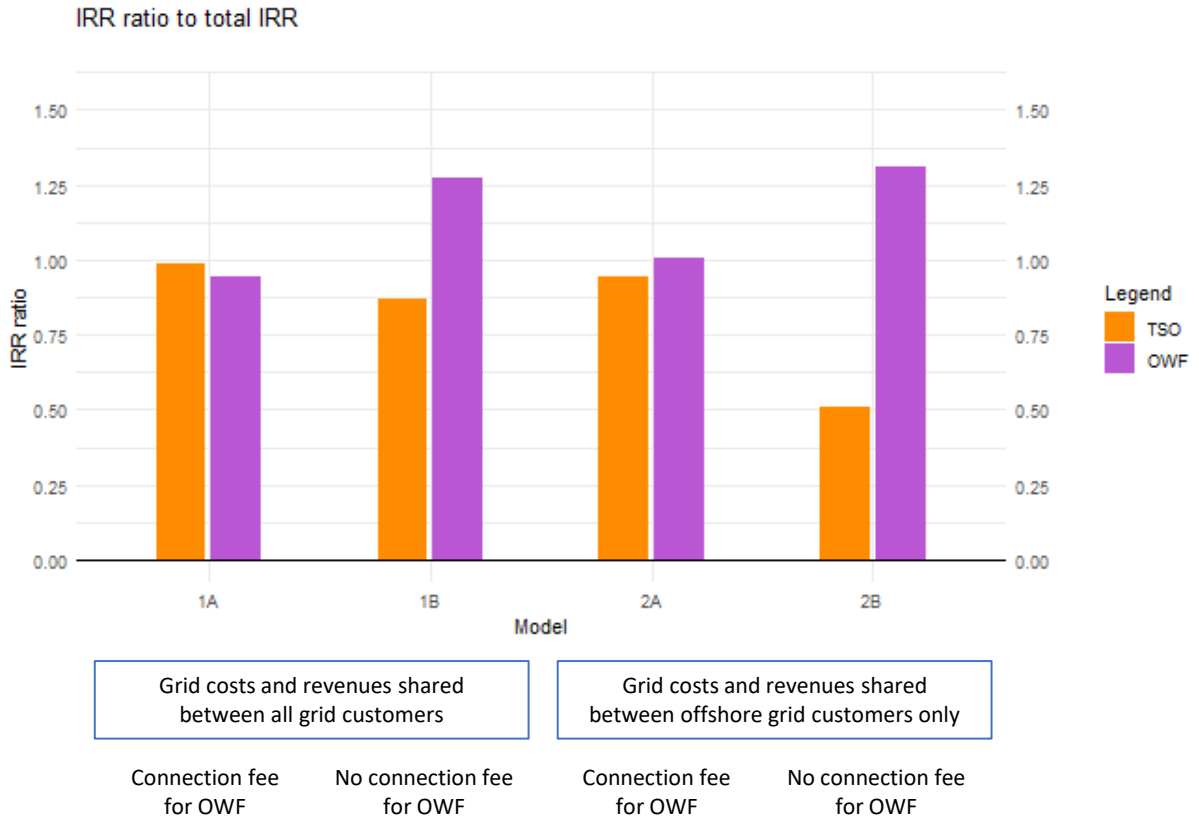
- The IRR ratio for the TSO in model 2 depends heavily on the relative size of congestion rents to grid costs.
- Where the TSO here is better off in model 1B relative to model 2B, onshore consumers cover the excess grid cost.

Effects on OWFs:

- Not paying connection fee seems to be the main driver for the IRR ratio for the OWFs.
- The difference between model 1B and 2B depends heavily on the relative size of congestion rents to grid costs.

Difference between TSO and OWFs:

- No robust conclusion on which model that provides the smallest difference - depends on the relative size of grid costs and congestion rents, in addition to starting point business case.



4. Regulatory approach: gradual development of the regulatory regime and business model for offshore wind hybrid projects between Norway and Europe

- **Regulatory approach:**

  - **a stepwise approach with gradual adjustment to the legislative framework and harmonisation when necessary**. See statement in the European Commission's ORE Strategy: '*hybrid projects will form an intermediate step between smaller-scale national projects and a fully meshed, offshore energy system and grid'.*

  - **Not all elements of the regulatory framework for hybrids at sea basin level can and will be clarified in the short term. Waiting for the adoption for a fit-for-purpose regulatory framework and remuneration model for hybrids should not be used as an excuse for not moving forward with hybrid projects. Hybrid projects can develop under current legislation framework, but legal certainty needs to be provided through different instruments while pursuing efforts to work on better regulatory frameworks on the long term.**

  - **Preserve the interests of the early movers / first project developers.**

VI - Content of the regulatory roadmap

- **In this gradual development of the regulatory regime, several processes are identified. These processes constitute the recommended regulatory roadmap to develop hybrid offshore wind project between Norway and Europe**:

1. Clarify fundamental points as to:

    - **Legal definition** of hybrids and project scope
        - **Legal clarification** by: legislation, as well as detailed provisions in agreements between TSOs.

    - **Applicable jurisdiction** over the different parts of the hybrid project
        - **Legal clarification** by: international delimitation treaties, bilateral/regional agreements (project-specific or energy-wide) (incl. non-binding regional agreements under Art. 14.1 TEN-E, to be updated every two years), soft law/MoU (not recommended).

VI - Content of the regulatory roadmap (Ctd)

2. Clarify the **degree of regulatory alignment** with the following EU requirements, identified as **the most influential ones** on the development of hybrid projects:

- Grid planning, permitting, financing, etc. for cross-border infrastructures.
  - application of the regime for project of common interest (PCI) or project of mutual interest (PMI) under the TEN-E Regulation, including for planning and permitting;

- Electricity market design rules:
  - unbundling rules;
  - capacity allocation, including the so-called 70% rule;
  - grid connection;
  - metering;
  - balancing.

Legal clarification by: incorporation into the EEA Agreement, bilateral agreement(s) or soft law guidelines. Binding legal clarification is to be preferred on the most essential elements, as it brings legal certainty to the actors.

VI - Content of the regulatory roadmap (Ctd)

3. **Clarify choice of market design alternatives,** within the common EMD framework chosen, in relation to:

planning (anticipatory invest.), ownership delimitation and model (even joint), operatorship, inclusion in bidding zones, TPA and grid access conditions, balancing responsibilities and access to balancing markets.

Legal clarification by: legally binding solution, by legislation (law and implementing legislation).

VI - Content of the regulatory roadmap (Ctd)

4. **Remuneration models at project level and allocation of costs & benefits between states** can be addressed in bilateral agreements, while continuing to work on harmonised solutions at the EU/EEA level in the long term.

- **At project level** between project participants (transmission operator, OWF, society/consumers): clarification must be provided on allocation of costs and benefits, remuneration models, access to support scheme (CfD), and access and cumulation of adjusting remuneration mechanisms.
  - **Legal clarification** by: legislation, project specific bilateral agreement, connection agreements, project specific cross-border cost allocation (PS-CBCA) decisions.

- **Between states**: Some common rules and common principles (identified below) should guide the cross-border cost sharing methodologies and negotiations.
  - **Legal clarification** by: EU/EEA legislation, targeted bilateral/regional agreement per sea basin, infrastructure agreement, EC Guidance (e.g. June 2024).

- Guiding principles in the allocation of costs and benefits between countries

Guiding principles in the allocation of costs and benefits between countries in hybrid projects	
Non-discrimination	The allocation models should build on non-discriminatory criteria between technologies, actors, and countries.
Transparency	The terms and conditions for the allocation models should be made transparent to all actors, either in law or on publicly available websites.
Fairness	In a cost sharing methodology the main questions that should be covered are: (1) which costs should be shared; and (2) how the cost should be divided. The methodology should also give the right incentives. If the cost sharing is based exclusively on a cost-benefit analysis, countries with a high share of flexibility, either in production or consumption, will have a higher benefit, and thus cover a higher share of the cost. This will reduce the incentives to develop the needed flexibility to handle the future energy system. In the discussion on the cost basis, there are discussions how to handle investments of onshore grid and additional cost for system operation. An important question is also how to handle landlocked countries in a cost sharing methodology per sea basin.
Regulatory certainty	The terms and conditions for the allocation models should be stable and regulatory authorities should ensure that they are developed and applied in a manner that provide sufficient regulatory certainty for the different involved actors. For that purpose, they should be made public and enshrined in binding legislation or regulation as far as possible.
Operational soundness	The allocation models should respect basic operational principles for both the OWFs and the grid. They should be easy to manage.
Viability	The allocation models should provide sufficient economic revenues for all parties.

Regulatory roadmap for developing hybrid offshore wind projects between Norway and Europe

Regulatory approach to be favoured:

A gradual development of the regulatory regime and business model for hybrid offshore wind projects between Norway and Europe is recommended. It relies on a stepwise approach with gradual adjustment to the legislative framework and the adoption of harmonisation measures when necessary.

- Not all elements of the regulatory framework for hybrids at sea basin level can and will be clarified in the short term. This should not prevent moving forward.
- Hybrid projects can be developed under the current legislative framework.
- However, legal certainty to be provided through different instruments while pursuing efforts to work on better regulatory frameworks in the long term.
- Effects on ongoing projects of new harmonised legislation affecting the economic model of the hybrid projects must be carefully assessed.

Legal clarification is needed on:

Fundamental definition issues related to:

- Legal definition of hybrids and project scope
- Applicable jurisdiction over the different parts of a hybrid project

Degree of regulatory alignment with key EU requirements:

- Grid planning, permitting, financing for cross-border infrastructures
- Electricity market design rules

Choice of market design alternatives within the common framework chosen:

- Grid & system planning
- Ownership
- Operatorship
- Access regime
- Cross-border trade & congestion management (HM/OBZ)
- Regulatory oversight

Agreement on remuneration models:

- At project level
- Between states

Legal clarification can be provided by:

- Legal definition: legislation, agreement between TSOs
- Jurisdiction: international maritime boundary delimitation treaties, bilateral/regional agreements (project-specific or energy wide), soft law/MoUs

Regulatory alignment: incorporation into the EEA Agreement, bilateral agreement or soft law guidelines. Legally binding solutions to be favoured.

Market design alternatives: legally binding solutions, by legislative amendments (law and implementing legislation)

- Project: legislation, project specific multiparty agreements, connection agreements, project specific CBCA decisions
- States: EU/EEA legislation, targeted bilateral/regional agreement per sea basin, infrastructure agreement, EC guidance

Access the full report here:

[Regulatory Roadmap for developing hybrid offshore wind projects between Norway and Europe – oceangridproject.no]

Thank you for your attention!

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Project partners:

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