Cooperation Paper
by the Offshore TSO Collaboration (OTC),
WindEurope, and HyNOS

Strong partnerships for a coordinated perspective on offshore energy

Initial ideas on interfaces in the regional planning process

I. Introduction

The risks of external energy dependency and price volatility have become more prominent in recent years. As a result, ensuring affordable energy and strengthening Europe's geopolitical resilience have become central pillars of EU energy policy. Offshore renewable energy, and the infrastructure that enables it, is critical to addressing these challenges and supporting the transition to a secure, sustainable energy system. A well connected offshore network infrastructure in the Northern Seas can help reduce dependency on fossil fuels, stabilise energy prices, and improve security of supply across the continent.

To realise this potential, timely cross-border grid development is essential. This requires close coordination not only between governments and TSOs, but also across sectors and stakeholders involved in offshore development.

Energy mixes, spatial planning, and allocation of land or maritime areas are decisions taken by national authorities. With this in mind, regional planning can be more efficient when efforts are aligned between investment in generation, transmission, and system integration – all while keeping long-term efficiency and cost-effectiveness in view. Recent work for example by ACER[1] underlines that aspects of today's EU-wide scenario and planning processes face shortcomings in transparency, stakeholder involvement and alignment across cycles. Addressing these gaps is essential to build legitimacy and trust in infrastructure planning. Against this backdrop, the Offshore TSO Collaboration (OTC) offers a concrete contribution by strengthening cross-sector stakeholder interfaces and enhancing coordinated planning approaches at a regional level, whilst providing input to the European-wide TYNDP planning cycles.

OTC Expert Paper III: Concrete project-sets for cross-border infrastructure in the Northern Seas

Last year, the joint regional planning process of the OTC TSOs resulted in the first coordinated analysis of potential concrete project-sets for cross-border grid infrastructure in the Northern Seas, published in the Expert paper III[2]. Concrete project proposals were shown for the period 2030 to around 2040, complementing existing European and national planning processes in a meaningful way. In April 2025, the OTC received a mandate from the North Seas Energy Cooperation (NSEC) to further develop and continue these regional planning activities.

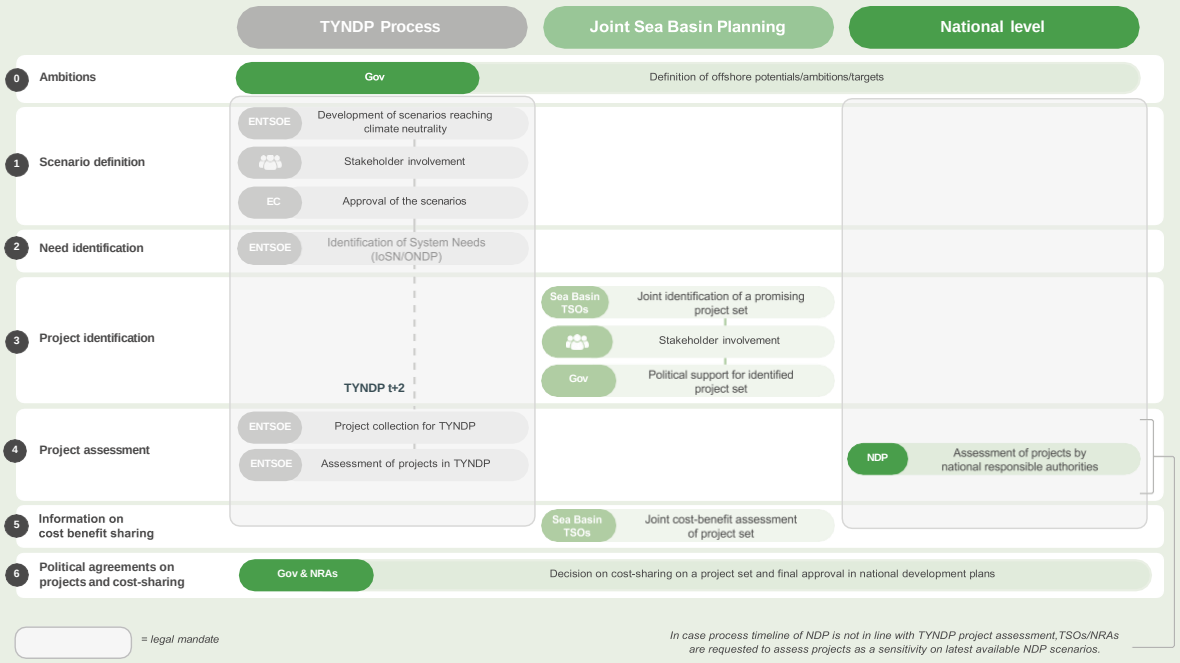
Key offshore wind stakeholder interfaces

As part of these ongoing efforts, the OTC has now identified key interfaces that require particular attention, including interfaces between wind farm developers, infrastructure project developers, and hydrogen stakeholders.

[1] Source: https://www.acer.europa.eu/sites/default/files/documents/Publications/ACER-Scenario-development-study-2025.pdf
[2] Source: https://www.tennet.eu/offshore-tso-collaboration

Whilst noting that this stakeholder list is non-exhaustive, engaging with these actors is essential for shaping an offshore network infrastructure that reflects diverse sectoral needs and enables a coordinated view on the development of an integrated energy system. It must be highlighted that there are additional relevant stakeholders at both national and European level playing an important role in developing an integrated energy system. This has been extensively described in OTC's Expert Paper III as illustrated in Figure 1. However, this cooperation paper focuses on the stakeholder interfaces with regard to offshore infrastructure and generation that have not been addressed with the same level of detail until now.

Figure 1:
Joint Sea Basin Planning within Northern Seas Network Planning



The paper is intended to support the development of an integrated offshore infrastructure in the Northern Seas, in line with the joint processes defined by OTC and the North Seas Energy Cooperation (NSEC). It also lays the groundwork for agreeing on the scope and timeframe for further development and implementation of this collaboration.

II. Interfaces in the Regional Planning Process

Regional planning refers to a joint, sea-basin approach of developing the Northern Seas' offshore network infrastructure that is led by TSOs and complements – rather than replaces – ENTSO-E's ONDP/TYNDP and national planning. Starting from shared, European commission-approved scenarios, the OTC identifies and iteratively tests a coherent set of cross-border projects, hybrid interconnectors, energy hubs and initial hydrogen links, with a mid-2030s to around-2040 horizon (to date). The OTC then assesses the sets of projects for cumulative socio-economic welfare and system adequacy at sea basin level (not project by project) and aligns early with governments and regulators to enable a workable offshore market design, pragmatic cost/benefit-sharing and funding. The agreed project set(s) are then fed into European and national processes for validation and decision, turning Northern Seas ambitions into bankable, buildable projects.

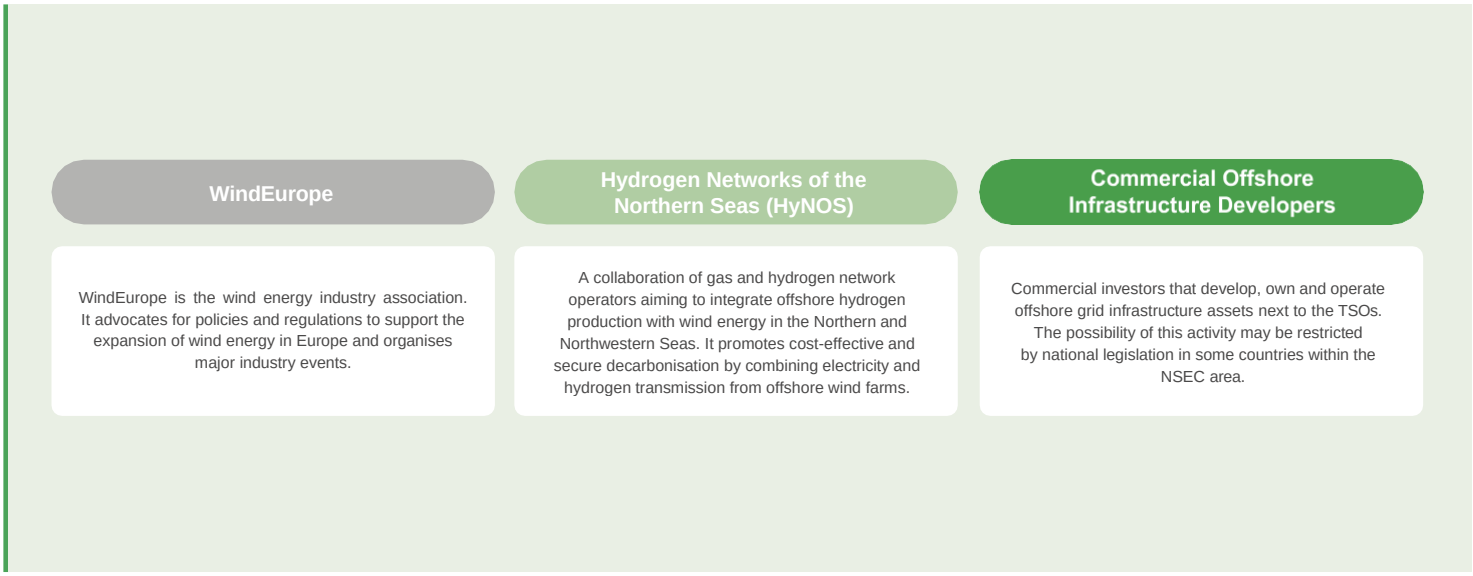
Collaboration with WindEurope and HyNOS

This cooperation paper aims to establish a starting point for jointly identifying meaningful interfaces in the areas of regional planning in the Northern Seas. To this end, the OTC has joined forces with WindEurope and HyNOS and established joint working groups. The central chapters of this cooperation paper were developed in close collaboration with the two groups and outline initial ideas for coordinated planning, going beyond the OTC TSOs, in the Northern Seas.

Interfaces with commercial offshore infrastructure developers

For the coordinated planning of cross-border offshore projects in the Northern Seas a third stakeholder group requires consideration: commercial offshore infrastructure developers. Whilst noting different approaches between jurisdictions with respect to what commercial parties are permitted to develop, operate and own, their merchant line projects need to be considered in the regional planning process. Due to market rules and legal requirements, the OTC has initiated first forms of engagement to achieve the most coordinated starting point for regional planning.

Figure 2:
Overview of the three stakeholder groups

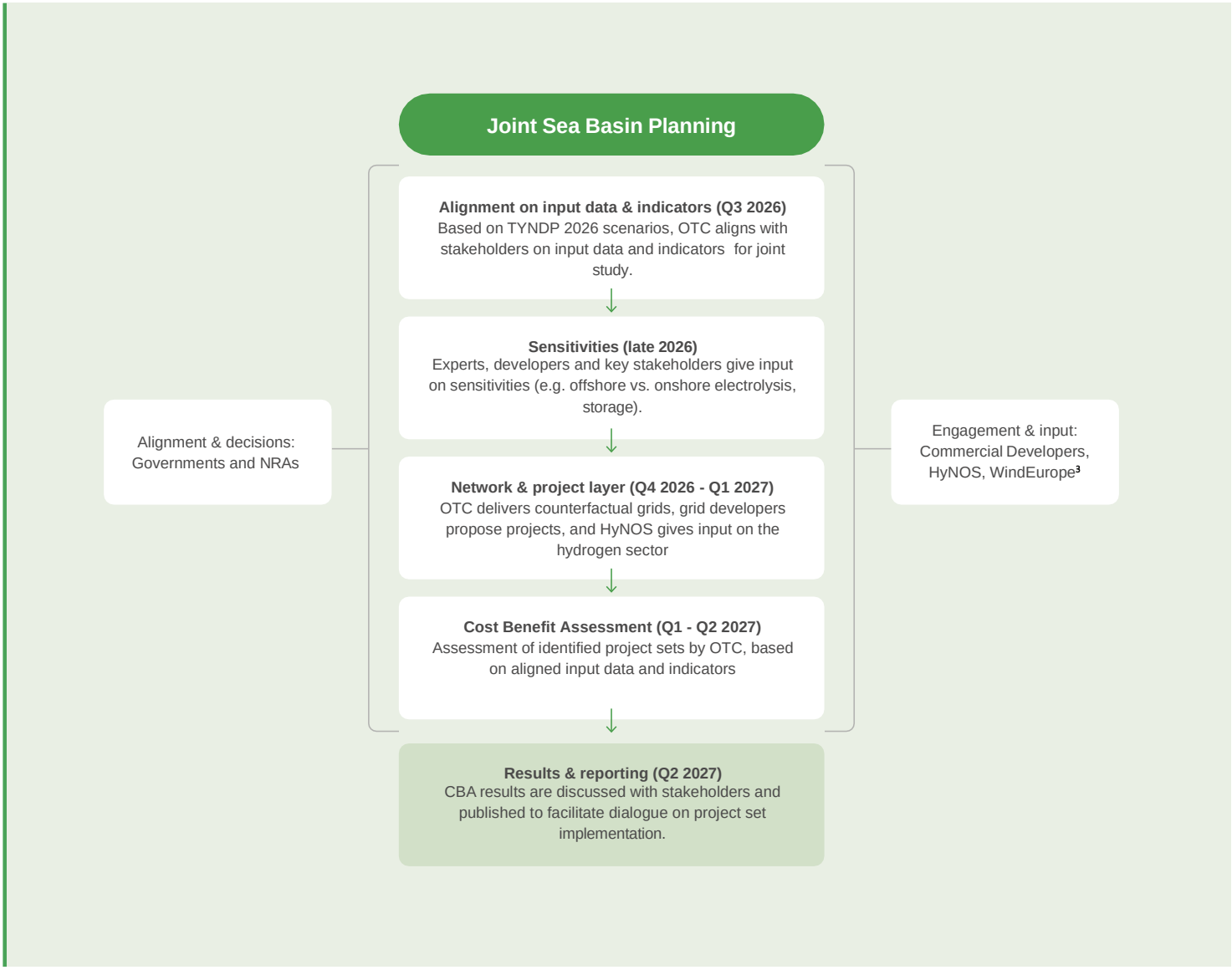


Regular alignment throughout the regional planning process

To enable the OTC TSOs to undertake comprehensive and effective joint sea basin planning, interfaces with offshore wind developers, HyNOS and commercial offshore grid infrastructure developers need to be considered. Involvement of these stakeholders should be assured by interacting via the existing joint working groups and providing additional touchpoints at different phases of the regional planning process.

While Figure 1 explains the OTC's general relation to European and national planning, Figure 3 (below) lists the concrete steps of the OTC regional planning cycle and where interfaces with the various stakeholder groups are activated. Thus, Figure 3 details the "Joint Sea Basin Planning" column from Figure 1. An explanation of the steps is given.

Figure 3:
Joint Sea Basin Planning



a. Collaboration with offshore wind farm developers

Offshore wind is the central renewable energy generation source and basis to develop the Northern Seas into Europe's Green Power Plant. The OTC TSOs are responsible for realising the required transmission infrastructure to make best use of the generated electricity. Hence, it is beneficial that offshore wind developers are engaged in the regional planning process for cross-border infrastructure at an early stage and in a well-coordinated way. The OTC recognises the need for interaction with wind developers at pre-defined stages of the planning process.

[3] For the purpose of this paper, we refer to the co-authors of this paper. Further stakeholders, such as environmental NGOs and civil society organisations, shall be equally consulted at the appropriate stages.

This chapter outlines the way OTC is planning to establish collaboration with offshore wind developers in order to address interface topics. Offshore wind developers (represented by WindEurope in this discussion) and the OTC will continue strengthening their cooperation in order to facilitate structured input to the planning process, responding to previous calls for greater participation. Considering different perspectives from various stakeholders will foster a timely and cost-effective implementation of hybrid offshore infrastructure.

Advantages

Engagement of offshore wind developers could provide a series of concrete benefits for transmission infrastructure build-out:

- Improved coordination between offshore wind developers and TSOs, addressing potential risks at an early stage and consequently reducing project uncertainty for both sides.
- Increased cost-effectiveness of grid expansion through early integration of offshore wind developers' contributions.
- Transparency and consistency of planning where technical viability is weighed against regulatory factors.
- Enhanced trust and co-operative culture among TSOs, developers, and other stakeholders.

Scope of cooperation: touchpoints in the regional planning cycle

Within the Joint Sea Basin Planning, the OTC aims to establish predictable entry points for offshore wind developers to be involved in the planning cycle for offshore hybrid infrastructure projects. These consultation touchpoints ensure that offshore wind build-out trajectories and spatial constraints are reflected in the design of a regional offshore grid plan.

The most relevant touchpoints are foreseen in the following phases:

- Input data, indicators and sensitivities:
  The ENTSO-E TYNDP scenarios will form the starting point for OTC regional planning, noting the significant stakeholder engagement already undertaken as part of this process. To reflect the regional characteristics of the OTC (e.g. to provide more up to date information, inclusion of additional UK data) scenario-related sensitivities to test key influencing factors may be defined. Any deviations from the scenarios are consulted in collaboration with wind farm developers via WindEurope to ensure alignment and validate the robustness of the planning assumptions.

- Network & project layer:
  Offshore wind developers can support cross-border cooperation in terms of site selection with holistic view on both grid and generation cost. In this context, offshore wind developers can provide their expertise about full-load-hours and wake effects to optimise the project topologies.

- Cost-Benefit Assessment:
  The TSOs carry out a cost-benefit analysis based on the jointly aligned input data. The TSOs share the cost-benefit analysis procedure with the offshore wind developers in advance in a transparent manner.

- Results, reporting & building understanding:
  Offshore wind developers will be consulted on the resulting system topology and project portfolio as primary outputs. OTC and WindEurope will discuss results, in terms of risks and benefits, and build a common understanding. The identified project set, and cost-benefit indicators will be published so that WindEurope is able to reflect on the outcomes.

Means of cooperation

Cooperation between the OTC and WindEurope will be based on informal exchanges within the Joint Working Group established in July 2025, but also on regular workshops organised by individual parties and on further ad-hoc working groups that could enable deep-dives into certain topics of common interest.

The OTC will invite offshore wind developers for consultation events (e.g. workshops, online webinars or similar) at touchpoints within the OTC planning cycle as identified above. Input and feedback from these engagements will be integrated into the work helping to improve the quality of the planning process and broaden the perspectives.

Further fields of cooperation

In addition to the involvement of offshore wind developers in the grid planning process and the already identified additional joint topics, more aspects of common interest could be addressed by WindEurope and the OTC. These could inform national-level discussions or implementation processes.

Subjects of interest could include:

- Discussions on market design for offshore bidding zones and potential tools for de-risking business cases for offshore wind farm investment;

- Market integration and solutions for ensuring future efficient electricity trading arrangements with the UK market (i.e. exploring the UK participation in the EU internal electricity market) and for removing other barriers to electricity trading such as the EU CBAM, and

- Discussions on how joint expertise of TSOs and developers can support better cross-border cooperation in terms of site selection and spatial planning with holistic views on both grid and generation cost. In this context, developers can provide their expertise about load factors and wake to optimise generation output but also could define boundaries for co-habitation with other use interests in the sea basin such as fisheries, defense, and nature protection.

b. Coordination between cross-border offshore electricity and hydrogen

Offshore wind energy will become the backbone of Europe's power supply and will also enable Europe to produce a part of its hydrogen demand regionally. The link between offshore wind expansion and flexible hydrogen production will contribute to a cost-competitive, clean and secure European energy supply. Coordinating the development of both electricity and hydrogen infrastructures early is essential to unlocking the Northern Seas' potential as Europe's energy hub and for realising a cost-efficient and integrated European energy system.

Advantages

A closer link between offshore wind power and hydrogen production can create benefits to the overall energy system. In addition to other decarbonised sources of electricity, offshore wind is required to enable relevant hydrogen production within Europe and in turn, flexible electrolysis can support the integration of fluctuating renewable energy sources. Increasing the coordination between electricity and hydrogen planning for the Northern Seas will help to adequately harvest these synergies and create overall energy system benefits.

In the shorter term, the link between offshore wind and hydrogen production will be realised by onshore electrolysers located close to the shore (in so-called "landing zones"). By installing electrolysers in proximity to the wind farms, transport needs in the electricity system can be reduced – and thus grid investment needs. Therefore, in the longer term, offshore wind farms with dual connections (i.e. connected to both the electricity grid and to an offshore electrolyser with access to an offshore hydrogen network) could see increased development. Overplanting offshore wind (e.g. 3 GW offshore wind with only 2 GW electricity grid connection) in combination with offshore electrolysis can increase HVDC utilisation rates and thereby enable cost-efficiencies. By facilitating the integration of both offshore wind and offshore electrolysers into the onshore electricity system, the system can profit from both relatively stable offshore wind production (in times of low onshore renewable electricity generation) and flexible electrolysis (in times of excess onshore renewable electricity generation).

Since the eventual deployment of offshore electrolysers will create strong bi-directional interdependencies between electricity and hydrogen systems, robust forecasts for their rollout will need to be developed.

Scope of cooperation: Towards an integrated planning cycle

Building on these insights, OTC and HyNOS are starting to develop a joint planning framework with the following key elements:

- Input data, indicators and sensitivities
  Aligned refinement of the TYNDP scenarios towards 2040 regarding offshore electrolyser capacity, and potential flexible consumption patterns.

Scenarios are designed to capture the interdependencies between electricity and hydrogen systems, allowing planners to model multiple integration pathways and manage uncertainties. Alignment on how hydrogen (electrolysis and hydrogen networks) can be integrated into the overall system model and alignment on input parameters, assumptions and sensitivities that the model should consider.

- Network & project layer
  Information on the latest developments in the hydrogen network and the current status of the hydrogen projects within ENTSO-G's planning processes can be incorporated into the network counterfactual.

- Cost-Benefit Assessment
  The OTC carries out a cost-benefit analysis based on the jointly aligned input data. The OTC share the cost-benefit analysis procedure with HyNOS in advance in a transparent manner.

- Results, reporting & building understanding
  HyNOS will be consulted on the resulting system topology and project portfolio as primary outputs. The OTC and HyNOS will discuss these results and build a common understanding. The identified project set and cost-benefit indicators will be published so that HyNOS is able to reflect on the outcomes.

With these first joint steps towards integrated planning, electrical and hydrogen infrastructure can be planned more coherently. OTC and HyNOS are thus pursuing the goal of implementing a cost-conscious and reliable integrated offshore energy network for Europe.

Means of cooperation

Cross-sector analyses are envisioned with harmonised scenarios, models, and assumptions covering electricity and hydrogen value chains.
However, creating such an integrated planning for electricity and hydrogen is not a task done in one planning cycle. We will embark on this task step by step over the next planning cycles.

In addition, the joint working group of OTC and HyNOS will continue and aim to address other joint topics (in addition to the interfaces and coordination in the planning process). For example, OTC and HyNOS will jointly identify regulatory barriers and explore solutions for integrated cross-border planning and ensure effective engagement with external stakeholders (including national regulators and governments).

Further fields of cooperation: dual-carrier infrastructure connections
Dual connection concepts are explored in which offshore wind farms are connected simultaneously to electricity and hydrogen networks. Spatial planning for these dual infrastructures is increasingly relevant, with onshore and potential offshore electrolysis facilities being efficiently located to enable efficient utilisation of cables, platforms, pipelines and electrolyser capacity. Different degrees of hydrogen rollout are considered to ensure flexibility in future development paths.

III. Involvement of commercial offshore infrastructure developers

Alongside regulated transmission system operators, commercial offshore infrastructure developers also play a role in the planning of cross-border grids in the Northern Seas. They can also introduce project proposals and bring forward innovative business models and technologies. Their involvement is important for reliable regional planning: better coordination between commercial offshore grid developers and TSOs (as fully responsible for national and European planning processes) would help improve coherence of planning in the Northern Seas and provide a more harmonised perspective on project portfolios for governments and regulators' considerations.

Rising stakes: latest developments and the road ahead

In recent years, the role of commercial developers in European grid planning has become increasingly relevant. While any developer can submit a project for the TYNDP, inclusion depends on the fulfillment of criteria such as cross-border relevance and government support, and national approaches vary widely. The benefit of integrating the commercial infrastructure projects into OTC regional planning is that they will be also assessed as part of project sets and not only individually. As interest grows in interconnectors, hybrid assets, and energy hubs, the interaction between TSOs and developers becomes more important. The lack of clear interfaces and early visibility on project proposals by third party grid developers across countries risks widening planning gaps.

This creates uncertainty, as in some countries TSOs must decide whether to integrate such proposals without assurance of alignment with national plans. Structured collaboration, transparent evaluation processes, and coordinated planning could help ensure that commercial innovation supports system development.

Early engagement is key:
how the OTC connects with commercial developers

Against this background, the OTC initiated a first structured exchange with commercial developers through a digital survey. Developers were invited to reflect on their role in the future offshore system, their expectations regarding transparency and investment reliability, and the challenges they encounter in existing planning and regulatory processes. They were also asked about their current projects, investment criteria, and the areas where early coordination with TSOs would be most valuable.

Figure 4:
Results of the survey

Roles, recommendations and perspectives of commercial interconnector stakeholders

The survey confirms that commercial developers see themselves as complementary partners to TSOs in delivering cross-border grid infrastructure. They emphasise the potential of private investment and innovation but highlight the need for clearer interfaces, transparent evaluation, and regulatory certainty to enable effective coordination. The feedback can be grouped into three main themes.

- **Transparency and integration in planning processes**
  Respondents stressed that transparency around evaluation criteria, data availability, and planning timelines is the decisive factor for engagement. Current processes (particularly within the TYNDP and national planning frameworks) are viewed as not transparent enough and insufficiently synchronised. Developers seek early visibility on planned reinforcements, preferred connection points, and the criteria used to assess project proposals. A predictable route from early concept submission to formal evaluation would substantially improve investment confidence and reduce the risk of misaligned or duplicative projects.

- **Risk allocation, investment reliability, and technical alignment**
  Developers pointed to uncertainty around who bears risks, how commercially initiated projects would interact with regulated assets, and whether long-term market conditions support bankable business cases. Consistent regulatory treatment, harmonised technical standards, and fitting connection frameworks were all identified as preconditions for investment.

- **Early coordination and information exchange with TSOs**
  Participants expressed strong interest in structured cooperation formats that enable early technical and strategic dialogue. Priority coordination areas include connection concepts, data exchange, and alignment of project timelines. Developers view OTC as a useful platform for such engagement, provided it evolves from consultation to a process with defined outputs and regular exchange.

First steps of integrating commercial developers into OTC planning

It is important to engage with commercial developers early on. Their feedback confirms that it could be beneficial for the planning process and the results. OTC identified first initial interfaces for the next regional planning process:

- Input data, indicators and sensitivities

  The ENTSO-E TYNDP scenarios will form the starting point for OTC regional planning, noting the significant stakeholder engagement already undertaken as part of this process. Where these scenarios are altered in any way for the purposes of OTC regional planning (e.g. to provide more up to date information, inclusion of additional UK data), commercial offshore infrastructure developers will be consulted.

- Network & project layer

  The regional grid planning process of the OTC is based on the latest TYNDP and taking into account the UK planning inputs. In the joint sea basin planning process it is foreseen to update the input with current information and to add new project ideas. Input from commercial offshore grid developers will be gathered to ensure the latest insights on hybrid projects. The input will used to define a counterfactual network and project candidates for the subsequent cost-benefit assessment.

- Cost-Benefit Assessment

  The OTC TSOs carry out a cost-benefit analysis based on the jointly aligned input data, assumptions and methodologies. These methodologies are aligned with the ENTSO-E latest CBA methodology and relevant jointly agreed criteria, sensitivities, etc. The TSOs share the cost-benefit analysis procedure with the commercial offshore grid developers in advance in a transparent manner.

- Results & reporting

  Commercial offshore grid developers will be informed on the resulting system topology and project portfolio as primary outputs. The identified project set, and cost-benefit results per indicator will be shared so that commercial offshore grid developers are able to reflect on the outcomes.

IV. Outlook and Next Step

The joint collaboration between TSOs, wind farm developers, commercial grid infrastructure developers and hydrogen infrastructure developers offers the opportunity to establish an evolving systems perspective for the development of an offshore grid in the Northern Seas.

A major advantage is, above all, the close exchange with governments and NRAs on regional planning and the project sets developed. Here, the regional approach can provide and absorb valuable impetus.

The steps outlined above will be implemented jointly for the first time in 2026/2027. The results will be used to continue to jointly identify challenges and develop proposed solutions. The aim is to implement the development of an affordable and integrated offshore grid for Europe.

Offshore TSO Collaboration

Offshore TSO Collaboration (OTC)

The OTC was established in 2022 and consists of TSOs from the Northern Seas which are working together to develop a sustainable offshore network infrastructure. The OTC's aim is to establish the North Sea as a hub for renewable energy and support Europe's energy security and decarbonisation objectives. These companies work together to drive the development of offshore grids in the North Sea, supporting the political goals set by the Esbjerg Declaration (2022) and the Ostend Declaration (2023).

WindEurope

WindEurope is the wind energy industry association. It advocates for policies and regulations to support the expansion of wind energy in Europe and organises major industry events.

HyNOS

Hydrogen Networks of the Northern Seas (HyNOS)

A collaboration of gas and hydrogen network operators aiming to integrate offshore hydrogen production with wind energy in the Northern and Northwestern Seas of Europe It promotes cost-effective and secure decarbonisation by combining electricity and hydrogen transmission from offshore wind farms.