MARINEWIND

Market Uptake Measures of Floating Offshore Wind Technology Systems (FOWTs)

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D1.1: Analysis of policy and regulatory barriers and enablers

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TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

EXECUTIVE SUMMARY

This document, **D1.1 – Analysis of policy and regulatory barriers and enablers to floating offshore wind deployment**, is a deliverable of the MARINEWIND project, which is funded by the European Union's Horizon Europe Energy Programme under Grant Agreement №101075572.

The primary aim of the MARINEWIND project is to identify challenges and potential opportunities for enhancing the role of floating offshore wind in innovative solutions for system integration. The project delves into various aspects, including market dynamics, policy and regulatory considerations, social and environmental factors (as part of WP2), techno-economic optimisation, and suggestions for storage and flexibility (outlined in WP3).

The thorough analysis will be incorporated into the MARINEWIND web-based Geographical Information System (webGIS). This system is designed to provide tailored information about floating offshore wind technologies to stakeholders, considering their specific category, geographical location, and objectives. Moreover, it will offer policy recommendations, empowering stakeholders to make more informed decisions about Renewable Energy Sources (RES) policies and promote societal acceptance (as outlined in WP4).

This deliverable evaluates critical elements related to wholesale market designs and international market development strategies. It also considers the policy and regulatory framework at both national and European levels to promote the wider adoption of Floating Offshore Wind Turbines (FOWT) within a long-term market perspective.

This in-depth analysis conducted as part of Task T1.1 within WP1 aimed to understand the policies and regulations impacting floating offshore wind technology implementation. This assessment encompassed examining wholesale market designs and international strategies at national and European levels to promote the adoption of floating offshore wind.

The evaluation also delved into relevant countries' legal frameworks and authorisation processes. Furthermore, it conducted a comprehensive review of policies supporting the deployment of renewable energy and their effects on the electricity market, financing, and innovation, focusing on the UK as a case study. The task also explored the role of carbon policies, financing mechanisms, and energy market designs in shaping a long-term vision for the market.

1 INTRODUCTION

The transition from high carbon energy sources to low carbon technologies is crucial in the face of the challenge of achieving net zero emissions. The growth of offshore wind technology, especially floating offshore wind, represents a significant step forward in this transition and is gaining increasing attention each year. By mid-2023, nearly 300 MW of projects had entered the offshore installation phase. However, the industry faces rising costs, regulatory obstacles, policy uncertainties, limited infrastructure, concerns about technology availability, long lead times, and the pressure to enhance productivity. Towards the end of the decade, supply chains will experience unprecedented demand, surpassing the current global installed capacity within shorter timeframes. The industry is preparing to install turbines of 15+ MW on floaters in the latter half of this decade, followed by the deployment of approximately 20 MW turbines in the 2030s [1].

More countries are anticipated to establish specific targets for floating wind projects and issue site and offtake tenders to support this development. Floating tenders are gaining momentum, with 750 MW already in progress in France. Additional tender opportunities are expected in the UK, Taiwan, Portugal, Spain, USA, and Italy by the end of 2024. Japan is projected to re-enter the market around 2026 with a tender for a site off Kuji in Iwate prefecture, ranging from 600 to 700 MW (or more, depending on grid capacity). Japan will also establish a new framework for wind farms in the Exclusive Economic Zone (EEZ) in the coming years, accelerating GW-scale development in the next decade. While it is too early to accurately predict Japan's progress until 2040 accurately, the nation holds significant potential for growth in this sector [1] [2]. An overview of the floating offshore wind in the global pipeline is shown in Figure 1.

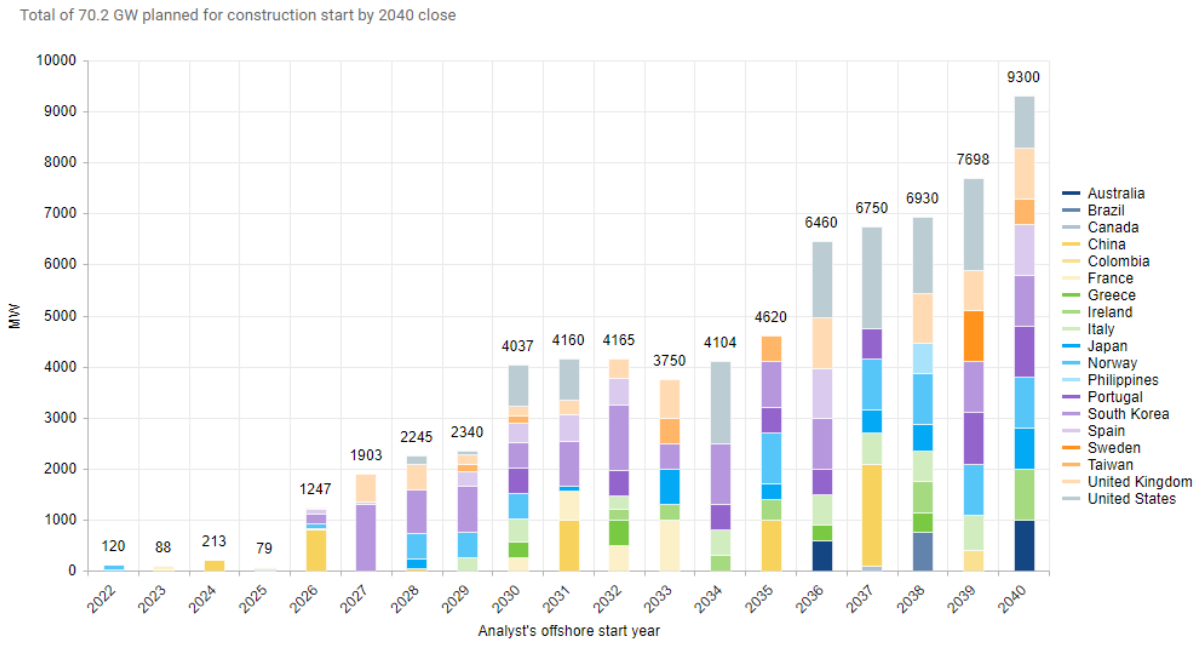

Figure 1: Global floating offshore wind projects in the pipeline. Note that the scale and order of projects may not yet be known or decided, e.g., UK CfD candidates. (data extracted from [3])

The goal of Work Package 1, "Policy Framework Assessment and Co-Creation," is to map markets, policies, and regulations at regional levels to facilitate the decarbonisation of the power system. Additionally, it focuses on crucial regulatory aspects necessary to support this approach, achieved through engaging stakeholders and conducting state-of-the-art assessments.

This document evaluates the obstacles and facilitators in policy and regulations for developing floating offshore wind at national and European levels. The findings from a survey on the offshore wind farm consenting process are detailed in Chapter 2. Chapter 3 offers an overview of key aspects related to flexibility and offshore development within the European Market Design Reform proposal. It also includes an analysis of support policies in the UK that have played a significant role in establishing a substantial portion of fixed offshore wind power. Chapter 4 summarises key findings and the next steps.

2 LEGAL AND AUTHORISATION FRAMEWORK AT THE COUNTRY LEVEL

This section provides an overview, based on a survey (see Annex 1 – Consenting Process Country Survey), of the authorisation processes for the construction, operation, and decommissioning of offshore wind power plants in Italy, the United Kingdom, Greece, Portugal, and Spain. These countries represent diverse regulatory frameworks and ambitions within the offshore wind sector.

Authorization authorities and competent bodies - Specific legislation and regulatory framework (Q1, Q2)

Italy's offshore wind energy sector is regulated by a complex network of authorities, including the Ministry of Infrastructure and Sustainable Mobility (MIMS), Harbour Master's offices, and the Ministry of Environment and Energy Security (MASE). The introduction of Legislative Decree No. 199 of 2021, which implements the EU directive known as RED II, marked a pivotal moment in Italy's regulatory landscape, providing a solid legal foundation for offshore wind development. However, a noticeable gap exists concerning explicit provisions for floating offshore wind farms in the country, leaving room for future policy development. The leasing round procedure does not apply to Italy.

In the **United Kingdom (UK)**, various entities play a role in granting authorisations for offshore wind projects, including The Crown Estate, Crown Estate Scotland, and regulatory bodies across England, Wales, Scotland, and Northern Ireland. The UK's British Energy Security Strategy (BESS) underscores the nation's commitment to renewable energy growth, encompassing innovative projects, including those in the field of floating wind energy. The UK follows the Contracts for Difference (CfD) model for auctioning and has set ambitious targets in the British Energy Security Strategy.

Greece has taken a unique approach by entrusting exclusive authority for offshore wind exploration and deployment to the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA). In July 2022, Greece introduced Law No. 4964/2022 to establish a legal framework for offshore wind development. It outlines licensing procedures, designates responsible authorities, and grants authorisation to the Ministry of Environment and Energy and other ministries for detailed regulations. Notably, the offshore area south of Evros Regional Unit's coastline and north-northeast of Samothrace Island is prioritised as a pilot zone for offshore wind farms with a capacity of up to 600 MW. While Greece's national legislation does not specifically mention floating offshore wind farms, its marine areas are recognised as ideal for their operation. **Greece** has set an ambitious target of 2 GW of offshore wind farms by 2030 and has developed a roadmap with seven critical milestones to achieve this goal. They also emphasise the importance of floating offshore technologies, citing rapid technological advancements, cost-effectiveness, and the utilisation of domestic resources. The development of offshore wind farms is seen as a way to promote renewable energy sources (RES) and expand the spatial possibilities for wind turbine installation in Greece.

Portugal is advancing in offshore wind energy development, overseen by The Directorate-General for Energy and Geology (DGEG) for licenses and Public Electrical Grid (RESP) for Grid Capacity Reserve titles. Permits for the use of maritime space are managed by the Directorate-General for Natural Resources (DGRM) and awarded alongside Grid Capacity Reserve titles. Portugal plans to launch an offshore wind power auction to reach 10 GW capacity. However, the current regulatory framework lacks specific provisions for floating offshore wind farms despite the suitability of Portuguese marine areas for such projects.

Lastly, **Spain**, with its extensive coastline along the Atlantic and Mediterranean, has embarked on an ambitious offshore wind journey. The country employs a multifaceted approach, with various competent authorities overseeing activities such as sea occupation permits, grid connections, tariff-related matters, and environmental assessments. Spain's ambitious targets for floating offshore wind capacity are supported by maritime spatial planning (POEM), highlighting its dedication to sustainable energy sources. However, the regulatory framework is evolving, and details for project permitting and competitive tendering processes are yet to be established.

Summarising, each participant EU country embraces offshore wind energy as a key component of their renewable energy portfolios. While each country has its unique regulatory framework and faces its peculiar challenges, all share a common goal: to harness the power of the wind to drive a sustainable and greener future.

Sea occupation permits (Q3)

The duration of sea occupation permits for offshore wind farms varies across European countries, with some having similar durations:

- **Italy**: sea occupation permits have a duration of 30 years, with the possibility of renewal through the competent ministry.
- **Greece**: allowed sea occupation permits for offshore wind farms for up to 30 years, and these permits can be renewed for an additional period of equal length.
- **Spain:** the anticipated durations range between 25 to 35 years, with a legal limit of 75 years for any type of activity, including extensions.
- **Portugal**: sea occupation permits have a maximum duration of 50 years.
- **The UK**: offered one of the longest sea occupation permit durations, lasting up to 60 years, covering two full project lifecycles. In **Scotland** (ScotWind), an option agreement is given to the successful ScotWind Developers for up to 10 years. The standard lease length for projects that proceed to a full seabed lease is 60 years.

A common aspect across these countries is the consideration of permit renewal, allowing for extending sea occupation permits beyond their initial durations, although subject to regulatory conditions. Additionally, the duration of permits in each country reflects the commitment to long-term offshore wind energy development as part of their renewable energy strategies.

Maritime Spatial Planning (MSP) (Q4)

All five countries recognise the significance of Maritime Spatial Planning (MSP) in aligning offshore wind development with broader marine use considerations. In the **UK** and **Portugal**, MSP is integrated into the authorisation processes.

In **Italy**, maritime spatial planning is in progress, but the implementing decrees have not been published yet. This plan identifies suitable marine areas for offshore wind installation. While MSP is not presently included in Italy's authorisation process, once approved, offshore wind projects will be required to comply with it, as specified in Legislative Decree n.199/2021.

Greece does not yet have a legally binding national Maritime Spatial Planning plan. However, there are special spatial planning frameworks related to maritime issues. Local MSPs are being submitted, with the first covering the North Aegean area. Offshore wind farm planning and development in Greece follow the country's spatial planning guidelines, including the National Spatial Strategy for the Marine Area and Marine Spatial Frameworks.

Spain has recently approved MSP, with the Royal Decree 150/2023, impacting the five Spanish marine demarcations (POEM). MSP in Spain delineates zones for offshore wind development, categorising them into Prohibition Zones (red zones), Restriction Zones (yellow zones), and Free–Prohibition/Restriction Zones (green zones). Due to their high environmental value, Prohibition Zones do not permit offshore wind farm development. In Restriction Zones, development is subject to impact assessments and additional restrictions during the authorisation process. Free–Prohibition/Restriction Zones are considered conducive to offshore wind energy development, with corresponding environmental assessments.

While the state of MSP and its integration into the authorisation process varies among the participant countries, they all recognise the crucial role of spatial planning in developing offshore wind energy.

Transboundary aspects (Q5)

Italy has not yet declared an Exclusive Economic Zone (EEZ) by law. Delimitation agreements with the other Mediterranean Sea States have been signed in the past to regulate the marine area beyond 12 miles. However, there is still a pending agreement with Malta. It's worth noting that Italy's national

legislation does not address transboundary impacts resulting from the deployment of offshore wind farms.

In the **UK** (England and Wales), transboundary impacts are considered, especially when they affect Natura 2000 sites designated under the Habitats Directive in other EU Member States. This consideration is incorporated into the Infrastructure Planning (Environmental Impact Assessment, EIA) Regulations 2017, aligning with the requirements of the EIA Directive (2011/92/EU). Regulation no. 32 outlines procedural duties in cases where significant environmental effects on an EEA State are expected due to a Nationally Significant Infrastructure Project (NSIP). As a signatory to the Espoo and Aarhus conventions, the UK has obligations to engage with other signatory States and their public where relevant.

On the other hand, **Greece** has a legislative framework to regulate transboundary aspects. Specifically, Articles 11 and 12 of Law 4546/2018 (A') govern these aspects. Article 11 mandates cooperation with competent authorities of EU member states sharing marine waters to ensure coordinated marine spatial planning. Meanwhile, Article 12 encourages efforts to collaborate with third countries in relevant marine areas in compliance with international law and conventions, including the Barcelona Convention. Differently, **Portugal** lacks specific legislation addressing transboundary aspects of offshore wind development. Finally, **Spain** has actively engaged in transboundary consultation processes with neighbouring countries, including France, Portugal, Italy, and Ireland. These consultations involve contributions from draft Spanish Maritime Spatial Planning documents. Notably, Spain's MSP for the Atlantic demarcation includes plans for a marine electrical interconnection project with a capacity of 2000 MW, with expected works scheduled between 2024 and 2026.

Transboundary cooperation is facilitated by existing international agreements and regional structures, ensuring coherence and coordination in maritime spatial planning. Greece, Italy, Spain, and the UK engage in consultation processes with neighbouring countries to address shared concerns and ensure efficient offshore wind development.

Regulation and Authorities for connection between FOWT plant and onshore grid (Q6)

In **Italy**, the authorisation for connecting a wind farm to the onshore grid falls under the Environmental Impact Assessment (VIA) process. The applicant receives the General Minimum Technical Solution (STMG) from TERNA, the national Transmission System Operator (TSO), within the environmental impact analysis. The STMG defines grid connection criteria and includes a description of the grid facility and related utility facility for connection. After farm construction authorisation, the Detailed Minimum Technical Solution (STMD) is requested from the TSO, followed by signing an electrical energy supply contract.

In the **UK**, offshore wind farms connect to the electricity grid via individual point-to-point routes from offshore to onshore infrastructure. However, current transmission and infrastructure capacity

limitations hinder the achievement of the 2050 Net Zero target for offshore wind capacity. To address this, the Department for Energy and Net Zero (DESNZ), Formerly known as the Department of Business, Energy & Industrial Strategy (BEIS), conducted a review of the Offshore Transmission Network (OTNR), concluded in May 2023 and are now implementing its findings to deliver a coordinated offshore transmission regime for Great Britain. Under the current regulatory framework, generators must sell transmission assets to Offshore Transmission Owners (OFTOs) within 18 months of wind farm construction, but it doesn't account for shared grid connections. Therefore, reviews are underway to coordinate OFTO arrangements, considering shared grid connections to enhance developer interactions and manage associated risks. This review also aims to bolster energy supply security during interface-related disputes. As part of the OTNR, consultations involve BEIS (now Department for Energy Security and Net Zero - DESNZ) and Ofgem (Office of Gas and Electricity Markets) to redesign the regulatory and legislative framework for offshore wind. This redesign explores alternative models like offshore islands or ring mains, multi-purpose interconnectors, hydrogen infrastructure, and jointly owned transmission assets.

Greece follows the process outlined in Article 74 of Law 4964/2022 (A'). It involves a Coordinating Committee for the Connection and Development of Offshore Wind Farm (OWF) projects, facilitating cooperation between the OWF Agency, Independent Power Transmission Operator (IPTO), Regulatory Authority for Energy (RAE), and other relevant bodies for OWF development. The IPTO manages interconnection projects from the Greek Electric Transmission System (GETS) to the Organized Development Areas of Offshore Wind Farms (ODAOWF) Interconnection Point, with construction costs covered by IPTO and recovered through System Usage Charges.

In **Portugal**, the connection between an offshore wind farm and the onshore grid requires a Grid Capacity Reserve Title (TRC), which entitles the promoter to use the grid connection point up to the assigned power rating. Two licenses are needed: a Production License and an Operation License. The TRC expires if the production license is not applied within the specified period. The operation license is essential to commence operations, and it requires various documents, including a declaration from the promoter, a favourable opinion from the grid operator, and civil responsibility terms.

In **Spain**, the MITERD (Ministerio para la Transición Ecológica y el Reto Demográfico) approves laws and regulations. At the same time, Red Eléctrica de España (REE), the Transmission System Operator (TSO), produces technical norms and procedure guides. REE manages and operates the transportation grid and is the reference entity for connection. Spain is currently analysing the offshore connection model, and the regulation's final details have not been established yet.

While each country has its regulatory framework, they all emphasise the importance of coordinating between relevant authorities and entities to connect offshore (floating) wind farms and the onshore grid.

Steps and timeframe estimate for the authorisation process (Q8)

The authorisation process within the participant countries is complex and involves different authorities. This critical element requires planning and coordination amongst authorities to reduce risks to developers and investors. A streamlined and transparent process reduces uncertainties and delays, which can otherwise be a major disincentive in the development of offshore wind projects.

It is observed that the concept of a single point of access – the so-called one-stop-shop - which would mitigate this regulatory risk is, to some extent, present in many of the participant countries. In detail, in **Greece,** the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA) is, on behalf of the State, the entity responsible for offshore wind farm projects. Similarly, in the **UK**, the Marine Licensing operations team adopts this approach to streamline the process of consenting and licensing. Specifically, when requested, they handle applications for various permits and licences, making the process more efficient and less burdensome for applicants, stakeholders, and regulatory authorities. Finally, in 2021, **Italy** introduced a new simplified legislation (implementing the EU directive RED II) aiming at centralising the consenting process management under the responsibility of the Ministry of Environment and Energy Security (MASE). However, the corresponding implementing decrees have not been published yet.

As a common aspect to all participants, the authorisation process involves entities responsible for the national electrical grid and its connection (national TSOs) for using the maritime space and assessing the installation's environmental impact. Regarding stakeholders, a specific step of **Italy**'s consenting process is (optionally) devoted to a public consultation involving the Regions and Municipalities in the so-called Conference of Services. Within the participant countries, **Greece** and the **UK** are the only countries where specific sea areas for offshore wind installations have been identified. In Greece, within these areas, eligible investors can apply for exploration tenders and, after a public consultation process, to the bidding and exclusive licensing phase. In the UK, developers must secure a seabed lease granted through periodic leasing rounds agreed by The Crown Estate (England, Wales & Northern Ireland) or ScotWind (for Scottish territorial waters). Then, the consenting process starts once the seabed lease has been granted and Agreement Option signed.

The nominal time frame for the consenting process is approximately 1–2 years for **Spain** and **Italy**, three years for **Greece**, 3.5 years for **Portugal** and four years for the **UK**. For instance, the 3.6GW Dogger Bank project in the **UK** is being developed in phases off the coast of Yorkshire – for which application processes began in 2011. The project was later consented in 2015 and is now under construction, with a completion date in 2026.

Actual examples of projects typically take a longer time to finalise the process. In Italy, for instance, the duration of the consenting process for the first (and only) offshore bottom-fixed wind farm has been 14 years, although not only due to administrative reasons (see the Example reported in Italy's Survey). Similarly, in the UK, a duration of up to 12 years has been reported, partly due to the complexity of environmental impacts of developments and the requirement for novel compensatory

measures. The **Italian** experience with **BELEOLICO,** a 30 MW offshore wind farm with fixed foundations installed in the Taranto harbour, demonstrated how long and complicated the authorisation process can be compared to the estimates. The authorisation process ended after **14 years,** partly due to the opposition of many public and private stakeholders and several sector organisations and partly to the bankruptcy of the wind turbine manufacturer.

Technical issues related to the electrical connection between the FOWT plant and the onshore grid (Q9)

All the participant countries identified similar technical issues related to the electrical connection between the wind farm and the onshore grid. In detail:

- Distance of suitable grid connection points in coastal areas close to potential sites
- Dynamic cables are needed to connect floating wind turbines to the substation, and they are still under technical development (only the 66 kV AC dynamic cable is in the commercial phase).
- In some cases, the local community pressure, due to visual impact and opposition, will carry the infrastructure away from the coast, inducing the need for offshore substations for deep waters (> 60 m), whose electrical equipment should coexist with the movement of the structure. This technology is still in the development phase, although some important players have already received the qualification for their products.
- It is unclear who is responsible for building the offshore grid infrastructure and the land connection point infrastructure. The envisaged options are the national TSO, the promoter, or a hybrid solution involving both. Related to this aspect, in some countries, it has not been cleared yet whether the grid connection point must be onshore or offshore.
- The choice of the energy transmission system (HVAC or HVDC) is still not straightforward and requires devoted case-dependent analyses. At distances exceeding about 50 km, HVDC solutions are more efficient and affordable (for wind farms > 1 GW). From this point of view, a standard regulation is not available yet.

Minimum requirements for the Environmental Impact Analysis (EIA) (Q10)

The participant countries reported similar minimum requirements to be met concerning the environmental impact analysis. In detail, the regulations require that special studies are carried out to minimise and mitigate the farm's environmental impact. The most critical aspects to be taken in account are:

- Impacts from accidents or malfunctions;
- Distance of the FOWT farm from marine protected areas;
- Changes to atmospheric and oceanic dynamics due to energy removal/modification;
- Interaction with ship courses (losses due to crashing, obstruction and obligation to change course);
- Interaction with birds (formation of obstacles in migratory corridors);
- Mammals and other species (benthic and pelagic fish) habitat modifications (including electromagnetic field effects from power cables);
- Changes to water quality: effects on sea conductivity, temperature, chlorophyll-A dissolved O2, salinity, pH;
- Effects on underwater noise;
- Protection of sea antiquities.

In **Greece,** these studies can be carried out during the construction or operation phase, whilst in **Italy,** these requirements must be mandatorily met within the environmental impact assessment, and suitable mitigation measures must be identified. Moreover, Italy reports that acoustics engineering analyses providing *ante operam* noise measurements for the farm site area are mandatory. This step is completed with reasoned, mandatory and binding advice issued by the competent authority, which may indicate the submission to the VIA (Environmental Impact Assessment) or the revision request. In the latter situation, an indication of the measures necessary to avoid or prevent the impacts that are likely to be significant and adverse is mandatory to pursue the VIA.

In **Spain**, the developer may optionally request the environmental body to prepare a Document of Scope for the environmental impact analysis indicating the extent and degree of the specification to be contained in the environmental impact assessment of a particular project. Without this request, the legislation defines the minimum contents the developer shall draw up in the EIA report. However, given the novelty of offshore wind developments in Spain and the lack of experience in the environmental body managing the environmental assessment of this kind of project, it is highly recommended the developers make use of the optional right to request the Document of Scope for each specific project, to have a more accurate indication about contents and degree of detail to be required in the EIA report.

In **Portugal,** offshore wind farm projects are subject to an environmental impact assessment only for a power capacity of 50 MW (20 MW in sensitive areas) or if they have more than 20 turbines (10 in sensitive areas). In all other cases, projects can be subject to a case-by-case analysis with the decision taken by the Directorate-General for Energy and Geology (DGEG) after consulting the Portuguese Environmental Agency (APA). The legislation regulates the EIA and ensures an interdisciplinary committee with participants from various external organisations reviews this procedure.

Operation and maintenance phase: specific regulations (Q11)

Different scenarios are observed concerning the wind farm operation and maintenance (O&M) phase. All the participant countries have specific regulations for this aspect (except **Greece** and **Spain**), and their actual implementation involves administrative rules (like in **Portugal**) and duties of the project owner, the wind turbine manufacturers and the transmission infrastructure owner. In **Italy**, the regulations for the operational and maintenance phase are provided by the certification body (e.g. RINA).

End-of-life of windfarms and decommissioning plan: specific regulations (Q12)

All the participant countries, except Greece, indicated that decommissioning plans and their schedule are required by their legislation or, at least, indicated in roadmaps. In detail, in **Portugal** and **Italy**, this plan must be provided (even in a preliminary stage) during the authorisation phase and, eventually, detailed before the farm's end-of-life. The general principle of these plans indicates that the farm promoter must remove all plant components and restore the sea area and seabed to its prior condition. For instance, a new environmental impact assessment is required **in Italy** if a revamping plan is envisaged. In the **UK,** there is currently no standard legislation to specify the best practices after operational life ends, and the physical conditions strongly drive decisions, theoretically admissible lifetimes of turbines, site conditions, country legislation, logistic difficulties and environmental impact. There are, however, existing guiding principles "where any damage done to the environment will need to be remediated by the owner"[1]. In **Spain,** in all cases of a concession, the General Administration of the State will decide on the maintenance of the works and facilities or their lifting and removal from the public domain and its area of protection easement by the interested party and at his expense. However, the legislation does not directly indicate the need for a decommissioning plan.

Stakeholder consultations during the authorisation process (Q13)

In all participant countries, stakeholders are mandatorily involved through a public consultation during the authorisation process, and the resulting observations are considered. **Spain** and **Portugal** report a similar approach in which this phase is mandatory for the environmental impact assessment. This phase is included in the procedure for achieving maritime state-owned property in **Italy**.

[1] https://iopscience.iop.org/article/10.1088/1742-6596/1222/1/012035/pdf

Details describing the stakeholders involved in each participant country are provided in the tables included in each Country Survey and reported in Annex 1 – Consenting Process Country Survey.

Economic costs associated with the consenting process (if any) (Q14)

This question refers only to those economic costs associated with the fees in relation to the consenting process towards the public administration. The costs for the farm's development are not considered here. The participant countries reported different costs associated with the consenting process, where differences arise in the amount of required budget and how it is computed. Variations of costs based on regions, sites and local issues are also reported. For instance, in **Portugal,** these are based on the installed power and refer to a deposit for tender participation (10.000,00 €/MVA, with a limitation of a maximum of 10 Mln€) and compensation payable to municipalities (1.500 €/MVA). Differently, in **Greece**, the application for a Research License is accompanied by a letter of guarantee, the amount of which is set at 10.000€/MW. Higher costs are reported in the **UK,** where the total costs for the consenting process are around 50,000 £/MW (43.000 €/MW). In **Italy**, the costs associated with the consenting procedure are estimated at 0.1 % of the total value of the farm deployment. In **Spain**, these costs include the fee for the occupation of the maritime-terrestrial public domain and the use of maritime-terrestrial public domain (DPMT) assets and the corresponding required guarantees, the fees to the Administration as consideration for the activities carried out (examination of the project in the processing of applications and inspection and verification of works). Nevertheless, these economic costs can vary as the regulatory framework for offshore wind farms is not yet available in Spain.

2.1 Most critical barriers and bottlenecks of the consenting process (Q16)

The barrier analysis highlighted the different experiences in handling the authorisation process between the UK and southern European countries. In fact, despite the absence of floating offshore wind farms even in the UK, the experience gained over the last 10-15 years, especially in Scotland, with bottom fixed plants, marks a maturity of process that cannot be compared. Notwithstanding this, it is possible to identify some common elements (at least to two countries), specifically:

- Lack of spatial planning in all geographic areas;
- Lack of suitable grid infrastructure in coastal areas close to potential sites;
- Excessive duration and complexity of the consenting process;
- Insufficient qualified staff to manage applications;
- Opposition by stakeholders;
- Insufficient knowledge on environmental impact of FOWT.

Concerning spatial planning, **Italy**, **Greece,** and **Portugal** emphasise the incomplete development of MSP concerning commercial offshore wind or its non-inclusion in the authorisation process. The **UK** instead underlines the inhomogeneity of MSP in the different regions. The only exception is **Spain,** for which the MSP is complete and part of the authorisation process. However, the new regulatory framework in this country is still being finalised to adapt the legislation to the new context.

The development and integration of grid infrastructure are widely acknowledged as significant hurdles for future offshore wind projects, leading to extra expenses and environmental consequences for extending cabling to reach grid connection points. **Italy** is facing a great challenge since the demand for connections to the grid is definitely too high compared to the current capacity and already foreseen by TERNA (the national TSO) for the near future. A huge plan for expanding grid infrastructures is scheduled according to the updated Development Plan for the national electricity grid in the next ten years [4]. Additionally, **Spain** claims regulatory problems, and **Portugal** an insufficient grid capacity. The **UK** states that public investment and government support are essential to address these infrastructure challenges.

Moreover, Italy and the UK claim for an excessive duration of the authorisation process. Italy, the UK and Greece also emphasise the complexity of procedures that often become a major obstacle for developers. Another important aspect affecting the duration of the process is the opposition of citizens, sectoral organisations and, more generally, stakeholders. Among these, the opposition of fishermen is the most frequently mentioned. The negative stakeholder opinion can be associated with the lack of communication from the authorities responsible for the authorisation process, the proponents and developers of the plants towards the local authorities and the representatives of the economic sectors. Moreover, the small number of qualified human resources dedicated to managing the process application, which would require a team with multidisciplinary skills (technical, environmental, legislative, financial, etc.), represents a further cause of delays in the authorisation process. Finally, from a technical point of view, the UK mentions that uncertainties about the environmental effects of FOWTs could potentially lead to higher expenses and longer approval processes during the permitting phase. In this regard, Spain and Portugal also underline that the absence of prototypes or commercial installation in the Mediterranean does not allow environmental sustainability to be demonstrated, generating stakeholder concerns and opposition. The discussed barriers are summarised in Table 1**.**

Table 1- Common barriers

Barrier \ Country	IT	GR	ES	PT	UK
Incomplete MSP	x	x		x	x
Insufficient grid infrastructures	x	x	x	x	x
Excessive duration of the process	x				x

Excessive complexity of the process	x	x			x
Insufficient regulatory human resources to process applications	x			x	x
Citizen and stakeholder opposition	x	x	x		
Lack of knowledge on environmental impact		x		x	x

In addition, there are several country-specific obstacles. The **UK** has highlighted procedural barriers due to the planned increase of transmission tariffs that will make some Scottish FOWT locations financially unfeasible and to the incomplete analysis being carried out outside Scotland before sites are made available for leasing bids, which implies a higher level of risk for developers.

The other countries report mainly political barriers. Italy points out that coastal areas interested in installing offshore wind farms often have no strong local value chain to exploit and benefit from. Citizens and economic operators see offshore wind only as an impact. In Spain where there is a partially decentralised system, problems related to the different positions of the regional administrations are reported. Moreover, as detailed in the answer to question Q21, there is still no regulatory timetable for the authorisation of projects and the design of tendering procedures. Portugal claims the lack of public investments in infrastructures whereas Greece mentions difficulties due to interstate disputes with neighbouring countries regarding national borders and the exploitation of maritime areas within them. A specific Greek environmental barrier regards the difficulty of identifying suitable areas for FOWT due to the presence of many marine protected areas. Country specific barriers are summarised in Table 2.

Table 2 - Country specific barriers

Barrier type / Country	Political barrier	Processing/Administrative barrier	Environmental barrier
IT	Need to reinforce the FOWT value chain, supporting local companies and creating local jobs and skills.		
GR	Interstate disputes with neighbouring countries regarding national borders and the		There are many marine protected areas in Greek waters.

	exploitation of maritime areas within them.		
ES	Actual partial decentralized system could affect development due to the position of the regional administrations. There is not yet a calendar of regulation for permitting of the projects and the design of the competitive tendering process and their calendar		
PT	Availability of funding or public investments in infrastructures		
UK		Timing of HRA/environmental assessment process Maintain/reduce transmission costs	

2.2 Most relevant enablers of the consenting process (Q18)

Mostly of the enabling factors listed by the UK relate to the acceleration of the authorisation process. The **UK** government is establishing a regulatory regime that covers the whole offshore wind project life cycle, from leasing to consenting, to operation and decommissioning, with specific actions to streamline the process by i) creating a Fast Track consenting process for Nationally Significant Infrastructure Projects, ii) updating the Energy National Policy Statements to ensure they reflect the importance of energy security and net zero, the role of offshore wind in delivering them and strengthen the priority of renewable energy infrastructure, iii) introducing the Offshore Wind Environmental Improvement Package (OWEIP) which includes regulations to adapt environmental assessments for offshore wind, enable strategic compensation and introduce Marine Recovery Funds, to reduce offshore wind consenting time from up to four years to one year, iv) providing a power to tailor Habitats Regulations assessments (HRA) processes. In this way, the government can ensure that environmental protection is addressed early in the consenting process, allowing adequate time to resolve discrepancies in evidence and data, inform and create ecologically robust compensatory measures and subsequently speed up the consenting process.

Italy identifies as priority enablers: i) the creation/extension of multidisciplinary teams to process applications, ii) the introduction of the one-stop-shop approach, iii) the availability of the national MSP that identifies areas for FOWT, iv) the increase of investments in storage systems and grid infrastructures, v) capitalize on the results of EU and regional projects and exploit stakeholder networks to communicate and disseminate and vi) increase cultural awareness among citizens.

Greece mentions the following administrative, technical and political enablers: i) the formation of a Coordination Committee for the Connection and Development of OWF projects to support HEREMA and to facilitate the cooperation with the other competent bodies, ii) the development of well-organized areas for OWF projects, iii) the establishment of the national target of 2 GW installed by 2030 and iv) the EU recommendations to accelerate the procedures of issuing licenses.

Spain considers important enablers: i) the consolidated broad network of companies with experience and capabilities for offshore wind activity acquired abroad, ii) linking the consenting process with the auction system that must include socioeconomic and environmental criteria and iii) the political interest in delivering an agile consenting process that allows the local areas with shipyard and heavy industry in crisis to take advantage of the development of offshore wind in Spain.

Portugal suggests the following enablers: i) the introduction of the one-stop-shop approach, ii) the identification in the Portuguese MSP of suitable areas for offshore renewable energies and iii) the preparation of tenders involving the simultaneous obtaining of the maritime space license and grid access license.

2.2.1 Simplification measures for the consenting process (Q17)

To overcome the complexity of the authorisation process, some countries have undertaken a pathway of simplification. In **Italy**, the simplification procedure that allows both the single authorisation and the maritime state concession to be obtained from the MASE was supposed to enter into force in March 2023, but, to date, there are still no implementing decrees. The new **Spanish** roadmap (December 2021) indicates the willingness to continuously improve the administrative processing, moving towards simplicity, digitalisation and integrated procedures is indicated. The purpose is to link the seabed right, the grid access award and the remuneration system to the result of the auctions, simplifying the process. However, nowadays, the regulation framework is not completed for offshore wind projects, with no specific simplification measures for the consenting process implemented. In the **UK**, to create a smoother and more user-friendly experience for all parties involved in the application and approval process, the Marine Licensing operations team adopts a one-stop-shop approach to streamline the process of consenting and licensing. This means that when requested, they handle applications for various permits and licences, including Section 36 Consent, deemed planning permission, Marine Licences, EPS licences, and basking shark licences all at once. This approach is often cited as the best process to be implemented. In **Greece**, the simplification process decided by the government is based on the development of pilot FOWT projects until market conditions and the maturity of this technology allow the development of large-scale projects. Given that offshore development is one of the strongest objectives of the strategy adopted by the political leadership, the Ministry of Environment and Energy plans to promote the creation of 3-4 pilot projects in the coming years that will play the role of a driver.

As emphasised by **Portugal** currently, several EU directives (e.g., Re-Power EU, REDII) establish that, to accelerate the energetic transition, environmental licensing should be accelerated if major environmental impacts are de-risked. However, until the moment, no changes have been implemented in the Portuguese legal framework to reflect these directives.

2.2.2 Additional country specific measures to enable FOWT

- **Creation of technological free zones in Portugal**: the recent legal framework for the electrical system introduced an adequate context for demonstration and pre-commercial projects through the creation of three technological free zones (ZLT), one of them for marine renewable energy projects located in Viana do Castelo. They are intended to allow testing in a real environment, with direct and permanent control by the competent regulatory authorities, particularly in terms of testing, provision of information, guidelines and recommendations.

- **Attraction of foreign investments and pilot programmes in Greece**: significant expected foreign investments (> 6 billion € by 2030 and > 28 billion € by 2050) with high Greek added value (67% expected to be part of the Greek economy and from the rest significant part in the EU) are foreseen to the Greek economy by the development of an Offshore Wind Industry. In Greece, the offshore area of Alexandroupolis has been selected to develop offshore wind projects up to 600 MW. The first pilot offshore wind farm (bottom-fixed) will be constructed in the Thracian Sea, within the first "go-to-area" in Greece, i.e., within a designated area, as foreseen by the Commission's REPowerEU toolkit, where RES projects proceed with fast-track licensing procedures. This pilot program solely concerns holders of existing Electricity Production Licenses or Special Projects Producer's Certificates (or pending ones applied for under the previously applicable regime) for offshore wind projects that are located in part or in whole within the aforesaid development area. The selected pilot area is the marine area of Alexandroupoli City that extends south of the coastline of the Evros Regional Unit and north-northeast of Samothraki. In addition, Greece has decided to run floating offshore wind parks with the method of Pilot projects, to reduce bureaucracy delays. This is a key part of the strategy of the Ministry of Environment and Energy which is expected to rapidly promote the creation, with special investment conditions, of 3 or 4 pilot floating offshore wind projects in selected areas. These areas are expected to be the marine areas of Ag. Nikolaos and Siteia in Crete, islands of Kos and Rhodos in South Aegean Sea, another area that extends in the offshore area of the axis Ag. Efstratios-Skyros-Central Evia and an area in Northwestern Ionian Sea.

- **New regulatory framework, public consultation and roadmap for Canary Islands in Spain**: Waiting for the approval of the new regulatory framework, that considers changing technological conditions and evolving energy regulations, currently, only facilities can be processed for the creation or extension of infrastructure for testing, demonstration or validation of prototypes (<50 MW) and new technologies associated with offshore wind. The first tenders in national waters are expected to be out at the end of 2023, although there is not yet a calendar to regulation for permitting of the projects and the design of the competitive

tendering process. In this regard, in 2022, the MITECO (Ministerio para la Transición Ecológica y el Reto Demográfico) launched a public consultation to coordinate the authorization procedure of the facilities with the granting of rights over use of marine space, access and connection to the electricity grid, and the promotion of investment through competitive procedures. The public consultation raised questions such as what information is considered necessary to develop a project, what design criteria should be required, what parameters should be used to evaluate bids, or who should be the owner of the evacuation facilities. Moreover, the roadmap (Hoja de Ruta para el Desarrollo de la Eólica Marina y de las Energías del Mar) in measure 3.6. Early Development of Offshore Wind Deployment in the Canary Islands established objectives to use the Canary Islands as a testing ground for energy transition technologies and policies. In particular, the Canary Islands have high potential for offshore wind energy due to the high number of equivalent hours of operation (Capacity Factor).

2.3 Major findings

The authorization processes for offshore wind power plants vary across European countries, reflecting their unique regulatory frameworks, energy goals, and geographic considerations.

In spite of this, from the analysis of the surveys on the authorisation process at country level, some common key elements emerge clearly.

The obvious but currently missing prerequisite for the installation of offshore wind farms is the presence of adequate onshore infrastructures for grid connection. All countries agree in calling for adequate infrastructure investments and some indicate the presence of development plans already approved and being implemented.

A second prerequisite should be a mature national MSP, inclusive of the offshore wind sector and integrated in the authorisation process. At present, not all national MSPs are consolidated and do not unequivocally identify suitable areas for the installation of offshore wind power plants. In many Mediterranean countries, this debate is still open. However, even in countries where the process is more advanced such as the UK, regional differences that create significant problems in achieving the set targets are evidenced.

Moving on to the authorization process, it is clear that the main bottleneck is its excessive duration (estimated and real) due to: i) the complexity of the regulatory framework, ii) the lack of human resources with adequate skill dedicated to the process, iii) the opposition of some categories of stakeholders and iv) the lack of a consolidated experience in the sector which makes it difficult to evaluate the environmental impact generated by some technological solutions. It is common opinion that, to overcome these limitations it is necessary to: i) simplify the authorization process by adopting for example the one-stop-shop approach, ii) Increase the number of resources dedicated to the managing of the authorization phase creating multidisciplinary teams, iii) organize events involving citizens and local stakeholders to clearly communicate the details of offshore wind projects, the global

and local benefits, and to gather comments and needs and iv) design, build and deploy pilot offshore wind farms to acquire the necessary experience and knowledge.

Many countries are implementing specific actions to streamline the process.

While each country approaches offshore wind development differently, the shared commitment to clean energy underscores the collective efforts toward a sustainable energy future. Further research and cross-border collaboration will continue to shape the evolution of offshore wind power within these diverse contexts The authorization processes for offshore wind power plants vary across European countries, reflecting their unique regulatory frameworks, energy goals, and geographic considerations.

3 ELECTRICITY MARKET DESIGN REFORM AND SUPPORT POLICIES TO FOSTER FOWT INTEGRATION

While Chapter 2 of this deliverable focuses on each country specific situation related to policy, regulatory, process and economic factors, Chapter 3 considers the overall EU framework reform on the electricity market with a focus on the UK support policies to promote the development and integration renewables, particularly offshore wind.

3.1 Innovation and priorities in the EMD reform

The European Commission (EC) suggested a significant revision of the European electricity market, collecting feedback from various stakeholders [5].

The reasons why the EC decided to start working on a reform of the rules of the electricity market regard the energy price increase of 2021 and 2022, triggered by

- the Eastern Europe conflict and the related gas supply reduction.
- the contemporary decrease of European production from hydropower and nuclear plants.
- the economic rebound after the pandemic, which led to an energy demand increase.

According to the EC, the actual electricity market design is too focused on the short term. Therefore, it is not flexible enough to balance the volatility of fossil fuel energy prices.

Among the weaknesses of the actual electricity market design, the EC identifies the **lack of flexibility** in the electricity grid. Gas-fired plants often set prices, and the more renewables enter the energy system, the more flexibility has to be provided. However, today, there is a short, low carbon flexibility supply, such as storage or demand response, and fossil fuels, usually gas-fired plants, cover this need.

To overcome these hurdles, the EC is considering introducing longer-term instruments, allowing consumers to benefit from more fixed priced contracts, providing secure, stable revenues for renewable and low carbon energy developers and facilitating investments in clean technologies. Consumers can sign fixed price contracts, dynamic price contracts and multiple contracts. Citizens and

businesses will select the contracts that best fit their circumstances, leveraging long-term prices to mitigate the impact of sudden price shocks and/or choosing dynamic pricing to take advantage of price variability to use electricity when it is cheaper (e.g. to charge electric cars or use heat pumps).

The proposal will create regional reference prices to boost Power Purchase Agreements (PPAs). It will require TSOs and DSOs to allow transmission rights for longer than a year to guarantee electricity transmission among parties signing forward contracts across regions or borders.

Regarding flexibility, the EC explains that "the more flexible the system is (the generation that can rapidly turn on or off, storage that can absorb or put power onto the system, or responsive consumers who can increase or decrease their power demand), the more stable prices can be and the more renewable energy the system can integrate" [5]. Therefore, Member States must assess their power system flexibility needs and set targets to satisfy them. Besides, the EC wants to reform the market in such a way that the electricity supply offers, also for grid balancing, are provided minutes before consumption, rather than hours, to foster the role of renewables in flexibility supply, given that offers from solar or wind plants are more accurate closer to real time.

The International Renewable Energy Agency (IRENA), in its 2019 Innovation Landscapes Briefs on market design [6], gave policy recommendations along the same lines.

"To enhance the operation of a system with high shares of VRE (variable renewable energy), the dispatch/scheduling time interval, the pricing of market time units, financial settlement periods, and the period between gate closure and real time delivery of power should be reduced. Using shorter market time units would help internalise the value of flexibility in the market price. The more reflective the prices are of the short-term market conditions, the better the price signals sent to generators, which can quickly alter their output by the system when needed" [6]. The main contributions of these policies are summarised in Figure 2.

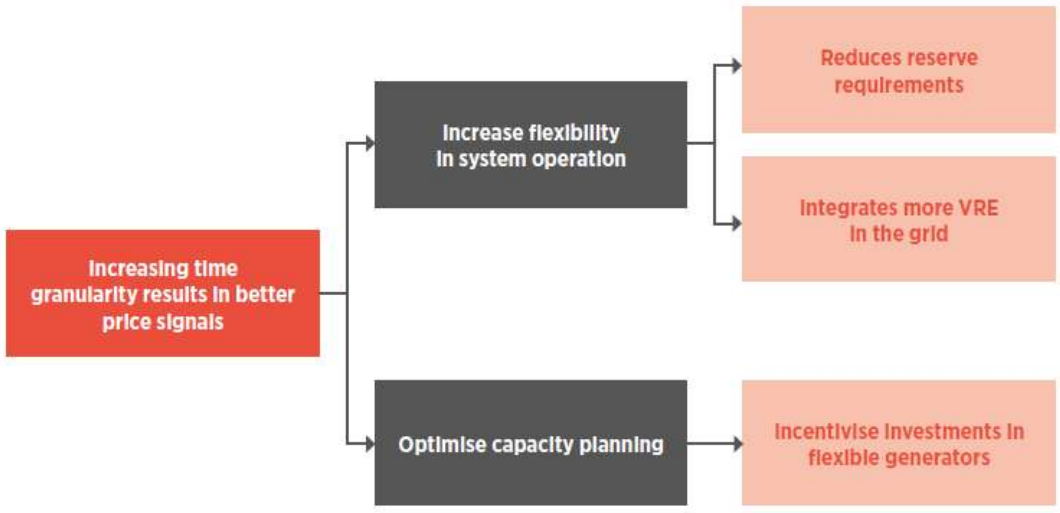

Figure 2 - Key contributions of increased time granularity in electricity markets [6].

IRENA explains that the opportunity to **set commercial positions and production scheduling closer to actual power delivery** increases the value of electricity trading and decreases imbalance settlements and their costs, reducing necessary ancillary services and quantity of reserves to activate for imbalance compensations. This new market condition would allow clearer planning and incentivise investments in renewables.

In addition, free price formation, without set price caps, including negative prices and price spikes, would provide clear signals for flexibility provision, upward or downward, to value the contribution to flexibility from renewables (through generation modulation) and from storage systems (through power storing and injection) [6].

According to IRENA, increased **time granularity** would be helpful. Also, increasing **space granularity** would support more efficient grid management and encourage renewables at the distribution grid scale and distribution, both in front of nodal and zonal pricing.

"Increasing space granularity by implementing either nodal or zonal pricing would result in price signals that could direct investments towards assets located where the transmission system would benefit the most and, therefore, relieve system constraints in a cost-efficient manner. Furthermore, such price signals can better direct investments towards renewable generation assets in locations with high prices, thereby reducing the overall electricity costs for consumers" [6]. The main contributions of this kind of policy are summarised in Figure 3.

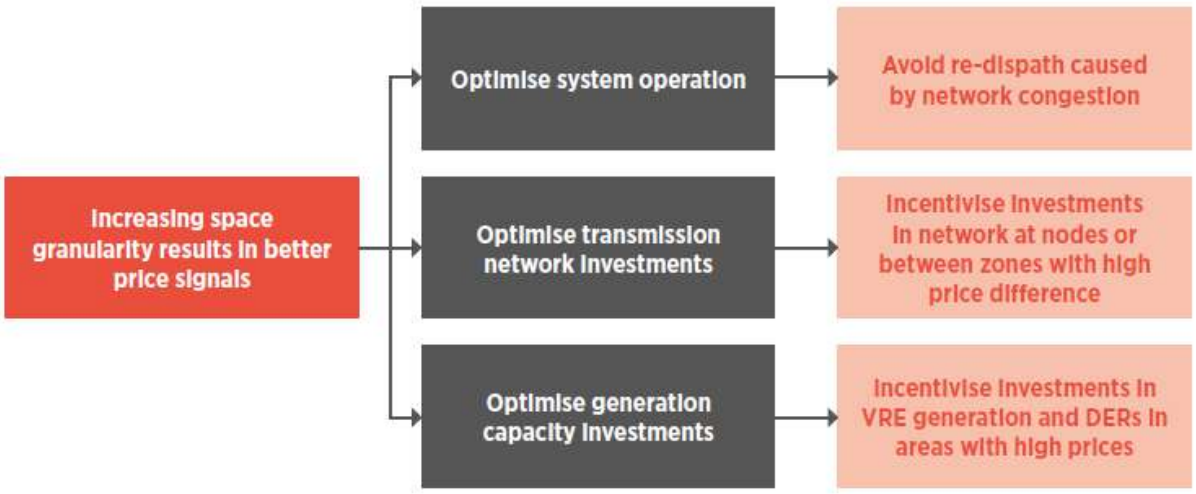

Figure 3 – Key contributions of increased space granularity [6].

The consequent price signals provided a clear and transparent mechanism for price formation, which would, for instance, provide indications to the system operators for congestion management;

- incentivise demand response and renewable deployment in areas where congestions are due to high demand and low supply.
- encourage interconnections to dispatch renewable energy from an uncongested area to a congested one, reducing curtailment.

Besides, IRENA underlines the necessity to introduce **new ancillary services** to activate the flexibility potential of renewables. For instance, wind turbines, equipped with an appropriate converter, can provide an inertial response (synthetic inertia) to manage frequency disturbances: "During a frequency surge, the power electronic controller can apply a retarding torque on the turbine to reduce generation, whereas, during frequency drops (Ela et al.,2012), the controller can utilise the kinetic energy of the turbine to increase power output (Morrena, Pierikb & Haana, 2006). This can also be achieved by reducing or increasing the blade angle to decrease or increase the power supply (Miao et al., 2010)" [6]. Generally speaking, distributed energy resources can support DSOs to solve congestion, bottlenecks, voltage and power quality issues.

To enable this kind of service, it is necessary to:

- introduce compensation mechanisms which value different performances (e.g. how fast the response is) properly;
- separate the procurement of balancing capacity and balancing energy:
    - usually, balancing capacity is procured in advance to real-time, and this cannot be done by distributed energy resources, preventing them from providing this kind of service, often in a more cost-effective way;
    - "studies – by the US National Renewable Energy Laboratory – concluded that the reserve requirements should not be static, as they have conventionally been, but instead should change according to the system conditions on a shorter time scale, such as on an hourly basis" [6];
- separate upwards and downwards balancing products, allowing the participation of plants working at minimum or maximum generation points.

Also, the International Energy Agency (IEA), in its Global Outlook 2022, underlines the role of flexibility, estimating that hour-to-hour flexibility needs on a global level will more than triple by 2050 in the Stated Policies Scenarios and double by 2030 and increase more than 3.5-times by 2050 in the Announced Pledges Scenario [7].

Consequently, flexibility is central to the R&I roadmaps of the European Technology and Innovation Platforms on Smart Networks for Energy Transition (ETIP SNET) and wind (ETIPWind).

ETIP SNET reminds us that "rising shares of non-dispatchable wind and solar PV increase the variability of the net load (the load that remains after removing wind and solar production from electricity demand), while the electrification of additional end-users, e.g. electric heating, road transport or industrial processes, raises peaks and increases the hourly, daily and seasonal variability of electricity demand." [8].

ETIP SNET Roadmap 2022-2031 dedicates Research Area 5 to "Flexibility enablers and system flexibility", covering all system flexibility issues and potential instruments [8]:

- flexibility needs evaluation;
- flexibility potential of all types of generation;
- energy storage and conversion technology flexibility services provision;
- the intrinsic network flexibility;
- the integration of AC, DC and AC/DC grids;
- flexibility management concepts and tools to enable grid operators and balancing parties to use different flexibility option combinations in the most efficient and effective possible way.

ETIPWind focuses more on wind technologies and wind energy development than on flexibility and overall energy systems. Nonetheless, it underlines the relevance of flexibility as well, given the increasing role that is expected for wind, a variable renewable resource that could be the first source of electricity in Europe by 2027, according to IEA, reaching 30-50% of the European power mix by 2050 [9].

2020 ETIPWind Roadmap's first Research and Innovation Priority is "Grid & System Integration" regarding the development of

- a "new grid architecture that values flexibility, efficiency and reliability" and that facilitates "communication between wind power plants and system operators";
- new technologies for grid integration and to "transfer wind power quickly, effectively and safely from the site of production to wherever it is needed" [9].

ETIPWind strongly suggests innovating in "short-term and seasonal storage, multi-cultured wind farms (wind farms with more than 1 type of turbine installed) and hybrid systems to add and manage the required flexibility. At the same time, more accurate and precise forecasting of both power production and demand will help to link demand and production better and ensure optimal use of available resources" [9].

However, as the EC proposed in the reform of the EMD and as stated by IRENA, technology development is necessary but not sufficient. Also, ETIPWind observes that:

"Whilst new technologies will help manage an energy system with high shares of renewables, the capabilities to absorb high shares of wind energy are more determined by economics and market design. Technical constraints exist, but market barriers and existing operating paradigms and principles are often more restrictive" [9].

The issues indicated by ETIPWind are similar to the ones stressed by the EC and IRENA:

- the increase of flexibility in the market to integrate more technologies;
- the introduction of intra-day markets to trade electricity closer to the moment of generation;
- to allow balancing reserve procurement by variable renewables;
- the use of virtual aggregation of different electricity generation technologies.

The European wind industry supports the new policies the EC suggested in its EMD reform.

WindEurope, the association of European industries working in the wind energy sector, welcomes the EC commitment, particularly in 2023, right after a disappointing 2022: European investments in new decreased to the lowest level since 2009, final Investment Decisions regarded just 10 GW – none in commercial scale offshore wind -, turbine orders plummeted by 47% year on year.

WindEurope underlines the importance of developing long-term contracts to provide certainties to consumers, asset developers and investors and make the market more resilient to short-term price variability. Support is also expressed for the commitment to foster short-term wholesale markets with the marginal cost approach, which is the best solution to reflect actual electricity value at a specific moment and to guarantee that the most cost-effective power plants provide dispatching.

In its response to EMD's suggested reform [10], WindEurope invites the European Parliament and the Council to maintain these aspects included in the EC proposal:

- “the availability of all contractual forms for power supply generation (Contracts-for-Difference, Power Purchase Agreements, merchant investments), with the possibility to combine Contracts-for-Difference and Power Purchase Agreements for the same project;
- the removal of national revenue caps for inframarginal generators with the expiration of the EU emergency rules on power market interventions, and do not become a structural part of Europe’s Electricity Market Design - this will restore certainty in wholesale market price formation;
- the inclusion of a Transmission Access Guarantee for offshore wind;
- Public interventions on electricity retail price formation respect pre-defined criteria, in line with EU Electricity Market Design acquis;
- TSOs and DSOs providing information to project developers on the available capacity for new grid connections and the status of connection requests;
- short-term wholesale markets are based on marginal pricing and the merit order.”

Besides, WindEurope invites to improve these aspects:

- “harmonisation of Capacity Remuneration Mechanisms, fully aligned with climate neutrality, allowing domestic and crossborder demand side response, storage and renewable generators’ participation;
- clarify rules on grid connections for renewables in the revised Electricity Regulation.”

Finally, WindEurope asks, on the contrary, “to remove Article 19a (4): Power Purchase Agreements should not be treated as a non-price criteria in the allocation of public support to renewables” (WindEurope, 2023, p. 3). The EC aims at boosting the role of PPAs by giving preference to bidders who signed/are going to sign a PPA with buyers facing entry barriers to this contract market. According to WindEurope, PPAs are crucial financial instruments for business cases and should not be used to fulfil different goals related to societal benefits rather than business and market ones.

3.2 The contribution of wind and renewable to flexibility

On the one hand, the increase in the shares of renewables in the grid implies an increase in variable power generation, given that solar and wind production cannot be planned. On the other hand, the electrification of consumption, through the spread of electric vehicles and heat pumps, implies an increase in load variability.

The more the energy system goes electric (both production and consumption), the more the variability peak reaches high numbers, as resulted in a simulation by ETIPWind focusing on Germany and Spain([11]).

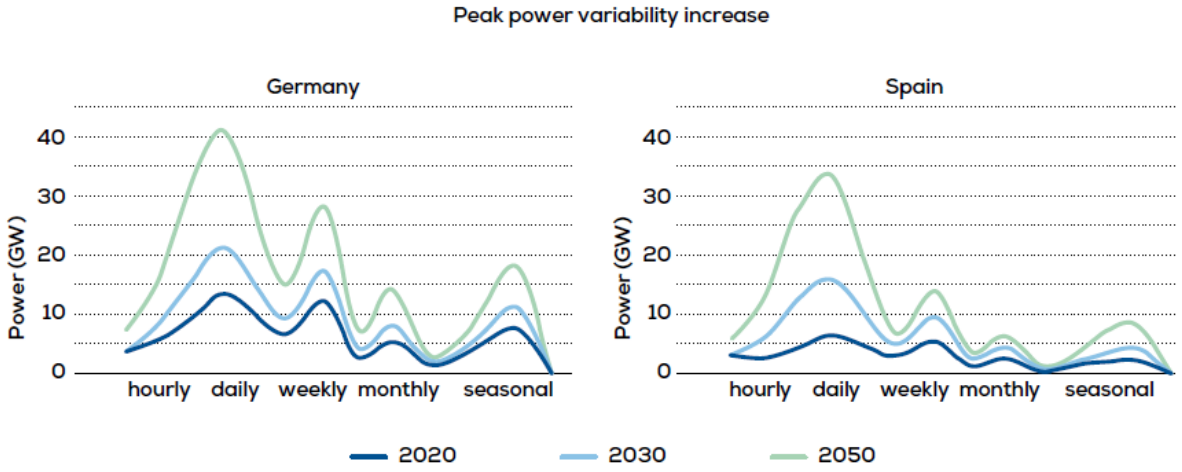

Figure 4 - Peak power variability in Germany and Spain based on the residual power load in 2020, 2030 and 2050 [11].

Variability depends on the timeframe, and the energy system can recur to different flexibility solutions that can be helpful to balance power supply and demand in different time cycles. The most suitable flexibility resources, depending on the timeframe, are summarised in Figure 5.

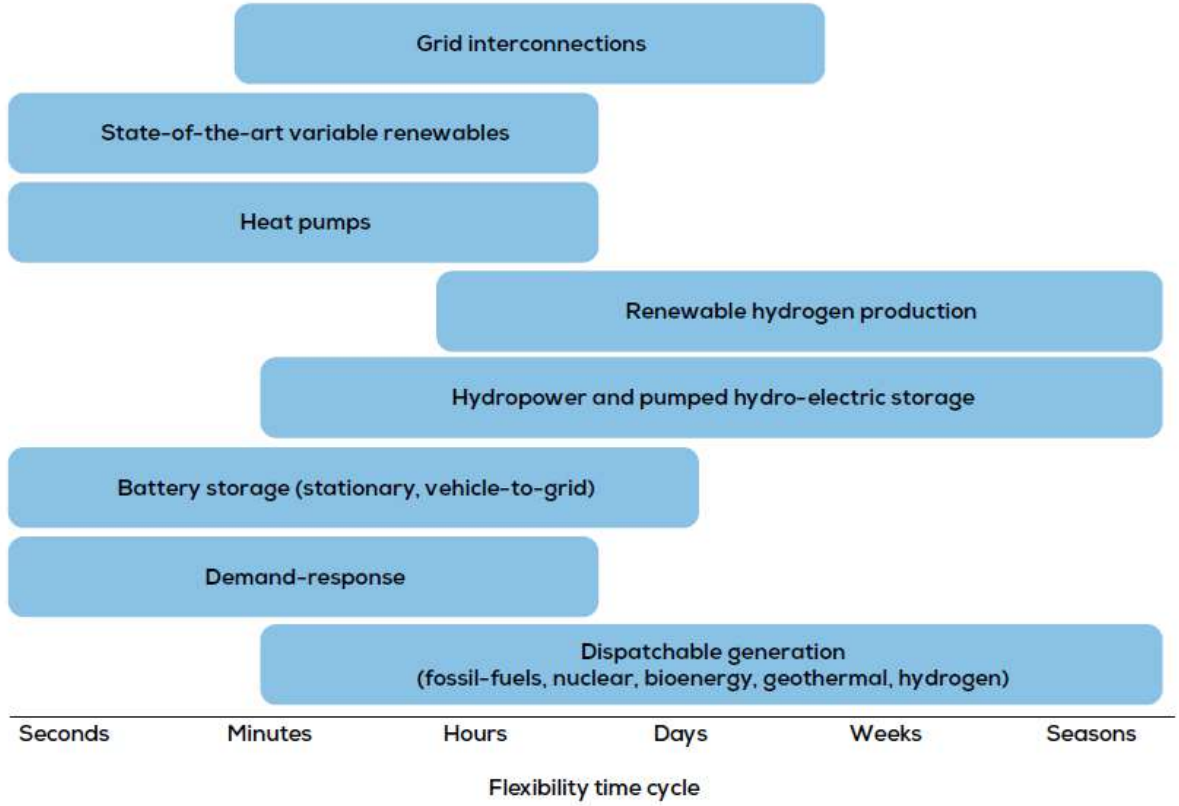

Figure 5 - Flexibility resources for different flexibility time cycles [11].

The higher variability is estimated to be within the daily timeframes. State-of-the-art renewables, like wind and solar, with demand response, heat pumps and battery storage, are suitable flexibility solutions for variability in daily timeframes. Surplus renewable production can be very useful also for flexibility within seasonal time cycles through power-to-hydrogen, with a potentially important role for wind.

ETIPWind reminds important applications. Ancillary services provision by wind turbines has already been used in Europe (e.g. Denmark, Ireland, Spain) and the USA (e.g. Texas). Main variable renewables can generate ancillary services at reduced capacity, making the remaining capacity available to dispatch both upward and downward. Different TSOs could test and confirm using variable renewables to provide fast active power in frequency response markets. The application in the Tule wind farm in the USA showed that wind turbines could provide flexibility and are more controllable than traditional synchronous generators, reaching a regulation accuracy of around 90%.

The energy system can count on flexibility provision from wind, but it has to value flexibility properly: flexibility has to be higher than the value of the otherwise generated power. Besides, new market "products should offer sufficient rewards to variable renewables not just for the kWh of flexibility provided but also for their commitment potential, and availability to be flexible and react bi-directionally (dispatched down or operated at reduced output) when necessary" [11].

From a technical and investment perspective, the necessary change to enable variable renewables flexibility supply consists of improved data collection and communication. It is not capital intensive.

The decarbonisation of the energy system requires using a range of solutions, not only variable renewables but also, for instance, different types of storage, hydrogen, grid interconnectors, and demand response. All these technologies have to be integrated for an efficient and effective use of them. With this integration, further flexibility services by variable renewables can be enabled. Integrating a wind farm and batteries or hydrogen production can empower wind energy generation to provide more flexibility. In these cases, improved data collection and communication are insufficient. However, the capital required is less than needed to retrofit conventional power plants and improve their ramp capability, according to IEA and RTE. Maintaining conventional power plants to use them just for flexibility needs is more expensive than moving flexibility provision to renewables, at least in short timeframes, where flexibility is particularly necessary.

3.2.1 The regulators' point of view

According to the EU Agency for the Cooperation of Energy Regulators (ACER), actual market design worked well, at least in "normal" conditions, and "ill-designed emergency measures or distorting price signals by interfering in market price formation may roll back EU market integration and overall competition, […] possibly increasing the overall cost of the energy transition up ahead" [12]. Provided this, ACER describes the situation similarly with respect to the other mentioned organisations. According to ACER's "Final Assessment of the EU Wholesale Electricity Market Design", published in April 2022:

"The market design will need to facilitate a massive rollout of low-carbon generation, particularly renewable generation characterised by high upfront investment costs, while ensuring that flexible resources complement intermittent renewable production where and when needed. Related to this, price volatility in the electricity system is likely to increase in the years ahead, indicating the increasing flexibility needs of the system. Hence, the market design must send adequate price signals to meet flexibility needs, again where and when needed" [12].

Particularly, ACER makes these suggestions to the EU and Member State policymakers:

1. Accelerate **electricity market integration:**
    a. achieve the "minimum 70% target" regarding electricity trade between Member States) by 2025,
    b. implement flow-based market coupling in the Core and Nordic regions,
    c. integrate national balancing markets,
    d. update the EU bidding zones to enable more effective locational price signals.
2. Support using **Power Purchase Agreements:**

a. use public guarantees covering counter-party risk,

b. help smaller renewable plants collect funds and manage risks,

c. protect consumers from price volatility,

d. conversely, consider the challenges of managing many small actors.

3. Improve the **renewable investment support scheme:**

   a. Member States should coherently choose a support scheme, distinguishing two different approaches

      i. to give priority to the speed deployment of new low-carbon **generation** at scale, with a cap on revenues,

      ii. to give priority to the integration of low-carbon **capacity;**

   b. conversely, consider that central support must not encourage inefficient activities.

4. Increase **liquidity in long-term markets:**

   a. attract more entrants,

   b. give opportunity to smaller independent companies,

   c. conversely, consider that “market-making” may be expensive,

5. Integrate **forward markets:**

   a. give more opportunities for hedging,

   b. conversely, consider implementation and operational hurdles to face.

6. Update **collateral requirements** to be allowed to trade in long-term wholesale markets:

   a. give opportunity to more actors to access fixed prices,

   b. conversely, consider the risk of failures and contagions.

7. Foster **price signal:**

   a. leverage price signals to make flexibility needs and services emerge and get valued,

   b. facilitate variable renewable energy integration,

   c. assess the opportunities of signals provided by scarcity pricing and capacity mechanisms, which encourage new generation, storage, demand side management and flexibility resources in general,

d. coordinate among Member States on national level policies (e.g. on capacity mechanism),

e. no risks detected.

8. Coordinate for **cross-border electricity exchange:**

a. enhance interconnections, low-carbon generation, balancing and security of supply,

b. conversely, consider costs and coordination and integration efforts.

On the third point, it seems that other relevant and respected stakeholders, like the ones this deliverable already referred to (e.g. ETIP SNET, ETIPWind, IRENA and WindEurope), consider it wiser to opt for the second approach, "capacity-oriented". Besides, ACER writes that "for systems with increasingly dominant shares of renewable generation, the rationale for moving in this direction seems strong". In this approach, "the most valuable projects would not necessarily be those that produce more electricity in total; the projects favoured would be those that produce more, where and when it is most valuable for the system" [12].

On the seventh point, ACER underlines that "in the absence of such a price signal, innovation in new technologies or solutions, which currently might not always be price-competitive with fossil fuels […], will be hampered or may not materialise at all" [12].

More specifically regarding offshore wind, ACER and the Council of European Energy Regulators (CEER) in April 2022 published their "Reflection on the EU strategy to harness the potential of offshore renewable energy for a climate neutral future", responding to the EC strategy published on November 19th 2020 [13].

ACER and CEER support the overall strategy, including integrating offshore wind farms through offshore bidding zones. Offshore wind farms and bidding zones can be connected to the onshore grid radially via a cable bringing wind energy to the land or adopting a hybrid approach, in which offshore wind farms are connected to different onshore bidding zones at different points on the land. In this case, interconnections can bring wind energy to different onshore bidding zones belonging to different countries and allow cross-border trade.

Radial offshore systems are coherent with actual regulations, given that they have only to comply with the national rules of the Member State in which they are installed. On the contrary, the **hybrid system** combines the diversification of wind electricity delivery, which can be directed to different onshore bidding zones depending on price and scarcity signals, and cross-border power trade among different bidding zones. This new integration of two different roles paves the way to a new configuration in which "large-scale deployment of offshore renewable energy will result in a gradual development of a meshed offshore network, which will connect several OWFs [offshore wind farms] with several onshore bidding zones" [13]. New challenges are posed, and, according to ACER and CEER, they still need to be fully understood and impose a gradual development of the rules to define the most effective regulatory framework.

ACER and CEER provide indications concerning different aspects.

Regarding **frequency balancing**, given that the interconnections with the offshore wind farms are through high voltage direct current (HVDC), frequency deviations can result only from power imbalances. They can be identified only on the onshore network. From a commercial point of view, these indirect frequency imbalances can be attributed to offshore wind farms.

Power imbalances can be managed in different ways. If the offshore wind farm is part of an onshore bidding zone, it can adjust its position close to real-time. This situation is included in the Home Market approach. This adjustment cannot be made in the last hour before real-time by offshore wind farms in a separate offshore bidding zone because cross-border intra-day trading is not possible in that period of time. These trading rules could be changed, extending the Home Market approach to the renewable plants in an offshore bidding zone and shortening the trading products. In addition, the characteristics of the connection cable have to allow these trades and adjustments.

The wind farms must be curtailed in front of congestions that can make adjustments impossible. Technically speaking, this requires specific system operation rules. From a commercial point of view, if wind farms are part of an onshore bidding zone, curtailment is managed with the Home Market approach via re-dispatching instructions and compensations by the TSO. Otherwise, if wind farms are located in an offshore bidding zone, curtailment is managed directly by the farms, which will be induced to reduce production given the impossibility of trade power.

According to ACER and CEER, it is necessary to give equal access to the network to both onshore and offshore bidding zones, provided that both onshore and offshore renewables are dispatched competitively. These changes are more difficult for bidding zones involving different Member States' territories, where clear rules have to be developed involving the TSOs.

ACER and CEER consider the offshore bidding zone a better model for integrating offshore wind in short-term markets, preventing market distortion and ensuring a higher level of efficiency with respect to the Home Market approach, which would imply derogations to the 70% minimum interconnector capacity requirement[2], meaning that these interconnectors would be significantly underutilised. This would also disincentivise investment into hybrid systems.

ACER and CEER do not agree with the EC about the suggested policy on the congestion income. This income is generated by congestion among bidding zones and is distributed to the TSOs owners of the interested interconnectors. The TSOs are expected by rules to use this income to maintain and increase cross-zonal capacities in such a way that this income constitutes a signal for interconnector improvements. The EC suggests distributing this income to offshore wind farms as a supportive measure to encourage investments in offshore. ACER and CEER identify different undesired consequences:

[2] The minimum capacity margin available for cross-zonal trade required by the Clean Energy Package

- the limitations of these congestions are suffered from by both offshore and onshore generators, which may ask for part of the congestion income on the grounds of non-discrimination;
- offshore wind farms would be incentivised to bid very low or negative prices to ensure themselves a place on the market, knowing that, even in the presence of congestion, they would earn anyway – a logic against price signal and efficient market;
- congestion income would cease being a signal of the need for additional interconnector capacity;
- the same objective, encouraging investments in offshore wind, could be more efficiently and effectively achieved using other instruments, like other renewable support policies (e.g. subsidies).

Given that a significant share of generation could be located in the offshore bidding zones connecting more Member States, the different countries, according to ACER and CEER, will have to coordinate for an effective and efficient use of the exports from the bidding zones to manage simultaneous adequacy crises, maybe through a newly created neutral entity.

Regarding developing **hybrid systems** connected by meshed DC grids, ACER and CEER underline the hurdles that may arise from inadequate and inconsistent rules. "The lack of harmonisation between the connection requirements to the power networks of two or more MS or synchronous areas may hinder the deployment of hybrid systems and lead to interoperability issues. This is because different connection requirements may lead to the deployment of OWFs [offshore wind farms], which later cannot be connected into hybrid networks because this would lead to interoperability problems (such as stability or voltage problems)" [13]. The lack of adequate rules can also hinder a cost-effective deployment of these infrastructures.

Another future frontier that may be applied to hybrid systems connections is AC-hubs, small/medium size offshore AC grids used to connect offshore generation, storage, and loads. These hubs may be connected to onshore networks, part of the energy system of one or more Member States, via HVDC. By now, there are both technological and regulatory constraints. "The grid connection network codes (NC RfG, NC DC and NC HVDC) have been developed assuming the presence of a sufficient amount of inertia and are, as such, not applicable to island systems. Hence, a straightforward extension of this legal framework is likely impossible for offshore networks made of AC-hubs" [13].

ACER and CEER suggest assessing the constraints and bottlenecks encountered by existing hybrid offshore systems, like Kriegers Flak Combined Grid Solution[3], and, consequently, to make national HVDC requirements more harmonised, considering additional requirements in the NC HVDC to

[3] See details on ENTSO-E website: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://eepublicdownloads.entsoe.eu/clean-documents/tyndp-documents/TYNDP%202016/projects/P0036.pdf

guarantee security and cost-effective development of DC meshed grids and AC hubs. This process would probably go through a revision of different network codes (NC RfG, NC DC and NC HVDC), in which it will be necessary to involve all stakeholders and related institutions (TSOs, NRAs, ACER, ENTSO-e, GC ESC, the EC).

Furthermore, of course, the more the DC meshed grid will grow, involving new technologies like AC hubs, the more complex the hybrid system will become, implying the necessity of regional coordination that may use the establishment of offshore Independent System Operators (ISOs) by interested TSOs and NRAs. ACER and CEER consider regional coordination and ISOs as useful instruments to face the technical challenges and the management of complex infrastructures with DC, AC and variable wind generation. ACER and CEER recommend creating an ad hoc group to collaborate among TSOs and NRAs of different Member States, also amending, if necessary, System Operation NCs, and so working with SO ESC.

In addition, developing the offshore grid and generators requires the revision of network development principles. However, ACER and CEER emphasise that new hybrid systems should develop in synergy with the ongoing network development processes, avoiding working separately offshore and onshore, which would lead to mismatches among the grids (e.g. ACER and CEER suggest also using the same cost-benefit analysis -CBA- methodology, not to incentivise investments for not sensible reasons). Strong regulatory supervision is also recommended, adopting a proactive top-down approach to prevent inefficient infrastructure development (as occurred in Great Britain).

Concerning governance aspects, ACER and CEER suggest establishing offshore bidding zones as simple and quick as possible, considering more long and complex procedures only if necessary, such as in case of a lack of agreement between the TSOs and the Member States involved in a multinational zone. Besides, regarding multinational offshore bidding zones, ACER and CEER agree that the governance of such zones should preferably be established on a voluntary basis and according to the methods agreed by the interested stakeholders. Only if needed, if cooperation does not work effectively, not keeping pace with deployment, the EU legislation could be used to ease the process. An EU legal framework would support the development of hybrid systems and provide more stability and certainty. Looking at best practices like the Germany-Austria-Luxemburg multinational bidding zone and the Single Electricity Market in Ireland (SEM) is important.

Finally, the regulators strongly emphasise the role of top-down and gradual governance.

“The need for more top-down governance increases when the offshore grids gradually become meshed, as this raises new challenges for network development, financing (cost sharing) and system operation. Common bodies such as ISO or RSC performing these tasks and regulated by regional or EU regulatory bodies are needed to address these challenges” [13]. Also, considering that “not all the challenges are known and understood. The appropriate solutions could be developed and implemented gradually by addressing the foreseeable challenges” [13].

ACER and CEER do not need specific solutions regarding offshore RES's network development and financing. The existing framework of ten-year network development plans (TYNDP), CBA methodology

and cost allocation principles provide a good starting framework for addressing the challenges arising from offshore projects

3.2.2 The TSOs' point of view

ENTSO-E, in the more recent Vision [14], summarizes in 4 key elements which are necessary to achieve a power system fit for a Carbon Neutral Europe:

1. the development of a significant system flexibility, both short and long duration;
2. Secure and efficient operation in future grids;
3. Energy infrastructure and investments;
4. Market design.

For all these reasons, ENTSO-E generally agrees with the EU Commission about its proposals to optimise the current Electricity Market Design [15]. In particular, in order to foster renewable energy generation, the use of flexibility solutions and innovation, ENTSO-E supports:

- The promotion of well-designed 2-ways Contracts for Differences and Power Purchasing Agreements;
- The conservation of the European short-term markets (day-ahead, intraday and balancing) to maintain efficient use of generation and flexibility resources;
- The establishment of flexibility needs assessments together with system adequacy studies to lead market design choices, investments and innovation in all sources of flexibility;
- An upgraded regulatory framework for TSOs to recognise ad enable investments in new transmission assets by TSOs.

However, ENTSO-E underlines some possible critical issues in the EC EMD reform proposal related to RES (and offshore) in the power system:

1. The need of simplification of the framework for Capacity Remuneration Mechanisms (CRMs) that is essential to support investments in resources needed to ensure the system adequacy;
2. The market distortion in using congestion income to support offshore generators in hybrid projects that implies a non-transparent subsidy paid by consumers to specific producer category.

From its perspective, ENTSO-E identifies six key challenges before the large scale roll-out of offshore wind [16].

1. Costs of massive investments for off and onshore transmission infrastructure;
2. Need of a coordinated maritime and onshore spatial planning;
3. Need of integrated solutions over time, space and sectors for transmission grids and market design to ensure affordability, sustainability, security, timeliness and reliability of power supplies;
4. Attention to system balancing;
5. Possible issues on system security related to effects on frequency stability, voltage stability, admissible line loading and voltage profiles considering very high shares of variable RES in the system;

6. Consideration of environmental protection and public acceptance.

Regarding system balancing, ENTSO-E points out that a massive share of variable RES calls for “more advanced flexibility products in balancing markets to satisfy operational flexibility — e. g. ancillary services. This operational flexibility can be provided by other sectors as well. Thus, while a high share of offshore wind unlocks the potential to decarbonise other sectors on the one hand, these sectors are, on the other hand, able to deliver important services to the electricity sector. A global system view is needed to organise this properly. An efficient market design must ensure maximum alignment of physical reality and markets.” [16]

Therefore, flexibility will be one of the key elements of the power system of the future, together with carbon neutral energy sources and a power grid enabling a fully integrated European Energy Market in the framework of an updated market design.

3.3 Current renewable support policies in Labs for the growth of offshore wind

The UK is the only country among the MARINEWIND partners where the (bottom fixed) offshore wind sector is “well” developed. For this reason, this chapter presents a focus on UK renewables policies.

3.3.1 Focus on the UK model of renewable support policies

Renewable energy projects play a vital role in tackling climate change and shifting towards a sustainable energy future. However, projects often encounter significant policy and regulatory challenges that impede their development and implementation.

Supportive policy and regulatory framework are required to provide clarity, stability, and incentives to enable an environment for investment and project development. However, several challenges persist, including inconsistent policies, complex permitting processes, grid integration issues, and inadequate incentives.

Addressing these challenges is crucial for the growth of renewable energy projects, including floating offshore wind projects. Overcoming these obstacles is key to establishing stability in the industry, allowing UK projects to lead in large-scale commercial floating offshore wind efforts. This progress brings us closer to achieving a net-zero emissions goal, strengthening energy security, supporting local supply chains, and improving our grid system for the future.

In the UK, challenges faced by floating offshore wind projects and other renewable technologies, such as fluctuating commodity prices, inflation, permitting complexities, and grid timing constraints, contribute to uncertainties in cost estimates.

3.3.1.1 UK Offshore Wind Market Overview:

The UK boasts the most offshore wind installations, with seven of the ten biggest wind sites. With 12.7 GW of operational capacity across 44 wind farms totalling over 2,500 turbines and plans to increase to 20 GW by the mid-2020s, the UK is expanding its offshore wind energy infrastructure. The government aims for 30 GW by 2030, with recent plans to increase this target to 50 GW by 2030. However, a report suggests that at least 75 GW of offshore wind may be needed to achieve net-zero greenhouse gas emissions by 2050, emphasising the need for ongoing investment and innovation [17] [18].

The success of offshore wind energy is attributed to tailored support mechanisms, including initial funding, supply chain investments, and Contracts for Difference (CfD). While CfD has supported offshore wind and solar projects, it raises questions about its appropriateness for wave and geothermal power technologies. Additionally, Renewable Energy Certificates (RECs) play a role in tracking renewable energy attributes but require clear guidelines and standardised mechanisms for effective implementation [19].

The Contracts for Difference (CfD) scheme guarantees a strike price for low-carbon electricity generation projects, reducing market volatility and capital costs. CfD contracts are awarded through competitive auctions, supporting offshore wind and solar developments. To promote floating wind

technology, there is a need for a separate CfD pot and investment in infrastructure, especially ports, to provide confidence to investors and ensure timely project development and construction.

Crown Estate Scotland achieved a significant milestone by concluding the world's first leasing round for offshore wind farms dedicated to supplying electricity directly to offshore oil and gas platforms. "17.8GW of floating offshore wind seabed potential was leased through the ScotWind leasing round in 2022, with a further 4.5GW has been announced by the Crown Estate to be leased in the Celtic Sea, which could see rights awarded by the end of 2023" [20].

These leases, known as **INTOG (Innovation and Targeted Oil & Gas),** mark a crucial step towards decarbonising North Sea operations. Of the nineteen received applications, 13 were granted Exclusivity Agreements, ensuring exclusive rights to the sites for further development. Once the INTOG Sectoral Marine Plan (INTOG SMP) is finalized in 2024, approximately £262 million in option fees will be secured. Subsequently, the selected projects will progress through planning, consenting, and financing stages, with successful applicants being offered option agreements.

These INTOG projects boast a total capacity of around 5.4 GW, with an extended seabed lease for 50 years for TOG projects and 25 years for IN projects.

CfD for floating wind: Floating wind projects under CfDs have been limited, with only one successful case. The Twinhub (UK2I) secured a CfD in Allocation Round Four (AR4) in 2022. The project secured a strike price of £87.3/MWh in 2012 prices (equivalent to $€_{2012}$107.7/MWh) for a 15-year period from its expected operational start in 2026/27 [1].

The fifth Allocation Round (AR5) began in March 2023, and, for potential bidders for this and future rounds, obtaining government consent authorisation is crucial for participation in Allocation Rounds.

The government also introduced floating Offshore Wind Manufacturing Investment Scheme to provide funding to support the development of port infrastructure, including facilities equipped with heavy lift capacity, adequate quayside space, and sufficient water depths. These enhancements are vital for activities such as floater fabrication, marshalling, assembly, and the transport and installation of turbines [20].

3.3.1.2 UK Electricity Market Arrangements (History and current):

The electricity market is an effective mechanism linking generators, transmission enterprises, consumers, regulatory bodies, and government policy. The UK Electrical systems date back 140 years, with the first operational community electricity generator operated in 1881. The GB electricity market has gone through continuous reforms from the pool reform in the 1990s to the New Electricity Trading Arrangement (NETA) in 2001, British Electricity Trading and Transmission Arrangements (BETTA) in 2005, splitting transmission function into System Operator (SO) and Transmission Operators (TO). T

- The 1990 Electricity Lighting Act (1899) enabled power companies in the 1990s to supply electricity to authorised users, which is considered the birth of the UK electricity industry.

Power stations were gradually interconnected to provide electricity supply with increased flexibility and security.

- The Electricity (Supply) Act 1919 and Electricity Acts 1922 led to the Electricity Commission appointing Electricity Commissioners and joint electricity authorities to provide central coordination and regional organisation.
- The Electricity Supply Act of 1926 introduced the first significant national coordination: the Central Electricity Board (CEB), which managed electricity generation in a limited number of power stations interconnected by a **national grid**.
- The Electricity Act 1947 established twelve Area Electricity Boards (AEBs) for the distribution and supply of electricity to consumers, replacing separate organisations in England and Wales
- In 2010, the UK National Grid estimated a significant gap between the demand and generation of electricity and the need for investment in the power sector to upgrade the infrastructure and compensate for the gap. New regulations were needed to attract more investors to participate in the UK's electricity market [21].

The National Grid became the Gid Operator, responsible for scheduling and dispatching all power transactions and accommodating a day-ahead wholesale market [22]. All generation units are queued according to the bidding price. Then, based on the load forecasting information and considering the reserve demand of systems, a combination of units is selected. Regarding costs, capacity payments are used as payments to units that keep active. Economic contracts such as **Contracts for Difference (CfD)** are commonly used to reduce uncertainties caused by fluctuations in electricity prices [23]. The CfD, a long-term contract between an electricity generator and Low Carbon Contracts Company (LCCC), enables the stabilisation of the generator's revenue at a pre-agreed level, **Strike Price**, for the duration of the contract. Under the CfD, payments can flow from LCCC to the generator and vice versa, as shown in Figure 6.

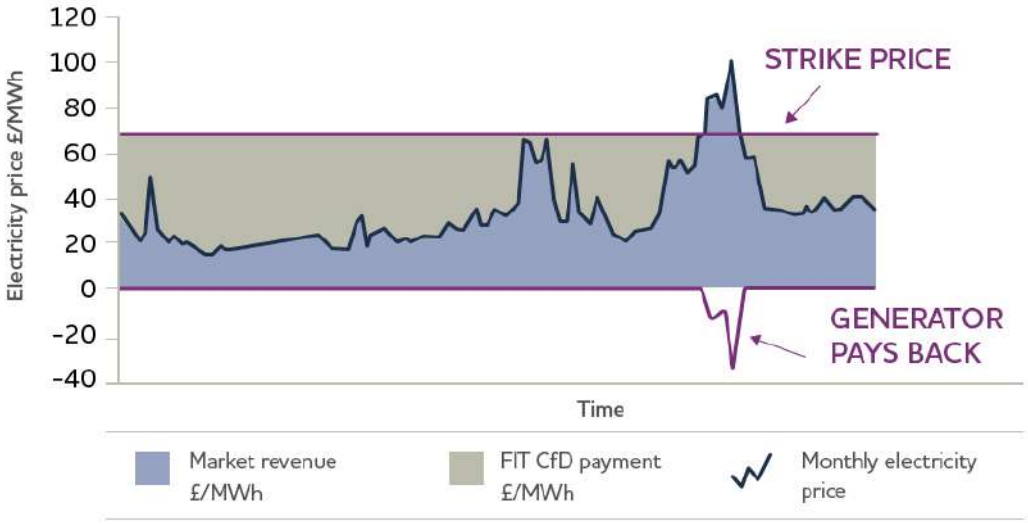

Figure 6- Illustration of payment flow between generator and LCCC under Contract for Difference (CfD) [24]

3.3.1.3 Review of Electricity Market Arrangement (REMA)

In the UK, the government establishes policy direction and parameters, with the National Grid providing analysis as a systems operator. The Department for Business, Energy and Industrial Strategy (BEIS) has overseen these policies since the merger of DECC (The Department of Energy and Climate Change) and the Department for Business, Innovation, and Skills in 2016. The Low Carbon Contracts Company (LCCC) handles CfD contracts and financial transactions, while the Electricity Settlements Company (ESC) manages the Capacity Market (CM)-)-related financial transactions, including capacity payments and collateral control. This is illustrated in Figure 7

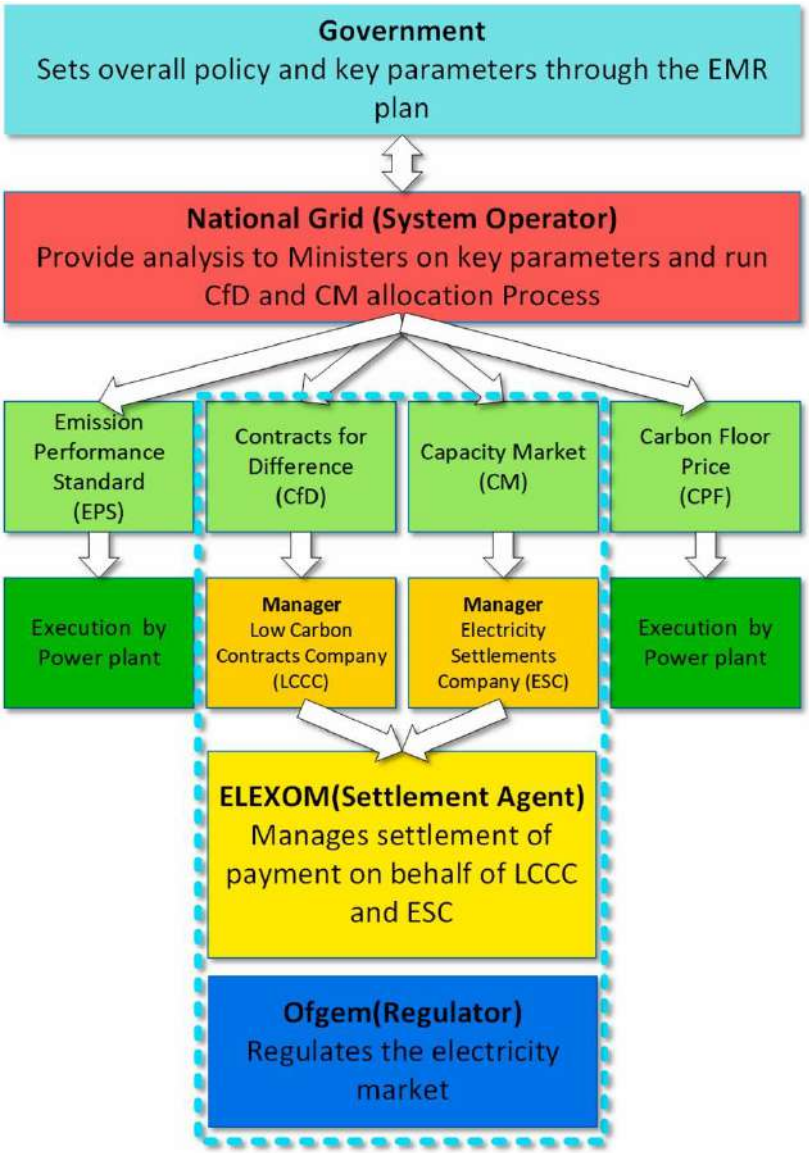

Figure 7: Illustration of the EMR mechanism [25]

Reaching Net Zero by 2050 necessitates a substantial transformation in our electricity sector. This transformation relies on reducing reliance on fossil fuels, lowering financing costs through government-supported Contracts for Difference (CfDs), increasing investments in renewables, and modernising our systems and markets to integrate renewable energy sources into the grid seamlessly.

Hence, the government initiated a consultation called the Review of Electricity Market Arrangements (REMA) to reform electricity markets in the summer of 2022. The goal is to reduce dependency on fossil fuel prices, protect consumers from price fluctuations, promote renewable energy, and enhance consumer protection. The consultation covered all non-retail electricity markets from July 18 to October 10, 2022. An update from the Department for Energy Security & Net Zero (DESNZ) is expected soon, outlining the feedback from stakeholders and the direction for the next phase of the review.

The reforms aim to stabilise long-term electricity markets and encourage the integration of renewable energy sources like floating offshore wind [26], [27]. A comprehensive approach is required to transform the existing electricity market structure while implementing specific policies to facilitate the integration of Floating Offshore Wind Turbines into the energy landscape, including:

- The reform of electricity market design implies making significant changes to the fundamental structure and functioning of the current electricity market. This reform could involve revising regulations, policies, and market mechanisms to adapt to the evolving energy landscape. It might include:
- Flexibility Enhancement: Introducing mechanisms to enhance the flexibility of the electricity grid. This could involve incorporating advanced technologies, such as smart grids and energy storage solutions, to accommodate the intermittent nature of renewable energy sources like FOWTs.
- Market Diversification: Creating diverse market options, such as long-term contracts, dynamic pricing, and spot markets, to accommodate various stakeholders, including consumers, producers, and investors. These options provide flexibility for FOWT projects to secure investments and for consumers to choose renewable energy sources.
- Grid Modernisation: Upgrading the existing electrical grid infrastructure to integrate renewable energy sources efficiently. This includes improving transmission and distribution networks, ensuring grid stability, and minimising energy losses during transmission.

Implementing Support Policies involves implementing specific measures, incentives, and regulations to encourage the deployment and growth of Floating Offshore Wind Turbines. These policies might include the following:

- Subsidies and Incentives: Providing financial support, tax incentives, or subsidies to FOWT developers to make their projects economically viable. These incentives can attract investments and lower the overall costs of FOWT projects.
- Research and Development Funding: Allocating funds for research and development in floating offshore wind technology. Investing in innovative solutions can lead to technological advancements, making FOWTs more efficient and cost-effective.

- Streamlined Permitting Processes: Simplifying and expediting the permitting processes for FOWT projects. Reducing bureaucratic hurdles can accelerate project timelines, making it more attractive for investors and developers.
- Grid Connection Support: Offering support for connecting FOWT projects to the electrical grid. This could involve grid infrastructure investments or policies prioritising renewable energy sources in grid connection decisions.
- Capacity Building and Training: Training programs and capacity-building initiatives to educate professionals in floating offshore wind technology. Skilled workforce availability is crucial for successfully implementing and maintaining FOWT projects.
- Market Guarantees: Ensuring market guarantees for FOWT-produced electricity. Guarantees such as power purchase agreements (PPAs) provide revenue certainty, making it easier for developers to secure financing for their projects.

By combining the reform of electricity market design with targeted support policies, governments and regulatory bodies can create an enabling environment for the widespread adoption of Floating Offshore Wind in the UK. This integration not only promotes clean and sustainable energy but also contributes to the overall reduction of greenhouse gas emissions and the transition towards a more environmentally friendly energy sector.

3.3.1.4 Role of Long-term Governmental Policy

In summary, the floating offshore wind industry requires a stable, long-term policy framework to achieve its goals and ensure certainty. This necessity spans various crucial areas:

- CfD Mechanism: Establishing a distinct category for floating wind within the CfD mechanism is critical. Clarity on the definition of floating technology and the implementation of phased CfD for floating projects, akin to fixed projects, are essential.
- Infrastructure Investment: Significant investment in port infrastructure, exemplified by initiatives like FLOWMIS and Green Freeports, is vital for project development. However, a disconnect exists between the timing of investments and project milestones. Investors need confidence that projects will progress as planned, which requires alignment between investment schedules and project developers' milestones, such as consent, CfD, and FID.
- Grid System Preparedness for the Future: To meet governmental targets for floating offshore wind and renewable energy, there must be a focus on developing a grid system suited for the 2030s and beyond. This necessitates substantial investments in electrical infrastructure and policy reforms to facilitate a holistic and coordinated network design. The current diverse connection regimes (radial, offshore non-radial, transmission operator, interconnector) could create disparities between projects without the right policies. Achieving this comprehensive network design will take time. Still, developers require prompt certainty to order essential electrical infrastructure components within the necessary timeframe

4 CONCLUSIONS

This initial analysis of the consenting process, support policies, and Energy Market Design at both the partner country and European levels has revealed significant needs within the floating offshore wind industry. While our assessment is preliminary, several crucial requirements have emerged:

- **Development of a European-wide Permitting Process:** A unified and consistent permitting process, including coordinated Marine Spatial Planning (MSP), is essential. This approach will provide a secure environment for developers and foster the growth of a well-organised European supply chain.
- **Implementation of Full-Scale Floating Offshore Wind Pilot Sites:** Establishing full-scale pilot sites, especially in the Mediterranean Sea, is imperative to deepen our understanding of the environmental impacts associated with floating offshore wind projects.
- **Clear Support Policies**: Clear and robust support policies, such as Contracts for Difference (CfD) and Power Purchase Agreements (PPA), are vital. These policies are instrumental in enhancing the economic viability of floating offshore wind, particularly during its pre-commercial phase.
- **Development of a Robust Grid System:** Both onshore and offshore grid systems must be prepared to accommodate a substantial volume of variable renewable energy. This preparation should be aligned with a cross-border and integrated vision.
- **Reviewed Energy Market Design:** An updated and efficient Energy Market Design is essential to serve as a robust framework for the floating offshore wind industry.

These aspects will be thoroughly explored and discussed in co-creation workshops involving stakeholders. Furthermore, throughout the entire duration of the MARINEWIND project, we will maintain continuous monitoring of the regulatory framework. This ongoing assessment will enable us to incorporate necessary changes and guidelines, facilitating the seamless integration of floating offshore wind into the energy landscape.

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[25] L. e. a. Jingi, "Evolution and reform of UK electricity market," *Renewables and Sustainable Energy Reviews,* vol. https://doi.org/10.1016/j.rser.2022.112317, p. 112317, 2022.

[26] Council of the EU, "Reform of electricity market design: Council reaches agreement," 17 10 2023. [Online]. Available: https://www.consilium.europa.eu/en/press/press-releases/2023/10/17/reform-of-electricity-market-design-council-reaches-agreement/#:~:text=The%20reform%20aims%20to%20make,energies%20and%20improve%20consumer%20protection.. [Accessed 20 10 2023].

[27] T. L. &. T. Chapelle, "REMA is too important to be kicked into the long grass," 2023. [Online]. Available: https://es.catapult.org.uk/insight/rema-is-too-important-to-be-kicked-into-the-long-grass/. [Accessed 20 10 2023].

6 ANNEX 1 – CONSENTING PROCESS COUNTRY SURVEY

6.1 Greece

Section 1 Legislative aspects

1) *Which authorities are competent to issue the authorisation for the construction, operation and decommissioning of offshore wind power plants in your country? If relevant, specify which authority is responsible for the seabed providing details about the latest leasing round and any planned future leasing round.*
Please provide a description of the competent authorities and their specific tasks

In the Greek seas, the rights to carry out activities regarding the exploration and deployment of offshore wind farms (OWF) pertain exclusively to the Greek state.
The entity responsible for OWF projects, on behalf of the Hellenic State, is the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA)[4] in so far as the management of rights is concerned regarding the research, exploration, and identification of organised development areas for OWFs, in addition to the assignment of research rights to third parties within said development areas.
Other key organisations within the development of the sector include the Independent Power Transmission Operator (IPTO)[5] and the Regulatory Authority for Energy (RAE)[6]. IPTO is responsible for the development of links between the transmission grid and OWFs, including the design, development, installation, and operation of interconnections between the Hellenic Electricity Transmission System (HETS) to the OWF Organised Areas Development (OWFODA). RAE, on the other hand, is in charge of organising a competitive tender process for the granting of operational aid for each OWFODA.

2) *Is there any specific legislation for floating offshore wind farms?*

Law 4964/2022, Chapter H': "FRAMEWORK FOR THE DEVELOPMENT OF OFFSHORE WIND PARKS"[7]
The legal framework for the development of offshore wind plants/farms/parks in Greece was introduced in July 2022 by Law No. 4964/2022. It regulates the main steps of the licensing and approval procedures, the authorities in charge and provides authorisations to the Ministry of Environment and Energy and other ministries for further, more detailed regulations. It should be noted that the offshore area extending south of the coastline of the Regional Unit of Evros and north-northeast of Samothrace Island is being prioritised as an Organised Area for OWF Development, as it was designated by Law 4964/2022 as a pilot area for OWF development

[4] https://herema.gr/
[5] https://www.admie.gr/en
[6] https://www.rae.gr/?lang=en
[7] https://www.taxheaven.gr/law/4964/2022

with a total capacity of up to 600 MW. In the national legislation, there are no specific references for floating offshore wind farms although it has been widely recognized that the available marine areas in Greece would be ideal for the operation of floating offshore wind farms. Specific references from the Greek regulatory framework for the development of offshore wind farms are highlighted below:

Article 66. The Greek State has the exclusive responsibility for the exploration, search and determination of the Organized Development Areas of Offshore Wind Farms (ODAOWF) and OWF Installation Areas as well as to grant the rights for research and exploitation within the ODAOWF. The above responsibilities are exercised by the Minister of Environment and Energy. The management on behalf of the Greek State of the rights deriving from the exercise of the responsibilities in assigned to the limited company under the name Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA) of **article 145 of Law 4001/2011 (A' 179)[8].**

Article 67. The planning and development of the Offshore Wind Farms (OWF) activity is carried out in accordance with:

(a) the country's energy planning and goals, as reflected in the National Energy and Climate Plan **(NECP, B' 4893/2019)[9]**,
(b) the wider planning of the country for the protection of the environment and biodiversity,
(c) the country's spatial planning, including the National Spatial Strategy for land, the Special Spatial Framework for Renewable Energy Sources (RES), of **Article 13A of Law 4269/2014 (A' 142)[10]**, the National Spatial Strategy for the Maritime Space and Marine Spatial Frameworks of **Law 4546/2018 (A' 101)[11],** as well as the international practices and the findings of the evaluation report of the Special Spatial Framework for RES, of **paragraph 4 of Article 5 of Law 4447/2016 (A' 241)[12],**
(d) the requirements of national security
(e) other criteria, such as the existence of monuments and shipwrecks, marine and underwater critical infrastructures, marine areas subject to restrictions, maritime traffic to ensure the terms and conditions of safe navigation, the development of the Hellenic Electricity Transmission System (HETS), as well as criteria related to production and development activities.

The National Program of OWF Development sets the national guidelines for the planning, development, siting, installation and operation of OWF, medium and long-term installed capacity targets for OWF Projects as well as includes the areas that can host OWF projects as potential ODAOWF and assesses the power of OWF projects that can be installed in them.

[8] https://www.e-nomothesia.gr/energeia/n-4001-2011.html
[9] https://www.elinyae.gr/en/node/62243
[10] https://www.taxheaven.gr/law/4269/2014
[11] https://www.taxheaven.gr/law/4546/2018
[12] https://www.taxheaven.gr/law/4447/2016

The OWF Agency (HEREMA) is responsible for the preparation of a Technical and a Strategic Environmental Impact study, which submits to the Department of Environmental Licensing of the Ministry of Environment and Energy.

A*rticle 69.* Right to apply for issuance of a OWF Research Permit have natural or legal persons established in:

a) a member state of the European Union
b) third countries that have concluded multilateral or bilateral international agreements with EU in the field of RES.

Article 70. The OWF Research Permit cannot be transferred to other natural or legal persons by its owner and the installment of an OWF project is allowed exclusively to the owner(s) of the OWF Research Permit for the ODAOWF in which the Permit refers to.

3) *How long is the duration of the sea occupation permit for an offshore wind farm in your country?*

Certificate for up to **30** years, which can be renewed for up to an equal period.

4) *Is there maritime spatial planning (MSP) in your country that includes offshore wind? If yes, is it part of the authorisation process?*

To date, there is no legally binding national Maritime Spatial Planning plan in Greece, but only some special spatial planning frameworks that refer to maritime issues. The first local MSP of the country submitted to the Ministry of Environmental and Energy in January 2023, referring to the area of North Aegean. The announcement of the remaining three local MSPs is expected as well as the cabinet act on the Marine Spatial Planning Strategy.

According to **Paragraph 1 of Article 67 of Law 4964/2022 (A'),** the planning and development of the Offshore Wind Farm (OWF) activity is carried out in accordance with the spatial planning of the country, including the National Spatial Strategy for the Marine Area and Marine Spatial Frameworks of Law 4546/2018 (A' 101).

5) *Are transboundary aspects regulated by legislation? Which ones? Please provide a summary of the main issues*

Transboundary aspects result from cooperation with EU members or/and third countries and they are regulated by legislation and specifically according to the **Articles 11 and 12 of the Law 4546/2018 (A').**

According to the **Article 11 (article 11 of Directive 2014/89/EU[13]),** as part of the planning and management process, the competent authority (Minister of Environment and Energy or the competent authority granted by him) cooperates with the respective competent authorities of the member states of the European Union with which the Hellenic Republic shares marine waters, in order to ensure that marine spatial planning is coordinated and has coherence throughout the maritime area in question. Cooperation takes into account, in particular, issues of transnational nature and is sought through:

a) the existing regional institutional cooperation structures, such as regional conventions on the sea, and/or
b) networks or structures of the competent authorities of the member states, and/or
c) any other method that meets the conditions of Article 11 (p.1), such as in the context of sea basin strategies.

According to the **Article 12 (article 12 of Directive 2014/89/EU),** the competent authority (Minister of Environment and Energy or the competent authority granted by him) when developing actions concerning marine spatial planning in the relevant marine areas shall make every effort to create a framework for cooperation with third countries, in accordance with international law and international conventions, such as by making use of existing international forums or with regional institutional cooperation, among which the Regional Convention for the Mediterranean Sea (Barcelona Convention) is included.

6) *Provide details about the regulation and the relevant authority for the connection between the FOWT plant and the onshore grid.*

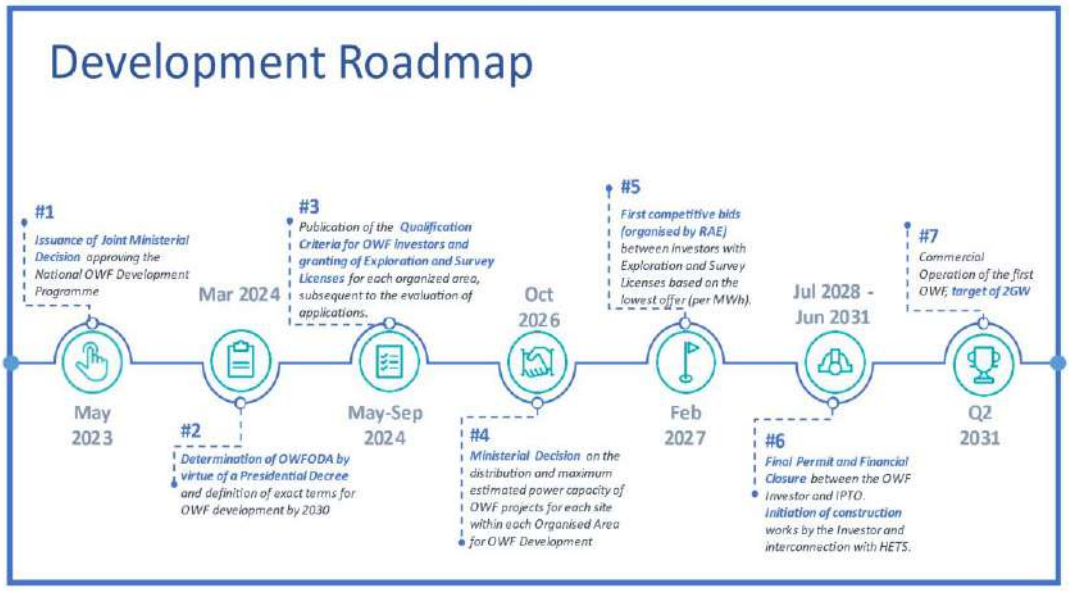
The process of connecting the FOWT plant with the onshore grid is in accordance with Article **74 of the Law 4964/2022 (A').** Under this scheme, a Coordinating Committee for the Connection and Development of OWF projects is set, whose mission is to support the OWF Agency and facilitate its cooperation with the Independent Power Transmission Operator (IPTO) as well as the Regulatory Authority for Energy (RAE) and the other competent bodies for the development of the OWF.

The IPTO is exclusively responsible for the planning, development, construction and operation of interconnection projects from the Greek Electric Transmission System (GETS) up to and including the Interconnection Point of ODAOWF. The construction cost burdens the IPTO and recovered from it through the System Usage Charges.

7) *Please provide any additional relevant information.*

Greece has announced a target for 2GW Offshore Wind farms until 2030. To successfully accomplish this target, although very optimistic, a development roadmap has been set up, having seven critical milestones for the upcoming years.

[13] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.257.01.0135.01.ENG%20



Floating Offshore technologies are widely acknowledged as a game changer in Greece mainly due to (i) rapid developments in technology, costs and projects; (ii) exploitation of domestic experience and local industrial base (shipyards, cables, etc); and (iii) significant domestic value (WTGs less than 40% of CAPEX).

The development of offshore wind farms is projected to significantly support the implementation of the policy objectives related to the promotion of RES, while the new technology of floating wind turbines is expected to significantly expand the spatial possibilities of their installation in Greece.

Section 2 Technical aspects

8) *How many steps does the authorisation process comprise?*
Please describe the steps, the estimated timeframe of each step and the documentation to be submitted

Greece's Law 4964/2022 on the development of offshore wind farms (OWF) sets forth a six-step licensing procedure that takes approximately three (3) years:

Step 1. Granting Exploration and Licenses within OWF Organised Development Areas - OWFODA (Art. 69 and 70 of Law 4964/2022).

HEREMA has been tasked with the designation of OWFODA. This mandate entails ensuring that wind projects in the Greek seas are subject to the most stringent international standards of environmental and marine protection. Conducting research and preparing technical studies

and measurements necessary for the planning, development, installation and operation of OWF in each ODAOWF is allowed to those who have been granted an OWF Research Permit, after the relevant application to HEREMA.

Step 2. Tender for exploration Licenses

Two (2) months following the designation of the Organised Areas for OWF Development and the issuance of the relevant Presidential Decree, HEREMA will establish the launch and deadline for the submission of applications by interested investors for Exploration Licenses within the OWFODA. Each application period has two (2) months duration. New application submission periods may start after six (6) months have passed from the end of the aforementioned two (2) months. Investors will be entitled to apply for an Exploration License in more than one OWFODA, and applications will be submitted through a digital platform overseen and managed by HEREMA.

Step 3. Eligible Investors

Eligible applicants include natural persons or legal entities established in an EU Member State or third countries that have entered into multilateral or bilateral international agreements with the EU in the renewable energy sector. All eligible applications will be evaluated by HEREMA based on specific criteria with respect to their professional, technical, and financial competence.

In terms of professional and technical ability, it is required as a minimum:

a) Proven experience within the last ten (10) years in the development of OWF Projects, of which at least one OWF Project with a capacity of one hundred (100) MW, and

b) proven experience in operation and maintenance of hydropower projects with a capacity greater than twenty-five (25) MW.

In terms of financial and economic adequacy, the following are required as a minimum:

a) annual turnover of the natural or legal person or its shareholders and related parties, in which case the cumulative turnover is taken into account, which is greater than two billion euros (€2,000,000,000), for at least one (1) year within the last three years.

b) a ratio of equity to loan capital greater than twenty percent (20%), and

c) submission of the guarantee letter of article 71 of Law 4964/2022 (A').

Step 4. Exploration Licenses

HEREMA may request within ten (10) working days from the submission of the application any clarifications or additional documents, otherwise the application is considered complete. If all criteria are met, HEREMA will issue the corresponding Exploration License within thirty (30) days from the submission date, which will automatically expire after three (3) years from the

date of its issuance, upon the relevant request from its owner, or upon a decision to cancel said license. The issuance of an Exploration License will require the submission of a letter of guarantee (€10,000/MW). The Exploration License cannot be transferred to other natural or legal entities by its owner(s) and the installation of an OWF Project is allowed exclusively to the owner(s).

Step 5. Public Consultation

Within a period of two (2) years from the end date of the first round of applications for Exploration Licenses, HEREMA will launch a public consultation for the OWF installation areas within each OWFODA. These areas will be determined by a relevant Ministerial Decision.

Step 6. Bidding Process and Exclusive Licensing for OWF Development.

Within four (4) months from the issuance of the relevant Ministerial Decision, a competitive bidding process will be launched by the Regulatory Authority for Energy (RAE) for the installation of OWF projects and the granting of operational aid on the basis of a sliding feed-in-premium. Investors will be called upon to submit distinct bids for each OWF installation area (within the OWFODA), for which such investor holds a previous Exploration License. At this stage, the selection criterion will be the lowest bid price (in €/MWh) for the compensation of the energy produced through the OWF project, developed within the OWFODA. The successful investor will be granted the exclusive rights for the licensing, development, and exploitation of the OWF project. The competitive tendering procedures continue until the total tendered capacity is covered.

9) *Provide details about the technical issues related to the electrical connection between the FOWT plant and the onshore grid. Please provide a summary.*

The Independent Power Transmission Operator (IPTO) prepares a strategic planning study for the development of the required Interconnection Projects of ODAOWF and submits to RAE for approval the necessary amendments to the current Ten-Year Development Program, as well as an estimate of the budgeted cost of developing these networks. RAE monitors and evaluates the implementation of schedules of the ODAOWF Interconnection Points and takes measures to ensure their completion. After request from HEREMA, IPTO issues a decision to reserve electrical space for the connection to Greek Electric Transmission System (GETS) and then, the successful tenderers submit to IPTO an application for the issuance of a definitive connection offer. Each OWF Investor bears the cost of the construction of the OWF Investor Interconnection projects, as specified in the final connection offer issued by IPTO.
The electrical system of an offshore wind farm and its connection to the grid is divided into three parts: (i) the internal connection of the park where, after the wind turbines are divided into clusters, each cluster is connected to the offshore substation, (ii) the connection of the offshore substation (if any) to the onshore substation, and (iii) the connection of the latter to

the onshore grid. A technical issue regarding the energy transfer is the selection of HVAC or HVDC technology. Considering each technology's attributes (OWF scale, distance from land, cost, length and number of cables, magnetic field, converters, loses, effects on the grid), the choice of connection method is quite complicated and requires special study for each OWF case. In addition, there is no suitable infrastructure (land or underwater) regarding the connection to the onshore grid, due to the immature level of development of OWFs in Greece. However, the Independent Electricity Transmission Operator in cooperation with the competent bodies for the OWF development will elaborate the infrastructure planning and development in the upcoming years, based on the recent framework for the development of OWFs.

10) Concerning the environmental impact analysis, what are the minimum requirements to be met?

According to the law **4964/2022 (Art. 68, Par. 4 & 5),** the technical study of every OWFODA should be submitted from HEREMA to the Department of Spatial Planning of the Ministry of Environment and Energy. Each technical study is submitted, by HEREMA, to a Strategic Environmental Assessment process through a Strategic Environmental Impact Study. In this study, the effects of the development of OWFs in the area are assessed. Then, HEREMA submits the Strategic Environmental Impact Study to the Environmental Licensing Directorate of the Ministry of Environment and Energy. The overall process to be followed could be described in 3 main steps:

1. The National Program for the Development of Offshore Wind Parks is established through a Joint Ministerial Decision and has as its purpose the process of regulating the ODAOWF in the context of the country's energy policy and the commitments it has undertaken at the European level. A Strategic Environmental Impact Study (SMBE) at National Level is mandatory.
2. By presidential decrees, following a proposal by the Minister of Environment and Energy, the ODAOWFs are delineated and the development conditions of the OWFs are defined. A SMBE at local level per ODAOWF is mandatory.
3. Allocation of OWF installation areas and approval of maximum power per OWF in the ODAOWF. N Environmental Impact Study at project level (per OWF) is mandatory for the Environmental Licensing.

Some of the main challenges for the Greek seas concerning the environmental impact analysis are highlighted below.

The installation of OWF within environmental protected areas, as they emerge from international conventions (e.g., Ramsar Convention on Wetlands, NATURA 2000 Network) and the National Law (established marine or underwater parks), is subject to restrictions. Considering that, the distance of OWF from the protected areas consists of a major criterion for evaluating the sitting areas in order to ensure the maximum possible limitation of the impacts as a whole on a country scale. In addition, particular risks and obstacles appear to arise for the avifauna and marine fauna. Under this scheme, the requirements to be met for the installation of OWF take into account the possibility of: (i) losses due to crashing, (ii) obstruction and obligation to change course and (iii) formation of obstacles in migratory

corridors. The potential environmental impacts are assessed through Special Ecological Assessment Studies (SEAS), including Special Ornithological Study. Finally, the installation and operation of OWFs may disturb and affect the behavior or migration routes of marine mammals and other species. Assessment of potential effects on fauna can be conducted through dedicated SEAS. These studies can be carried out during the construction of OWF as well as the operation of the OWFs. Furthermore, measurements regarding the Sea conductivity, temperature, chlorophyll-A Dissolved O2, Salinity, PH and underwater noises must be taken into account, along with aqua life and birds monitoring (e.g. radar). Regarding marine antiquities, their protection is deemed necessary.

11) *Concerning the operation and maintenance phase, is there any specific regulation in your country?*

N/A

12) *What is the legislation for the farm's end-of-life? Is a decommissioning plan required? Please indicate if there are special rules for site conditions after decommissioning is implemented*

N/A

13) *Are stakeholder consultations performed during the authorisation process? If yes, please specify details in the table below:*

Stakeholder category	**Phase of the authorisation process**	**Type of opinion requested (mandatory, non-mandatory)**	**Methodology (notice published online, organisation of specific events etc.)**
Public	Step 5. Public Consultation	Mandatory	Notice published online

14) *What are the economic costs associated with the consenting process (if any)? Please specify the total cost or the cost for individual steps if relevant.*

Steps 1, 2, 3, 5 and 6 have no economic costs associated with the consenting process.

Step 4. Exploration Licenses

a. The application for the issuance of a Research License is accompanied by a one-time proof deposit of the Offshore Wind Research License Fee which comes in the amount of ten thousand euros (€10,000).

b. The application for the issuance of a Research License is accompanied by the letter of guarantee, the amount of which is set at ten thousand euros per megawatt (10.000€/MW).

15) Please provide any additional relevant information.

N/A

Section 3 barriers and enablers

16) *Provide a list and describe the most critical barriers and bottlenecks of the consenting process in your country.*

Barrier number	Type (technical, political, administrative etc.)	Description
1	Political	Interstate disputes with neighbouring countries regarding national borders and the exploitation of maritime areas within them.
2	Environmental	Several Special Ecological Assessment Studies needed to approve the environmental impacts on seas and avian fauna.
3	Technical/ administrative	Strict professional and technical criteria as well as financial competence for the applicants.
4	Administrative/ technical	There was no legislation regarding the Offshore Wind Farms in Greece until July 2022. Thus, the maritime spatial planning was underdeveloped so far.
5	Environmental	There is a large number of protected areas due to several activities within them (aquaculture, tourism, military areas, maritime heritage, fishing, shipping etc.) as well as areas where several animal species (fish, birds etc.) are hosted.

17) *Are simplification measures for the consenting process currently being developed/implemented in your country? If yes please give a brief description of those currently being implemented*

N/A

18) *Provide a list and describe the most relevant enablers of the consenting process in your country.*

Enabler number	Type (technical, political, administrative etc.)	Description
1	Administrative	Formation of Coordination Committee for the Connection and Development of OWF projects, with the aim to support HEREMA and to facilitate its cooperation with IPTO, RAE and the other competent bodies for the development of OWF
2	Technical	Maturation of Organised Development Areas for OWF projects along with the new Law
3	Political/environmental	National target of 2 GW Installed Power until 2030
4	Political	EU recommendations to accelerate the procedures of issuing licenses

Example

19) *If possible provide an example of a completed authorisation process analysing the relevant points: time needed to complete the procedure, barriers/bottlenecks, problems and lessons learnt*

N/A

20) *Are there any other relevant topics to mention that are specific to your country? If yes please provide a short summary*

Significant Expected Investments > 6 billion € by 2030 and > 28 billion € by 2050 - Attracting foreign investments with high Greek added value (67% expected to be part of the Greek economy and from the rest significant part in the EU) are foreseen to the Greek economy by the development of an Offshore Wind Industry.

The legal framework applicable to offshore wind development in Greece is stipulated by Law 4964/2022, dated 30 July 2022, published in the Government Gazette on offshore wind farms (OWF). Article 174 of the Law provides for a special pilot program for the development of offshore wind projects up to 600 MW to be developed in the Thracian Sea. The first pilot offshore wind farm (bottom-fixed) will be constructed in the Thracian Sea, within the first "go-to-area" in Greece, i.e., within a designated area, as foreseen by the Commission's REPowerEU toolkit, where RES projects proceed with fast-track licensing procedures.This pilot program solely concerns holders of existing Electricity Production Licenses or Special Projects Producer's Certificates (or pending ones applied for under the previously applicable regime) for offshore wind projects that are located in part or in whole within the aforesaid development area. The selected pilot area is the marine area of Alexandroupoli City that extends south of the coastline of the Evros Regional Unit and north-northeast of Samothraki. In addition, the Greek state has decided to run the floating offshore wind parks with the method of Pilot projects, otherwise the bureaucracy would be so big that they would not start even in two years. The floating offshore wind parks is a key part of the strategy of the Ministry of Environment and Energy, so it is expected to rapidly promote the creation, with special investment conditions, of 3 or 4 pilot floating offshore wind projects in selected areas. These areas are expected to be the marine areas of Ag. Nikolaos and Siteia in Crete, islands of Kos and Rhodos in South Aegean Sea, another area that extends in the offshore area of the axis Ag. Efstratios-Skyros-Central Evia and an area in Northwestern Ionian Sea.

6.2 Italy

Section 1 Legislative aspects

1) *Which authorities are competent to issue the authorization for the construction, operation and decommissioning of offshore wind power plants in your country? If relevant, specify which authority is responsible for the seabed providing details about the latest leasing round and any planned future leasing round.*

The principal authorities competent for granting the authorization for the construction are: the Ministry of Infrastructure and Sustainable Mobility (MIMS), the Harbour Master's offices (managed by MIMS) and the Ministry of Environment and Energy Security (MASE). Other authorities giving advice to the Ministries during the process are: the Ministry of Culture (MIC), the Regions, Municipalities and the national grid manager (TERNA Spa). Within the new upcoming legislation, the Ministry of agricultural, food and forestry policies (MASAF) is also involved in the specific process for the offshore wind farms installation.
The leasing round procedure is not applicable for Italy.

2) *Is there any specific legislation for floating offshore wind farms? If yes please provide a short summary and references to legislation. If not please indicate which is the reference legislation and provide a short summary of it.*

A specific law has been issued (Legislative Decree n. 199 of 8 November 2021) which implements the EU directive known as RED II. Nevertheless, the corresponding implementing decrees have not been published yet.
Current legislation refers to Article 12 of Legislative Decree No. 387 of 29 December 2003, which implements Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. Legislative Decree 29 provides that:
i) the construction of an offshore wind farm is subject to a single authorization (Legislative decree 152/2006 art.27) for construction and operation (Art. 12, c. 4); ii) the authorization also includes related works and grid infrastructures, such as connection facilities with the coast and the electricity grid, deployment at sea of excavation material derived from the deposition of grid line art. 109 of the legislative decree 152/2006, and landscape assessment art. 146 of the legislative decree n. 42 of 22 gennaio 2004, iii) the granting of the authorization is subject to the prior acquisition of the maritime state concession (Art. 36 of the Navigation Code) / payment of the concession fee.
Article 2(158) of Law No. 244 of 24 December 2007 amended Legislative Decree No. 29 by specifying competent ministries (see answer to question 1 for details) , their role and that wind power plants for electricity production, located at sea, are among the project categories to be submitted to the EIA, of state competence (to note that, for installations on the mainland, a single permit is issued by the region or the provinces delegated by the region if the rated power is lower than 30MW).
Circular No. 40/2012 clarifies the procedure (see answer to question 8 for details)

3) *How long is the duration of the sea occupation permit for an offshore wind farm in your country? Please specify the number of years.*

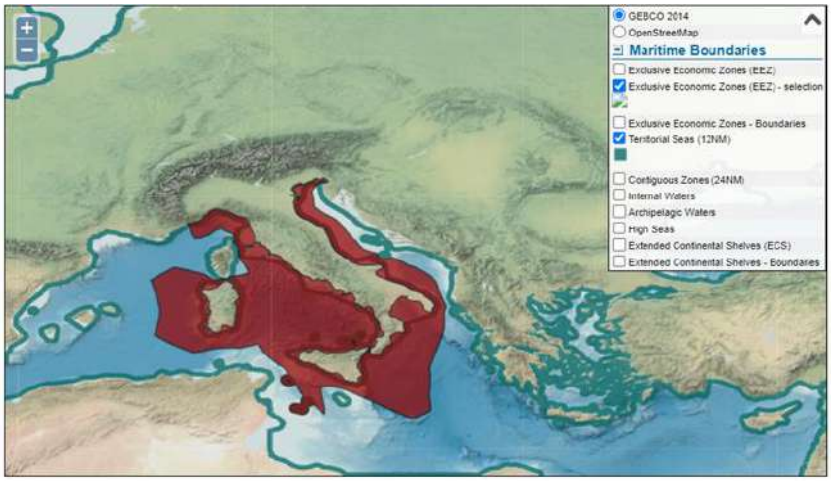
The duration of the sea occupation in Italy is 30 years, which can be renewed with the competent ministry.

4) *Is there maritime spatial planning (MSP) in your country that includes offshore wind? If yes, is it part of the authorization process?*

Maritime spatial planning is about to be launched (we are waiting for the implementing decrees). Within this plan, marine areas with potential vocation for offshore wind installation are identified (Pianificazione Spazio Marittimo: fino al 30 ottobre in consultazione pubblica i Piani di gestione | mit). At the moment, this aspect is not included in the authorisation process. Once approved, the new offshore plants must comply with it as reported in Legislative Decree n.199/2021 . At the moment, considering Article 23 of 199/2021, suitable areas for offshore wind farms could be: i) dismissed Oil&Gas platform locations with 2 NM buffer; ii) ports for 100 MW wind farms.

5) *Are transboundary aspects regulated by legislation? Which ones? Please provide a summary of the main issues*

In Italy, the Exclusive Economic Zone (EEZ)has not yet been declared but there are some treaties with neighbouring countries that regulate the sea area beyond the 12 miles. An agreement with Malta seems still missing.
(https://www.marineregions.org/eezdetails.php?mrgid=5682&zone=eez)
Transboundary impact due to the deployment of offshore wind farms is not considered in the national legislation.



6) *Provide details about the regulation and the relevant authority for the connection between the FOWT plant and the onshore grid.*

The authorization for the connection between the wind farm and the onshore grid is managed within the Environmental Impact Assessment (VIA) process. Specifically, once the environmental impact analyses are sent to the competent authority (MASE), the applicant must receive the General Minimum Technical Solution or STMG, from TERNA, National Grid Electric Transmission (TSO) company, which defines the criteria for grid connection. The STMG, contained in the connection quote, includes a description of the grid facility for connection and the related utility facility for connection (including infrastructure falling in national waters) or the solution for the specific connection. After receiving the authorization for the farm construction, the applicant must request to the TSO the Detailed Minimum Technical Solution (STMD) and get positive feedback. Then, the contract for electrical energy supply is signed.

7) *Please provide any additional relevant information.*

NA

Section 2 Technical aspects

8) *How many steps does the authorization process comprise? Please describe the steps, the estimated timeframe of each step and the documentation to be submitted.*

The authorization process consists of several steps:

1) Application sent to Harbour Master's office and published for comments and observations - 65 days
2) Advice from Ministry of Infrastructure and Sustainable Mobility (MIMS), Ministry of Culture (MIC) and MASE (Scoping)- 60 days
3) Application sent back to Harbour Master's office which gets the advices from Regions, Municipalities and the stakeholders - 180 days
4) Application revised following the Harbour Master's office requirements - 75 days
5) Applicant provides the General Minimum Technical Solution or STMG, to TERNA, National Grid Electric Transmission (TSO) company and must receive positive feedback - 270 days max
6) The applicant issues to the Ministry of Environment and Energy Security (MASE) the procedure to obtain the Single Environmental Procedure (PUA) which includes the Environmental Impact Assessment (VIA). Within the upcoming new legislation the Ministry of agricultural, food and forestry policies (MASAF) is also involved - 60 days (minimum up to 225)
7) Application sent to the Conference of Services (which includes the competent Ministries, the Regions, Municipalities and the national grid manager) - 180 days
8) The applicant receives the authorization for the farm deployment

9) Applicant requests to Terna the Detailed Minimum Technical Solution (STMD) and receives feedback - 150 days
10) Applicant can start the deployment

9) Provide details about the technical issues related to the electrical connection between the FOWT plant and the onshore grid. Please provide a summary.

The main technical issues related to the connection between the FOWT plant and the onshore grid can be summarised as follows.

- AC/DC array and export dynamic cables are needed and are still under development (only the 66 kV AC dynamic cable is in the commercial phase);
- a floating offshore substation (OSS) for deep water > 60 meters, typical of FOWT, is needed which is not yet available (alternatively a fixed OSS for deep water could be considered) ;
- for distance exceeding about 50 km HVDC solutions become more efficient and affordable (for windfarm > 1 GW) and there is not a standard regulation.

10) Concerning the environmental impact analysis, what are the minimum requirements to be met?

The legislation establishes the minimum requirements to be met for the environmental impact assessment. Specifically, a preliminary study must be addressed, which must cover at least the following points:
(a) environmental effects of the project, including cumulative effects, and possible impacts from accidents or malfunctions;
(b) feasibility of technical and economic mitigation measures that can reduce or eliminate adverse environmental effects;
(c) elements not covered in the regulations but deemed necessary by the competent authority;
(d) public consultation concerning the project, i.e., its social acceptance.
Once the environmental impact analyses are sent to the competent authority (MASE), the applicant must receive the General Minimum Technical Solution or STMG, from TERNA, National Grid Electric Transmission (TSO) company, which defines the criteria for grid connection (see answer to question 8 for details)
In addition, depending on where the submarine pipelines run, it is necessary to have the Environmental Impact Assessment (VIncA, art. 5 D.P.R. n. 357/97). This is an act required by European Union law to establish in advance whether projects are likely to have significant impacts on Sites of Community Importance (SIC, 92/43/CEE directive), Special Areas of Conservation (ZSC, 92/43/CEE directive) and Special Protection Areas (ZPS, 79/409/CEE directive). An *ante operam* validated investigation is then required with regard to avifauna/marine mammals and also with regard to meteo-marine measurement.
Finally, an acoustics engineer is required to make *ante operam* noise measurements for all site areas: cable duct and part of the site where the plant is built. The procedure is completed with a reasoned, mandatory and binding, advice issued by the competent authority, which may indicate the submission to VIA or the request for revision. In the latter situation, indication of

the measures necessary to avoid or prevent the impacts that are likely to be significant and adverse is mandatory to pursue the VIA.

11) *Concerning the operation and maintenance phase, is there any specific regulation in your country?*

The regulations for the operational and maintenance phase must be provided by wind farms certification bodies (e.g. RINA). This holds only if the wind farm is located within 12 miles from the national coasts.

12) *What is the legislation for the farm's end-of-life? Is a decommissioning plan required? Please indicate if there are special rules for site conditions after decommissioning is implemented*

This aspect is regulated through the Environmental Impact Assessment (VIA) procedure. Within this process, a preliminary decommissioning plan must be presented. Two years before the farm end-of-life, a detailed decommissioning plan must be proposed and subject to admissibility of Environmental Impact Assessment procedure. A new VIA is required if a revamping plan is envisaged. Differently, only the assessment of the environmental conditions described in the detailed decommissioning plan (and approved by the VIA) must be performed.

13) *Are stakeholder consultations performed during the authorisation process? If yes, please specify details in the table below:*

Stakeholder category	**Phase of the authorization process**	**Type of opinion requested (mandatory, non-mandatory)**	**Methodology (notice published online, organisation of specific events etc.)**
All stakeholders	Application for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Publication at the Notice board of the municipalities and the maritime office interested, regional and national newspapers
Region for admissibility from an urban and planning point of view, for	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)

fisheries protection aspects			
Province for the release of the authorization for interventions submitted to the hydrogeological constraint	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)
Coastal municipality/municipalities for admissibility from an urban planning point of view	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)
Customs district; Civil Engineering Office for Maritime Works for evaluation purposes on the technical suitability of the plants, artifacts and works;	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)
State Property Agency, for the dominical aspects and also as regards the criteria for the determination of the fee	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)
Azienda Sanitaria Locale (local health Authority)	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)

The Superintendency for archaeological heritage (for the possible presence of submerged archaeological assets) and that for landscape assets or other subjects competent in the case of areas subject to such constraints;	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)
Military authorities; Competent Lighthouse Zone Command; Port Authority, where existing, with regard to any interference of the wind farm with the activities and traffic affecting the port areas falling within the jurisdiction of the latter;	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)
Local Sea Fisheries Advisory Commission to know if there are particular and significant fishing activities in the area; Park Authority, where established;	Procedure for the maritime state-owned property	Non mandatory, but observations are taken into consideration if relevant	Online notice board of the Harbour Master (all the technical documentation is available)

14) *What are the economic costs associated with the consenting process (if any)? Please specify the total cost or the cost for individual steps if relevant.*

At present, the costs associated with the consenting process is about 0.1 % of the total value of the farm deployment.

15) *Please provide any additional relevant information.*

NA

Section 3 barriers and enablers

16) *Provide a list and describe the most critical barriers and bottlenecks of the consenting process in your country.*

Barrier number	Type (technical, political, administrative etc.)	Description
1	administrative	The authorization process is too complex and slow, requiring advices from many entities. Optimization is needed.
2	technical	Harbour Masters rejected many projects
3	technical/political	Lack of a consolidated national MSP and its implementation as part of the consenting process
4	Technical / social	Need to reinforce the Floating Offshore Wind value chain, supporting local companies, and creating local jobs and skills.
5	political/legislative	Lack of simplification procedures to shorten the time to complete the authorization process
6	social	No adequate information to citizens and stakeholders on real benefits, costs and impacts of Floating Offshore Wind

17) Are simplification measures for the consenting process currently being developed/implemented in your country?
If yes please give a brief description of those currently being implemented

Simplifying measures are being considered but have not yet been implemented.

18) Provide a list and describe the most relevant enablers of the consenting process in your country.

Enabler number	***Type (technical, political, administrative etc.)***	***Description***
1	technical	The establishment of a multidisciplinary task force of experts supporting ministries in the management of the authorization process
2	administrative	"One stop shop" procedure to facilitate communication between applicants and a single entity providing the authorization
3	technical	Availability of the MSP analysis regarding the identification of suitable areas for OW farms, considering conflicts with other sectors and possible co-uses
4	technical	Increase of investments in storage systems and grid infrastructures
5	technical/social	Possibility to build on and implement the results of numerous past and ongoing relevant R&D projects at EU, National, sea-basin and subsea-basin level, including those obtained by stakeholders engagement and by the creation of 5 helix communities
6	cultural	Increase cultural awareness among citizens

Example

19) *If possible provide an example of a completed authorization process analysing the relevant points: time needed to complete the procedure, barriers/bottlenecks, problems and lessons learnt*

As an example, the first offshore wind farm in Italy, the Beleolico park owned by Renexia, is considered. Beleolico is a 30 MW offshore wind farm with fixed foundations installed in the Taranto harbour. The project was presented in 2008 and the park started to operate in April 2022. In the following some (freely translated) quotes about the consenting process from relevant websites.
After a very long process, due to bureaucratic delays, authorization problems and opposition from some ministerial bodies (Soprintendenze[14]) and Municipalities, Beleolico, the first offshore wind farm in the Mediterranean, was inaugurated in Taranto on 21 April, 14 years after its presentation.
(https://www.infobuildenergia.it/beleolico-taranto-primo-parco-eolico-off-shore-italia/).

Interview to Riccardo Toto, Renexia General Director

Q: The Beleolico project was launched in 2008 and only in recent weeks (March 2022) the first four turbines of the ten constituting the full park have been installed 2 km from the coast. You have gone through complex events, what can be done to streamline the authorization procedures?

A: There is certainly the need to simplify the authorization process. We are moving in this direction even if the timeline is still long. The certainty of the times of realization is central for private investors. However I realize that who is in charge to grant the authorizations for innovative technologies,needs to accurately evaluate the proposals because many projects are neither sustainable nor feasible.

(https://www.canaleenergia.com/rubriche/transizione-ecologica/beleolico-ecco-le-prime-quattro-turbine-del-parco-offshore-di-taranto/)

The president of Legambiente (one of the most relevant environmental protection association in Italy), Stefano Ciafani, commented: «After 14 years of delays and institutional ostracisms, the first offshore wind farm in the Mediterranean Sea finally started to operate in Taranto. It is an emblematic case of the “via crucis” authorization in Italy. The project was proposed in 2008, was opposed by local authorities and received the negative opinion of the Soprintendenze for an incomprehensible visual impact, considering that in the close harbour chimneys of the former Ilva, Eni refinery, cement plants and port cranes are present. The case

[14] Ministry of Culture - MIC

of Taranto (Beleolico project) is unfortunately only the tip of the iceberg because in Italy there are many renewables projects blocked due to excessive bureaucracy, adverse local administrations, negative opinions by Soprintendenze, moratoriums by the Regions, protests by local committees and some environmental associations. This is unacceptable: the country should apologize to the companies that are investing in clean energy.».

(https://greenreport.it/news/energia/taranto-dopo-14-anni-inaugurato-il-primo-parco-eolico-off-shore-ditalia-legambiente-scusate-il-ritardo/)

This information could be confirmed and completed during MARINEWIND lab with the contribute of Renexia and other selected stakeholders.

20) Are there any other relevant topics to mention that are specific to your country? If yes please provide a short summary

NA

6.3 Portugal

Section 1 Legislative aspects

1) *Which authorities are competent to issue the authorisation for the construction, operation and decommissioning of offshore wind power plants in your country? If relevant, specify which authority is responsible for the seabed providing details about the latest leasing round and any planned future leasing round.*
Please provide a description of the competent authorities and their specific tasks.

The overall licensing process is managed by the Directorate-General for Energy and Geology (DGEG).

The Grid Capacity Reserve title is issued by the operator of the Public Electrical grid (RESP).

The right to private use of the national maritime space is granted by concession and it is formalized in the form of a 'permits of private use of the maritime space', briefly TUPEM (*Título de Utilização Privativa do Espaço Marítimo*). TUPEM is conducted in parallel with the Grid Capacity Reserve procedure and is awarded by the Directorate-General for Natural Resources (DGRM).
Portugal expects to launch its first offshore wind power auction by the last quarter of this year, aiming to reach 10 GW

2) *Is there any specific legislation for floating offshore wind farms? If yes please provide a short summary and references to legislation If not please indicate which is the reference legislation and provide a short summary of it.*

No

3) *How long is the duration of the sea occupation permit for an offshore wind farm in your country?*

Depends on the type of license. Max 50 years.

4) *Is there maritime spatial planning (MSP) in your country that includes offshore wind? If yes, is it part of the authorisation process?*

There is a MSP in Portugal. Currently, the MSP foresees technological development zones (ZLT) for the development of pilot projects. Simultaneously, the procedure of including new areas for commercial offshore wind development in the Portuguese MSP is ongoing. Due to the number of developers interested, the government has decided to initiate this procedure by its own initiative. The MSP is part of the authorization process.

5) *Are transboundary aspects regulated by legislation? Which ones?*
Please provide a summary of the main issues.

No

6) *Provide details about the regulation and the relevant authority for the connection between the FOWT plant and the onshore grid.*

For the connection between the FOWT and the onshore grid, the promoter needs to apply for a Grid Capacity Reserve Title (TRC), which entitles the promoter to use the point of injection into the public grid up to the power rating assigned in the TRC. The power rating to be assigned is the minimum between what the promoter demands and the grid availability in the requested connection point. In the competitive process, the title is issued by the network operator (REN, for the transmission grid) after the auction procedure for the allocation of grid reception capacity (electronic auction).
Two licenses are required : a) Production license and b) Operation License.
The request for both licenses is addressed by the promoter to the licensing entity, DGEG.
The TRC expires if the production license is not applied within the established period.
The operation license is required to start operation and its request must be accompanied by the following documents: (a) a declaration by the promotor certifying that the installation is prepared to operate complying with all the conditions in the production license; (c) favorable opinion of the grid operator stating that the conditions for connection and injection of energy into the grid are met; c) civil responsibility terms.

7) *Please provide any additional relevant information.*

NA

Section 2 Technical aspects

8) *How many steps does the authorisation process comprise? Please describe the steps, the estimated timeframe of each step and the documentation to be submitted*

In January 2022, a new legislation was introduced – Decree-Law no. 15/2022, of 14 January (DL 15/2022) – which establishes a new legal framework for the National Electric System (SEN). This new law incorporates in a single legislative document a wide range of diplomas, and changes some aspects of the licensing process, further clarifying procedures and timelines of each license. It also introduces the free technological zones (ZLT) as demonstration and testing areas for new technologies with specific and adapted regulatory regimes.

The licensing procedure for marine renewable energy projects consists of the following phases:

1. Reservation of injection capacity in the Public Electrical Grid - “Capacity Reserve Title” (Título de Reserva de Capacidade - TRC).
2. Permit for the Private Use of the Maritime Space - “TUPEM”.
3. Environmental Impact Statement (EIS; Declaração de Impacto Ambiental, “DIA”).
4. Production license (Licença de Produção).
5. Operation License (Licença de Exploração).

The overall licensing process is managed by the Directorate-General for Energy and Geology (DGEG).
The Grid Capacity Reserve title is issued by the operator of the Public Electrical grid (RESP).

TUPEM is conducted in parallel with the Grid Capacity Reserve procedure and is awarded by the Directorate-General for Natural Resources (DGRM).
The environmental assessment is conducted before applying for the Production License. The environmental permitting is granted by the Portuguese Environmental Agency (APA) which will issue the DIA. The DIA can be requested in parallel with the TUPEM request,
Each step of the licensing process and the corresponding temporal range is described below.

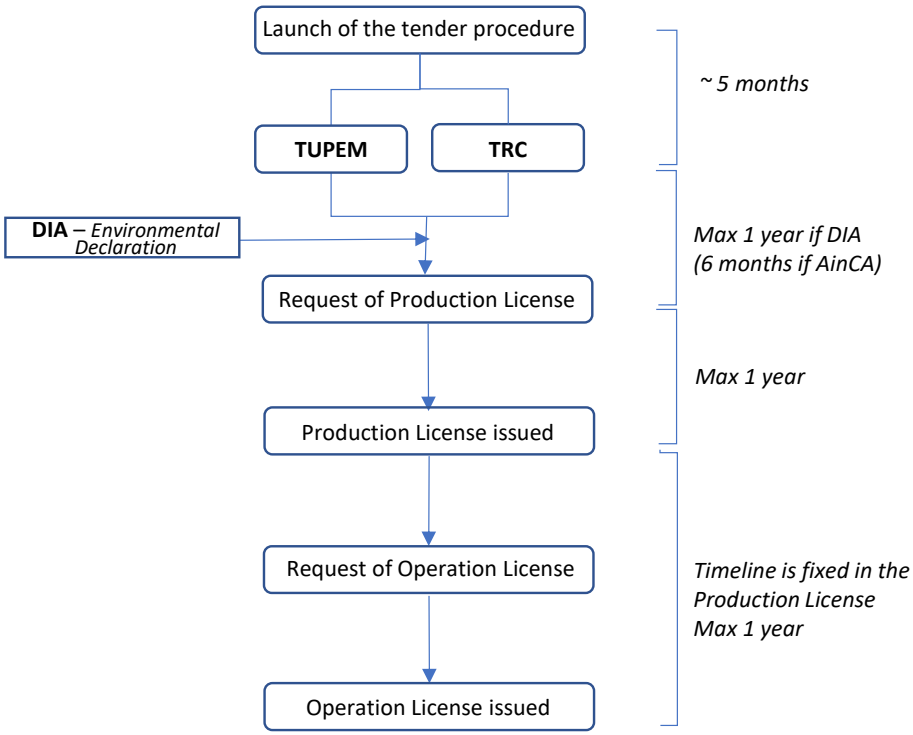


Figure 1. Licensing process in a competitive procedure.

9) *Provide details about the technical issues related to the electrical connection between the FOWT plant and the onshore grid.*

Certain challenges arise when connecting offshore wind farms to the Portuguese electrical network. One of the primary obstacles is the distance between most of the energy transport infrastructure and the cost line, which requires the construction of additional infrastructure to transport energy from offshore wind farms to the existing on land infrastructure. This will require significant investment and extensive planning.
Another issue that needs to be addressed is the question of who will be responsible for building the offshore infrastructure and the land connection point infrastruture. Currently, it is not yet decided whether it will be the Transmission System Operator (TSO), the promoter of the wind farm, or a hybrid system involving both parties. Each option has its own advantages and disadvantages, and careful consideration will be required to ensure that the most efficient and cost-effective solution is chosen.

Overall, connecting offshore wind farms to the Portuguese electrical network is a complex process that requires careful planning and investment. However, with the right approach and a willingness to collaborate and innovate, it is possible to overcome these challenges and ensure that Portugal can benefit from its significant potential of offshore wind energy.

10) *Concerning the environmental impact analysis, what are the minimum requirements to be met?*

Offshore wind projects under the following conditions are subject to an **Environmental Impact** Assessment (EIA):

- Power capacity above 50 MW; or above 20 MW if located in sensitive areas.
- More than 20 turbines; or more than 10 turbines in case of sensitive areas.

In other circumstances, the projects can be subject to a case-by-case analysis with the decision taken by DGEG after consulting the Portuguese Environmental Agency (APA).
The EIA in Portugal is regulated by DL 151-B/2013. More recently the DL 152-B/2017 established minimum content requirements for the environmental impact statements, as well as requirements to ensure the environmental impact studies are reviewed by an interdisciplinary committee with participants from various external organizations.

11) *Concerning the operation and maintenance phase, is there any specific regulation in your country?*

Yes, operation and maintenance is regulated by Decree-Law No. 15/2022 of January 14 2022, which established the organization of the National Power System ("SEN").

12) *What is the legislation for the farm's end-of-life? Is a decommissioning plan required? Please indicate if there are special rules for site conditions after decommissioning is implemented*

A dismantling plan needs to be provided with the submission of the Production Licence request.
This plan must describe all actions to be put in place, the removal of equipment used and the associated logistics. The plan must be updated when requested by DGEG or other entities responsible for its approval.
In the EIA phase, the promoter must indicate the decommissioning phase in the time schedule.
In the decommissioning phase itself, the project promoter must submit a decommissioning plan to the APA and this must be approved by the APA.

13) *Are stakeholder consultations performed during the authorisation process? If yes, please specify details in the table below:*
Yes

Stakeholder category	**Phase of the authorisation process**	**Type of opinion requested (mandatory, non-mandatory)**	**Methodology (notice published online, organization of specific events etc.)**
All	During the EIA procedure	Mandatory	The public consultation is organized by the EIA authority and may include public sessions,

			where the applicant is invited to participate
All	During the TUPEM request procedure	Mandatory	The spatial area of the TUPEM is subject to public consultation by DGRM who publish the documents on its website and an appropriate portal.

14) *What are the economic costs associated with the consenting process (if any)? Please specify the total cost or the cost for individual steps if relevant.*

In a competitive process, a deposit is defined in the tenders documents of the auction. Just for reference, in the general access method, the deposit is €10.000,00 per MVA, with the maximum limit of €10 Million. Compensation payable to municipalities: One-off payment of €1,500.00/MVA of allocated connection power.

15) Please provide any additional relevant information.

NA

Section 3 barriers and enablers

16) *Provide a list and describe the most critical barriers and bottlenecks of the consenting process in your country.*

Barrier number	Type (technical, political, administrative etc.)	Description
1	Political and administrative	No experience with auctions for offshore wind, leading to long and costly procedures
2	Technical	Uncertainties regarding environmental impacts of scaling up floating offshore wind
3	Political and administrative	MSP undergoing the process of including offshore wind areas (ongoing discussions)
4	Social	Opposition from fishery associations due to the imposed limited access to sea areas
5	Technical	Grid capacity; reinforcement of the electrical grid
6	Administrative	Reinforce the Public Administration institutions involved in licensing
7	Economic	Availability of funding or public investments in infrastructures

17) *Are simplification measures for the consenting process currently being developed/implemented in your country?*
If yes please give a brief description of those currently being implemented

Currently, several EU directives (e.g., Re-Power EU, REDII) establish that, to accelerate energetic transition, environmental licensing should be accelerated if major environmental impacts are de-risked. However, until the moment no changes have been implemented in the Portuguese legal framework to reflect these directives.

18) *Provide a list and describe the most relevant enablers of the consenting process in your country.*

Enabler number	Type (technical, political, administrative etc.)	Description
1	Administrative	Online submission (tentative One Stop Shop)
2	Administrative	Establishment of areas for offshore renewable energies in the Portuguese MSP (i.e., PSOEM)
3	Political	Preparation of bid/ tenders that foresee that successful developers obtain the maritime space license and grid access license simultaneously.

Example

19) *If possible provide an example of a completed authorisation process analyzing the relevant points: time needed to complete the procedure, barriers/bottlenecks, problems and lessons learnt.*
NA

20) *Are there any other relevant topics to mention that are specific to your country?*
If yes please provide a short summary

The recent legal framework for the electrical system introduced an adequate legal framework for demonstration and pre-commercial projects through the creation of three technological free zones (ZLT), one of them for marine renewable energy projects located in Viana do Castelo. They are intended to allow testing in a real environment, with direct and permanent control by the competent regulatory authorities, particularly in terms of testing, provision of information, guidelines and recommendations. This corresponds to the concept of regulatory sandboxes.

6.4 Spain

Section 1 Legislative aspects

1) *Which authorities are competent to issue the authorisation for the construction, operation and decommissioning of offshore wind power plants in your country? If relevant, specify which authority is responsible for the seabed providing details about the latest leasing round and any planned future leasing round. Please provide a description of the competent authorities and their specific tasks*

The authority responsible for the sea occupation permit as established by Royal Decree 150/2023, of 28 of February, is the MITERD – Dirección General de la Costa y el Mar. For the connection to the onshore grid, the reference entity is REE (Red Eléctrica Española). Although there is no yet a specific design for the tariff scheme, the competent authority for those activities should be MITERD – Dirección General de Política Energética y Minas, Subdirección general de Energías Renovables. As regulated by Law 9/2018, of 5 of December, that modifies the 21/2013 Law, of 9 of December, of environmental assessment, the environmental competent authority is MITERD – Dirección General de Calidad y Evaluación Ambiental. Then, for the administrative authorizations (AAP - previous administrative authorization, AAC - construction administrative authorization and AAE- operating licence) generally regulated by Royal Decree 1955/2000 the competent authority is MITERD – Dirección General de Política Energética y Minas, Subdirección General de Energía Eléctrica.

In order to clarify the authorities involved in the authorisation process, note the reference [1] Organigrama MITECO Febrero 2023. There has not been any leasing round, neither there are scheduled future planned leasing rounds, waiting for the regulatory framework.
[1] Organigrama MITECO Febrero 2023

2) *Is there any specific legislation for floating offshore wind farms? If yes please provide a short summary and references to legislation. If not please indicate which is the reference legislation and provide a short summary of it.*

On December of 2021 the public authorities presented the roadmap (Hoja de Ruta para el Desarrollo de la Eólica Marina y de las Energías del Mar [2]) which sets as an objective for 2030 an objective for offshore wind capacity between 1–3 [GW]. Additionally, the long-term vision on the offshore wind scenario in Spain indicates the potential of our country to reach 17 GW in 2050. Recently, the 28 of February of the 2023, the government published the maritime spatial planning (POEM, Planes de Ordenación del Espacio Marítimo [3]) including favourable zones to develop floating offshore wind projects.

[2] Hoja de Ruta para el desarrollo de la Eólica Marina y de las Energías del Mar (miteco.gob.es)

[3] POEM – La ordenación del espacio marítimo (miteco.gob.es)

The previous regulatory framework (Real Decreto 1028/2007, de 20 de Julio) that established the administrative procedure for the processing of applications for authorization of electricity generation facilities in the territorial sea had not real applicability, nowadays in state of temporal suspension (moratorium). Therefore, although the roadmap indicates the way forward to development, there is no yet a calendar to regulation for permitting of the projects and the design of the competitive tendering process and their calendar, which should ideally be presented in the near future.

3) *How long is the duration of the sea occupation permit for an offshore wind farm in your country? Please specify the number of years.*

There is no precedent for commercial offshore wind projects yet, although the industry expects sea occupation permits with periods between 25–35 years. In any case, the sea occupation permit cannot exceed 75 years (Ley 22/1988, de 28 de Julio, de Costas) for any type of activity including prorogations for that permit. Additionally, the Royal Decree 876/2014, of 10 of October, establish specifically that depending on the type of use, the maximum term of the concessions, including all possible extensions, may not exceed 75 years for restoration and conservation projects of marine or coastal ecosystems, works aimed at guaranteeing public use and the integrity of the maritime-terrestrial public domain and marine farming, 50 years for public service facilities that, by their nature, they require the location of the public domain and 30 years for the rest of activities and facilities.

4) *Is there maritime spatial planning (MSP) in your country that includes offshore wind? If yes, is it part of the authorisation process?*

Yes, the maritime spatial planning (MSP) was recently approved by the Royal Decree 150/2023, of 28 of February, for the 5 Spanish marine demarcations (POEM, Planes de Ordenación del Espacio Marítimo). It is important to note that out of the high potential areas for offshore wind defined in the maritime spatial planning, the development of offshore wind farms will not be allowed.

In particular, the approved MSP will affect the authorisation process in correlation to the definition of 3 typologies of zones for offshore wind development. Prohibition Zones (red zones) are considered incompatible with any technology of offshore wind energy due to high environmental value of habitats and of the biodiversity components present. For Restriction Zones (yellow zones) also for environmental and biodiversity reasons, the development of offshore wind will be subject to an impact assessment on RN2000, whose detailed analysis of the values natural present in the place justifies that it does not affect bottoms with the presence of Habitat of Community Interest (HIC) or marine species, apart from the general environmental assessment associated to these types of projects. In any case, subject to more restrictions during the authorisation process. The Free–Prohibition/Restriction Zones (green

zones) are considered favourable zones for offshore wind energy development, but in any case, subject to the corresponding environmental assessment.

5) *Are transboundary aspects regulated by legislation? Which ones? Please provide a summary of the main issues.*

Reports on [4] Maritime Spatial Planning Country Information (Spain | The European Maritime Spatial Planning Platform) indicate that Spain has participated in several transboundary consultation processes of neighbouring countries (France, Portugal, Italy and Ireland). A transboundary consultation process was launched to obtain the inputs of neighbouring countries from the draft Spanish MSP (Maritime Spatial Planning) documents, and a specific meeting was held in September 2021 for that purpose, as reported on [4] Maritime Spatial Planning Country Information. In this sense, the recently presented MSP for the Atlantic demarcation considers in the short term planification a marine electrical interconnection project with a capacity of 2000 [MW] and expected works between 2024-2026.

6) *Provide details about the regulation and the relevant authority for the connection between the FOWT plant and the onshore grid.*

The authority that approves laws and regulation is the MITERD, although REE (Red Eléctrica de España), Transmission System Operator (TSO), produces technical norms and guides of procedures, as well as being the entity that manage and operates the transportation grid, then the reference entity to deal with the connection (Article 6, Royal Decree 1955/2000). REE is partner at EUROBAR, an European initiative that has conformed work groups to study optimum technical solutions and the adequate regulatory framework for offshore connections. In this context, the authorities have not yet established the final details about the regulation for connection between the FOWT plant and the onshore grid. Current regulations and descriptive guides of procedures and other documentation can be found at (Red Eléctrica). In principle, the developer connects the plan onshore to the grid, but REE is currently analysing the model of offshore connection.

7) *Please provide any additional relevant information.*

NA

Section 2 Technical aspects

8) *How many steps does the authorisation process comprise? Please describe the steps, the estimated timeframe of each step and the documentation to be submitted.*

Under the present framework regulated by **[5]** Royal Decree 1955/2000, of 1 of December, the authorization process begins with the request for the AAP (Autorización Administrativa Previa - previous administrative authorization) and the presentation of the EIA (Environmental Impact

Assessment) that after the corresponding processing allows the developer to obtain the DIA (Declaración de Impacto Ambiental – Environmental Impact Statement) and the AAP (then, the concession of the public–maritime domain). The estimated timeframe for the above-mentioned request and obtention may be of 54 weeks (see note 1). Within this initial phase, the request for Declaración de Interés Público (Public Interest declaration) may be requested, if necessary. In addition, the GTA (Grid Access Award) should also be obtained.

The documents that the request for the AAP should include, described in article 123 of the RD 1955/2000, are a Preliminary Draft of the Project which shall contain location, purpose and main characteristics of the installation, with drawings at minimum scale of 1:50.000, estimated budget and offprints (separatas) for the public administrations with goods or services of their management which could be affected by the project, and documentation to accredit applicant's capacity in the terms described in article 121 (capacity in legal, technical and economic–financial terms for the realization of the project). In reference to the EIA, the applicable regulation, Law 9/2018, of 5 of December (with reference BOE-A-2018-16674) and Law 21/2013, of 9 of December, of environmental assessment (with reference BOE-A-2013-12913), define the content of the documentation in article 35 and Annex VI.

In parallel to the obtention of the AAP, the works correlated to the process to obtain the AAE (Autorización Administrativa de Ejecución - construction administrative authorization) can get started with an estimated timeframe of 68 weeks (see note 1) in temporal intersection with the APP obtention process. The AAE request (article 130 of RD 1995/2000) shall include the execution project in accordance with the relevant technical regulations (solicitud de licencias de obras – building permits enquiry).

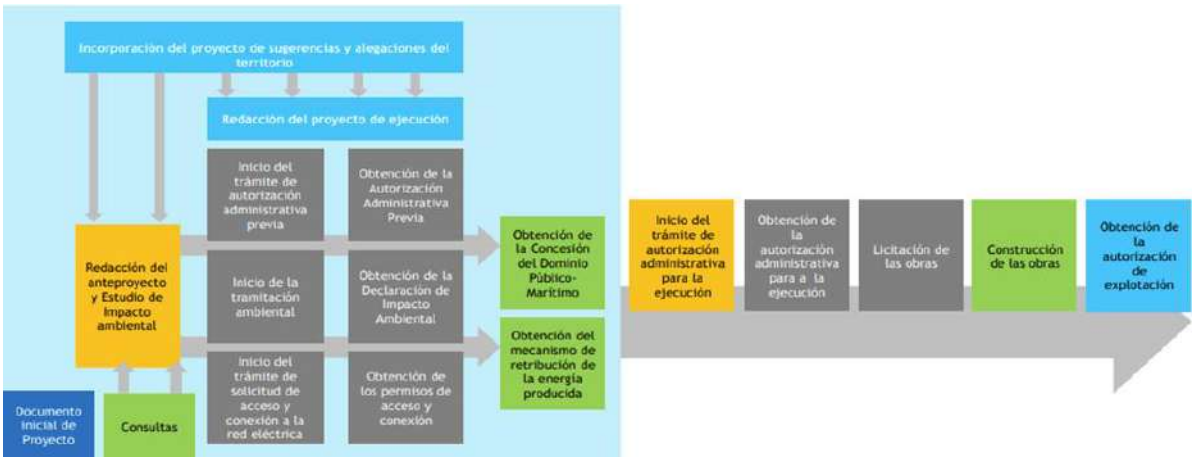


Figure 1. Schematic authorization process. Source: Sener.

As an estimation, both the AAP (Autorización Administrativa Previa – Previous Administrative Autorization) and AAE (Autorización Administrativa de Ejecución – Commercial Licence) phase may require a comprehensive duration in a range between 1–2 years (see note 1).

After the finalization of the construction phase, the authorization process finalizes with the request and obtention of the AAE (Autorización Administrativa de Explotación – Commercial Licence) with an estimated comprehensive timeframe of 10 weeks (see note 1) before obtaining the AAE. As stated in the Royal Decree 1955/2000, of 1 of December in article 132, the request for commissioning certificate (Acta de Puesta en Servicio – Commissioning protocol) will be accompanied by a certificate of completion of work (Certificado de Final de Obra) signed by a competent facultative technician.

Note [1] The time duration of the steps of the authorization process described above comes from internal planning estimations (not from reference documents or official documents).

9) *Provide details about the technical issues related to the electrical connection between the FOWT plant and the onshore grid. Please provide a summary.*

In relation to the characteristics of the national continental shelf (great water depths near shore) offshore wind development will need dynamic cables with the floating technology. As of today, high tension and diameter dynamic cables are still under development phase (not in the market). In correlation, the local community pressure due to visual impact and opposition, will carry the infrastructure away from the coast, inducing the need for offshore substations, whose electrical equipment should coexist with the movement of the structure, and push for dynamic cables of high tension. As before, floating substations are still into development phase. Additionally, in the absence of legislation, the point of connection cannot be full assumed, within the scope of the north European countries model that considers the point of connection offshore, rather than onshore.

10) *Concerning the environmental impact analysis, what are the minimum requirements to be met?*

Law 21/2013, of 9 of December, of environmental assessment (with reference BOE-A-2013-12913), and the modifications introduced by Law 9/2018, of 5 of December (with reference BOE-A-2018-16674) define the minim requirements concerning the environmental impact analysis for commercial offshore wind projects (>30 MW).

In particular, article 34 of consolidated text of Law 21/2013 establish that the developer may request the environmental body to prepare a document of scope of the environmental impact analysis that indicates the extent and degree of specification to be contained in the environmental impact assessment of the relevant corresponding project. This permitting step is optional.

In the absence of the Document of Scope provided by the environmental body at developer's request, article 35 of the Law 21/2013 defines the minimum contents that the developer shall draw up in the environmental impact assessment report (with additional details set out in Annex VI). However, given the newness of Offshore Wind developments in Spain and the lack

of experience in the environmental body managing environmental assessment of this kind of projects, it is highly recommended the developers to make use of the optional right to request the Document of Scope for each specific project, in order to have a more accurate indication about contents and degree of detail to be required in the Environmental Impact Assessment Report.

11) *Concerning the operation and maintenance phase, is there any specific regulation in your country?*

There is not a national specific regulation for O&M for offshore wind projects.

12) *What is the legislation for the farm's end-of-life? Is a decommissioning plan required? Please indicate if there are special rules for site conditions after decommissioning is implemented.*

Royal Decree 876/2014, of 10 of October, within article 147 indicates that in all cases of termination of a concession, the General Administration of the State will decide on the maintenance of the works and facilities or their lifting and removal from the public domain and its area of protection easement by the interested party and at his expense, but article 88 (documents to be provided with the basic project) and article 91 (content of the project) do not indicate directly the need for a decommissioning plan. However, article 78 indicates that the General Administration of the State may require the establishment of financial guarantees, to be extended until the end of the concession of use of marine domain, in order to prevent damages to the environment due to the activity, that may cover the decommissioning of the facilities.

The roadmap (without legal capacity) superficially advances that any proposed installation should provide for the removal of such installation at the end of their service life or when necessary, without any more detail.

In addition, Royal Decree 1028/2007, of 20 of July, in article 18 (guarantees) indicates also that if the developer do not compliance with the obligations to decommission the installation and restore the state of the public domain, depending on the investment plan and restoration plan submitted, the deposited guarantees will be executed which could account up to the 2 percent of the budget.

13) Are stakeholder consultations performed during the authorisation process? If yes, please specify details in the table below:

Stakeholder category	Phase of the authorisation process	Type of opinion requested (mandatory, non-mandatory)	Methodology (notice published online, organisation of specific events etc.)
Puertos del Estado (MITMA).	EIA	NM	Official electronic communication from Environmental Body
Town Hall affected by the onshore installation.	EIA	NM	Official electronic communication from Environmental Body
Town Hall in the vicinity of the infrastructure.	EIA	NM	Official electronic communication from Environmental Body
Non–profit Environmental Organizations.	EIA	NM	Official electronic communication from Environmental Body
Environmental Body of Regional Government	EIA	M	Official electronic communication from Environmental Body
D.G. de Bellas Artes (Ministerio de Cultura y Deporte) oe equivalent regional Cultural Heritage competent body	EIA	May be M, depending on the specificity of the location	Official electronic communication from Environmental Body
Fishermen's Association	EIA	NM	Official electronic communication from Environmental Body
Maritime Captaincy	EIA	NM	Official electronic communication from Environmental Body

Stakeholder category	Phase of the authorisation process	Type of opinion requested (mandatory, non-mandatory)	Methodology (notice published online, organisation of specific events etc.)
Provincial Council	EIA	NM	Official electronic communication from Environmental Body
Delegation of the Government in the Autonomous Region.	EIA	NM	Official electronic communication from Environmental Body
Sub-delegation of the Government in the province.	EIA	NM	Official electronic communication from Environmental Body
State Meteorological Agency (MITECO).	EIA	NM	Official electronic communication from Environmental Body
State Aviation Safety Agency (MITMA).	EIA	May be M, depending on the specificity of the location	Official electronic communication from Environmental Body
D.G. de Marina Mercante (MITMA).	EIA	May be M, depending on the specificity of the location	Official electronic communication from Environmental Body
General Directorate of Civil Protection and Emergencies (Ministry of the Interior).	EIA	May be M, depending on the specificity of the project	Official electronic communication from Environmental Body
Ministry of Defence.	EIA	May be M, depending on	Official electronic communication from Environmental Body

Stakeholder category	Phase of the authorisation process	Type of opinion requested (mandatory, non-mandatory)	Methodology (notice published online, organisation of specific events etc.)
		the specificity of the location	
Public Health Coordination.	EIA	May be M, depending on the specificity of the project and location	Official electronic communication from Environmental Body
Geological and Mining Institute of Spain.	EIA	NM	Official electronic communication from Environmental Body
Institute of Marine Sciences (CSIC).	EIA	NM	Official electronic communication from Environmental Body
International Institute of Law and Environment.	EIA	NM	Official electronic communication from Environmental Body
D.G. del Agua (MITECO) or regional equivalent body	EIA	May be M, depending on the specificity of the location	Official electronic communication from Environmental Body
D.G. de la Costa y el Mar (MITECO), through the provincial delegation.	EIA	M	Official electronic communication from Environmental Body
Secretaria de Estado de Medio Ambiente (MITECO).	EIA	NM	Official electronic communication from Environmental Body

Stakeholder category	Phase of the authorisation process	Type of opinion requested (mandatory, non-mandatory)	Methodology (notice published online, organisation of specific events etc.)
D.G. de Biodiversidad, Bosques y Desertificación (MITECO).	EIA	M	Official electronic communication from Environmental Body
Secretary General of Fisheries.	EIA	May be M, depending on the specificity of the location	Official electronic communication from Environmental Body
Regional organization of public utility.	EIA	NM	Official electronic communication from Environmental Body

Note that for the EIA (Environmental Impact Assessment) and Marine domain concession permit, both of them within the authorisation process, the developers are required to submit project information to mandatory public information and consultation process for each particular project, as well as to properly answer to all raised queries or statements. In addition, the marine spatial planning (POEM) has been submitted to public consultation. No further additional details could be indicated due to the lack of a particular regulatory framework.
For more clarity on the stakeholders related to MITECO (Ministerio para la Transición Ecológica y el Reto Demográfico) is recommended to consult reference [1] Organigrama MITECO Febrero 2023.

14) What are the economic costs associated with the consenting process (if any)? Please specify the total cost or the cost for individual steps if relevant.

The full costs for development are not considered, but only those economic costs associated with the fees in relation with the consenting process with the public administration. The economic cost associated with the consenting process are related to some fees included in the Coast Law (Ley 22/1988, de 28 de Julio, de Costas) and the Royal Decree 876/2014, of 10 of

October. In detail, Chapter II of the Coast Law (articles 84–87) define specifically the fees for the different concepts that include the following.

1) The fee for occupation of the maritime-terrestrial public domain (DPMT)

2) For the use of maritime-terrestrial public domain assets.

3) Fees to be received by the Administration as consideration for the activities carried out (article 86).

3.1) Fee for examination of the project in the processing of applications.

3.2) Inspection and verification of works.

Additionally, the economic cost associated with the guarantees for the DPMT also should be considered and the grid access award. Note that other particular fees could appear in the consenting process for the benefit of the regional administrations.

However, as the regulatory framework for offshore wind farms is not yet available, the economic costs associated with the consenting process can vary.

15) *Please provide any additional relevant information.*

NA

Section 3 barriers and enablers

16) *Provide a list and describe the most critical barriers and bottlenecks of the consenting process in your country.*

Barrier number	Type (technical, political, administrative etc.)	Description
1	Administrative.	There is not yet a calendar to regulation for permitting of the projects and the design of the competitive tendering process and their calendar (incomplete regulatory framework). This leads to important delay in the authorisation processes.
2	Political.	Local citizens, particularly fishermen, rejection at the location of the project.
3	Political–Administrative.	Actual partial decentralized system could affect development due to the position of the regional administration.

4	Administrative	Regulatory problems for connection into the onshore grid. REE within EUROBAR yet in process to determine the particular framework to offshore connections.
5	Technical.	There are not prototypes or commercial installations on Mediterranean waters.
6	Political	Higher LCOE of FOWT with respect to other technologies, as onshore wind or PV solar, reduces administration engagement to a short-term deployment of this technology

17) Are simplification measures for the consenting process currently being developed/implemented in your country? If yes please give a brief description of those currently being implemented.

The roadmap (December, 2021) indicates within measure 3.4. (Adaptation of the administrative framework for the authorisation of offshore renewable installations) the willingness of a continuous improvement in the administrative processing, moving towards simplicity, digitalisation and integrated procedures, without further details. In this line, the objective considers the correlation between the different rights (marine space, access, connection and remuneration) associated with one competitive process. Then, the purpose is linking the seabed right, the grid access award and the remuneration system to the result of the auctions, simplifying the process.

In this context, in October of 2022, the MITECO (Ministerio para la Transición Ecológica y el Reto Demográfico) launch a public consultation in order to coordinate the authorization procedure of the facilities with the granting of rights. However, nowadays the regulation framework is not completed for offshore wind projects with no specific simplification measures for the consenting process implemented.

18) Provide a list and describe the most relevant enablers of the consenting process in your country.

Enabler number	Type (technical, political, administrative etc.)	Description
1	Technical	Extended network of companies with experience and capabilities for offshore wind activity, despite no commercial projects developed at national waters. (Nervión, Navantia, Navacel - shipyards and manufacturers Technology developers -14 floating platforms developed in Spain - HiveWind, X1Wind, Saitec, etc Engineering companies - Sener, Idom, etc Developers - Iberdrola, Capital Energy, BlueFloat, ... Other solutions - DT Bird etc) Spain has the ecosystem to develop floating offshore wind and this fact can support the interest for developing and enable a fast track consenting process as well as this ecosystem can provide lessons learnt from the experience of these companies abroad another consenting processes.
2	Political	The consenting process is expected to be linked to the auction system and this auction system is expected to include socioeconomic and environmental criteria. This fact allows to include criterias related to measure the madurity of the projects, reducing the effort during the consenting process

		once they are awarded (e.g. EIA prepared ready to be delivered).
3	Political	Strong shipyard industry actively involved in the current offshore wind projects (bottom fixed and floating), after years of crisis in the naval sector, fostering the local economy. Political interest in delivering an agile consenting process that allows the local areas with shipyard and heavy industry in crisis to take advantage of the development of offshore wind in Spain.

Example

19) If possible, provide an example of a completed authorisation process analysing the relevant points: time needed to complete the procedure, barriers/bottlenecks, problems and lessons learnt.

As of today, not a single completed authorization process has been executed for a commercial offshore wind project within the framework of the recently MSP published.

20) Are there any other relevant topics to mention that are specific to your country? If yes please provide a short summary.

Royal Decree-Law 12/2021 paralyzed the processing of electricity generation facilities in the territorial sea until the approval of a new regulatory framework, since the previous framework, implemented by Royal Decree 1028/2007, has become outdated in relation to the current situation of technology and the evolution of energy regulation. Currently, only facilities can be processed for the creation or extension of infrastructure for testing, demonstration or validation of prototypes (<50 MW) and new technologies associated with offshore wind as mentioned in RD 29/2021. In any case, the tariff mechanism is not defined.

In this context, the first tenders in national waters are expected to be realised at the end of 2023 (Q4 2023), although there is not yet a calendar to regulation for permitting of the projects and the design of the competitive tendering process. Therefore, at half of 2023 (Q2–Q3 of 2023) the industry expects the establishment of such a necessary regulatory framework. In relation, from October to June 22 of 2022, the MITECO (Ministerio para la Transición Ecológica y el Reto Demográfico) launch a public consultation in order to coordinate the authorization

procedure of the facilities with the granting of rights over use of marine space, access and connection to the electricity grid, and the promotion of investment through competitive procedures. The public consultation raised questions such as what information is considered necessary to develop a project, what design criteria should be required, what parameters should be used to evaluate bids, or who should be the owner of the evacuation facilities.

The roadmap (Hoja de Ruta para el Desarrollo de la Eólica Marina y de las Energías del Mar) in mesure 3.6. Early Development of Offshore Wind Deployment in the Canary Islands established objectives to use the Canary Islands as a testing ground for energy transition technologies and policies. In particular, the Canary Islands have high potential for offshore wind energy due to the high number of equivalent hours of operation (could exceed 4500) within a context of below–objectives use of renewable energy, accounting with just 10,5% of the total electricity generation. However, there is not a clear idea if finally the Spanish government will prioritise this area or will focus on looking for projects which maturity ensures offshore wind deployment before 2030, no matter their location within Spanish coasts.

6.5 The United Kingdom

Section 1 Legislative aspects

1) *Which authorities are competent to issue the authorisation for the construction, operation and decommissioning of offshore wind power plants in your country? If relevant, specify which authority is responsible for the seabed providing details about the latest leasing round and any planned future leasing round. Please provide a description of the competent authorities and their specific tasks.*

- The Crown Estate is responsible for the seabed in England, Wales and Northern Ireland and Crown Estate Scotland is responsible for the seabed in Scotland.
- The developer must secure a lease for the seabed with the Crown Estate before the consenting process – is granted through leasing rounds.
- Projects >100 MW (England and Wales) are defined as Nationally Significant Infrastructure Projects (NSIP) and examined by the Planning Inspectorate.
- BEIS grants/refuses consent based on recommendations from the Planning Inspectorate
- Development consent per country:
  - England – Development Consent Order is granted under the Planning Act (2008), which incorporates a number of consents, including a marine licence and onshore consents
  - Wales – National Resources Wales determines the marine licence
  - Scotland – Marine Scotland examines applications for offshore works with Scottish Ministers granting/refusing consent under the Marine (Scotland) Act of 2010 (up to 12nm offshore) and the Marine and Coastal Access Act 2009 (12-200 nm from shore)
  - Northern Ireland – The Department of Agriculture, Environment and Rural Affairs (DAERA), as the Marine Plan Authority (MPA), is required to prepare marine plans for the better management of the Northern Ireland marine area. This Marine Plan is made up of two plans: one for the inshore regions under the Marine Act (NI 2013) and one for offshore regions under the Marine Access Act (MCAA 2019). As part of that, and under the authority of DAERA, The Marine Management Organisation (MMO) carries out most licensing functions for the Northern Ireland offshore region on behalf of the Secretary of State (as the appropriate licensing authority). "The Marine Management Organisation (MMO), a Defra's sponsored nondepartmental public body, sponsored, carries out most licensing functions for the Northern Ireland offshore region on behalf of the Secretary of State (as the appropriate licensing authority). It creates and enforces marine conservation byelaws and enforces conservation legislation, and issues wildlife licences for the Northern Ireland offshore region"[15,16].

[15] Marine Plan for Norther Ireland (public consultation) 2018, https://www.daera-ni.gov.uk/sites/default/files/consultations/daera/Marine%20Plan%20for%20NI%20final%2016%2004%2018.PDF

[16] https://www.rya.org.uk/knowledge/planning-licensing/marine-licensing/northern-ireland-marine-licensing#:~:text=Marine%20licensing%20for%20Northern%20Irish,Marine%20Management%20Organisation%20(MMO)

- Onshore consent for infrastructure, e.g. landing cables, is given by the relevant local planning authority unless the project is NSIP and it is included in that process.
- Throughout the development process, developers are obliged to seek the views of a number of statutory consultees. These include a wide range of government-appointed consultees and authorities, affected local authorities and those that have an interest in the land affected. Non-statutory consultees with specific interests in the development are also likely to be consulted (such as RSPB).[17]

2) *Is there any specific legislation for floating offshore wind farms? If yes, please provide a short summary and references to legislation; If not please indicate which is the reference legislation and provide a short summary of it.*

The UK government published its British Energy Security Strategy (BESS) in April 2022 "setting out how the UK will accelerate its transition away from oil and gas towards renewable sources of energy, with an ambition to deliver up to 50GW by 2030, including 5GW of innovative floating wind"[18].

The UK has an established regulatory regime covering the whole offshore wind project lifecycle, from leasing to consenting, operation to decommissioning – with actions underway to accelerate the pipeline and meet the country's ambitions. There are legislations in place and some in development to help accelerate the deployment of offshore wind while continuing to protect the marine environment[19]. These are highlighted below:

- Current:
  - **Market policy and market framework**: Four **Contracts for Difference (CfD) auctions** have run in the last seven years to support low-carbon electricity generation, with Annual CfD auctions from 2023 onwards starting with Allocation Round 5 opening in March 2023.
  - **Leasing rounds** delivered by The Crown Estate and Crown Estate Scotland give opportunities to new entrants, with further seabed leasing rounds planned including for floating wind in the Celtic Sea.
- Network Reforms:
  - **Reform in CfD Scheme**: A consideration of the use of Non-Price Factors as a reform to the CfD scheme

[17] https://www.thecrownestate.co.uk/media/2861/guide-to-offshore-wind-farm-2019.pdf

[18] https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

[19] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1148255/offshore-wind-net-zero-investment-roadmap.pdf

- **Offshore Transmission Network reform:** A review was launched in 2020 to assess the way offshore transmission network is designed and delivered to help deliver net zero emission by 2050
- **Strategic Network Planning via holistic Network design**: ongoing design recommendations for connecting offshore wind via a single, "centralised", integrated network connecting 23 GW of offshore wind projects.
- **Onshore transmission regulation reform & investment**: Ofgem's decisions on accelerating regulatory and funding approvals

- Consenting reforms:
  - **Nationally Significant Infrastructure Project (NSIP) Action Plan**, a UK cross-government plan that sets out how to reform NSIP consenting processes to ensure the planning system can deliver for the future which offshore wind projects will benefit from
  - **Legislation streamlining offshore wind consenting process**: An introduction of the Offshore Wind Environmental Improvement Package, including regulations to adapt environmental assessments for offshore wind, to enable strategic compensation and introduce Marine Recovery Funds.
  - Fast Track Consenting Process via powers in the Leavellling up and Regeneration Bills, based on necessary quality criteria to meet for offshore wind projects

- Environmental Legislations Packages in development
  - OWEIP PackageHabitats Regulations Assessments
  - Offshore Wind Environmental Standards and Strategic Monitoring
- Supply Chain related policies & related investment schemes:
  - **Offshore Wind Manufacturing Investment Scheme** to support investment in major port and manufacturing infrastructure. This scheme will accelerate supply chain development and energy security.
  - **Supply Chain Plan policy** for projects over 300MW and all floating offshore wind projects to commit to a series of actions to strengthen the renewable energy supply chain in the UK and Europe before they can compete in a CfD auction.
  - **Floating Offshore Wind Manufacturing Investment Scheme (£160 million)** to support investment in the infrastructure needed for commercial-scale deployment of floating offshore wind.
  - **UK Infrastructure Bank**- investment across the capital structure (senior debt, mezzanine, first loss, debt guarantees and equity) to help crowd private finance into net zero infrastructure. The Bank has identified ports and floating offshore wind as investment opportunities and, particularly, enabling infrastructure projects.
  - **UK Export Finance** provides enhanced support for supply chain investment through the Export Development Guarantee and offers a range of finance products to grow exports once established in the UK.

3) *How long is the duration of the sea occupation permit for an offshore wind farm in your country? Please specify the number of years.*

In the leasing Round 4 tender process, launched in October 2019 in the UK, the lease terms were extended from 50 to 60-year lease terms. Enough for two full project lifecycle and reflecting maturing offshore wind technology and operations. [20,21] In Scotland (ScotWind), an option agreement is given to the successful ScotWind Developers which are for up to 10 years. For projects that then proceed to a full seabed lease, the standard lease length are 60 years[22].

4) *Is there maritime spatial planning (MSP) in your country that includes offshore wind? If yes, is it part of the authorisation process?*

Yes

5) Does legislation regulate transboundary aspects? Which ones? *Please provide a summary of the main issues*

Yes, for projects in England and Wales, transboundary impacts, affecting Natura 2000 sites (sites designated under the Habitats Directive outside of the UK in other EU Member States) are taken into account when determining consent for new energy projects.

"The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations') transpose the requirements of the EIA Directive (2011/92/EU) governing statutory notification and consultation in respect of transboundary effects of development on European Economic Area Member States ('EEA States'). Regulation 32 of the EIA Regulations establishes the procedural duties necessary where the Secretary of State (SoS) is of the view that a Nationally Significant Infrastructure Project (NSIP) is likely to have significant effects on the environment in an EEA State; or where an EEA State is of the view that its environment is likely to be significantly affected by an NSIP. The duties under Regulation 32 apply until the decision on the Development Consent Order (DCO) is made.

The UK, as a signatory to the Espoo and Aarhus conventions, has obligations to engage with other signatory States and their public where relevant."[23,24]

6) *Provide details about the regulation and the relevant authority for the connection between the FOWT plant and the onshore grid*

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[20] https://www.thecrownestate.co.uk/en-gb/media-and-insights/news/2019-the-crown-estate-launches-the-uk-s-first-major-offshore-wind-leasing-round-in-a-decade-opening-up-the-opportunity-for-at-least-7gw-of-new-clean-energy/

[21] Information Memorandum, Introducing Offshore Wind Leasing Round 4, (page 47) https://www.thecrownestate.co.uk/media/3321/tce-r4-information-memorandum.pdf

[22] https://www.crownestatescotland.com/freedom-of-information/200-scotwind-lease-length

[23] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/408465/transboundary_guidelines.pdf

[24] https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-twelve-transboundary-impacts-and-process/

Offshore wind farms are mostly connected to the UK's electricity grid by way of constructing individual routes of point-to-point connection from offshore infrastructure to onshore infrastructure. There are, however, limitations in the supporting transmission and infrastructure to cope with the 2050 Net Zero target of offshore wind increased capacity. Hence, the ongoing offshore transmission network review ('OTNR'), led by the Department of Business, Energy & Industrial Strategy ('BEIS'), to address these concerns and provide suitable recommendations for an alternative way forward [25].

The current regulatory framework, by which generators sell the transmission assets to Offshore transmission owner (OFTO) within 18 months of constructing a wind farm, is not currently equipped with cases of a common grid connection. There are ongoing reviews of the current OFTO to co-ordinating the offshore transmission system, considering any shared grid connections which will increase the interfaces between developers and associated risk, and security of supply in the event of any dispute concerning these interfaces.

There are ongoing consultations as part of the OTNR, BEIS (now DESNZ) and Ofgem to redesign the regulatory and legislative framework for offshore wind, considering alternative models such as offshore island or ring main, multi-purpose interconnectors, hydrogen, jointly owned transmission assets on others [26,27].

7) *Please provide any additional relevant information.*

N/A

Section 2 Technical aspects

8) *How many steps does the authorisation process comprise? Please describe the steps, the estimated timeframe of each step and the documentation to be submitted.*

In the UK, The Crown Estate is responsible for supporting the development and offshore wind

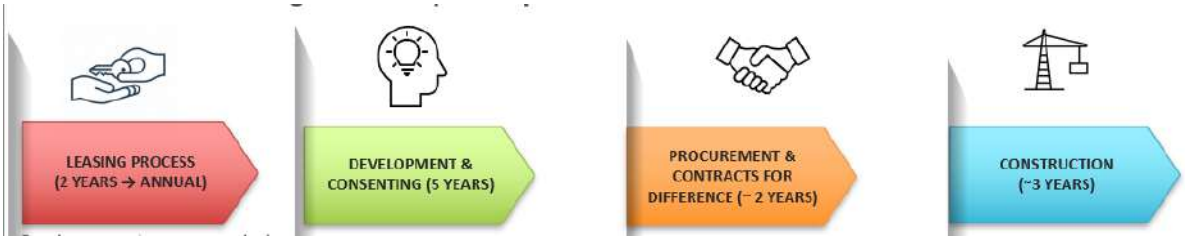
[25] https://www.burges-salmon.com/news-and-insight/legal-updates/energy-power-utilities/offshore-transmission-will-point-to-point-connections-become-pointless-in-an-integrated-future#:~:text=To%20date%2C%20offshore%20wind%20farms,point%20to%20point%20connection'

[26] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/979088/OTNR_Q1_2021_Newsletter.pdf

[27] [17]https://www.nationalgrid.com/our-businesses/national-grid-ventures/interconnectors-connecting-cleaner-future/multi-purpose-interconnectors

pipeline by making new areas of seabed available for development, awarding rights for extensions to existing projects and facilitating test and demonstration opportunities for innovative technologies. The Crown Estate is responsible for supporting the development in England, Wales and Northern Ireland, and Scotland owns and manages the seabed in Scottish territorial waters. The consenting and planning processes for the new offshore generating station will vary if above or below 100MW. Information provided here refers to 100 MW+ projects[28].

The UK refers to the authorisation process as the development and consenting process and consists of several steps. The duration of the consenting process steps will differ in different regions of the UK as the Scottish and Welsh administrations have devolved powers to plan and consent to some activities in their territorial waters[29]. The consenting process can take, at a minimum, 4 years, and often longer (c12 years) from developers bidding for sites within pre-defined leasing zones to reaching the final investment decision, as highlighted in the figure above.Despite the variations across UK administrations relating to offshore wind development, the consenting process has similarities in the pre-application, determination and post-consenting steps, but with significant differences in the mechanisms and organisations involved.



Step 1 Leasing Process: Developers must secure a seabed lease granted through periodic leasing rounds agreed by The Crown Estate (England, Wales & Northern Ireland) or ScotWind (for Scottish territorial waters). Four Leasing rounds have been agreed to date by The Crown Estate, and the first round in a decade under ScotWind management of offshore wind rights. Seabed rights are awarded to successful developers for 60 years (from the previous 50 years in agreement rounds (AR1)-3). Seabed lease applications can only be made to the respective authorities when leasing rounds are open. For sites in English, Welsh or Northern Irish waters, the authority is The Crown Estate (TCE); for sites in Scottish waters, it is Crown Estate Scotland

[28] https://www.gov.uk/guidance/consents-and-planning-applications-for-national-energy-infrastructure-projects

[29] https://ore.catapult.org.uk/wp-content/uploads/2021/09/FOW-CoE-FOW-Development-and-Consenting-Process-Risks-and-Opportunities-Public-Summary.pdf

(CES)[30].

Subject to the outcome of planned Habitats Regulations assessments (HRA) and other key consent and permissions assessments, developers are granted leases for their selected sites.

Step 2 Development & Consent Process: The consenting process starts once the seabed lease has been granted and Agreement Option signed. The development and consenting stages are managed by the wind farm developers and are for the wind farm and transmission assets[31]. Development processes cover activities up to the point of financial close. Special Purpose Vehicle (SPV) led this by providing a structure to enable external investment, managing the design of the wind farm, and securing consent for wind farm and transmission assets. The development process also includes activities required to secure planning consents, such as the environmental impact assessment, and activities required to define the design and engineering aspects, highlighted below:

- Pre-application scoping: The developers will produce an early pre-application scoping report to enable agreement from the planning authorities of requirements in advance of the formal application. In Scotland, developers are required to carry out a public pre-application consultation with a 6 weeks notice of the event.
- Environmental Impact Assessment: The planning authorities (England- Marine Management Organisation (MMO), Wales- Natural Resource Wales (NRW), Scotland- Marine Scotland Licence Operation Team (MS-LOT), will then recommend that an Environmental Impact Assessment (EIA) is undertaken to describe the potential impacts that may lead to substantial effects linked to a wide range of environmental factors (Climate change, biodiversity, human environments). The process can take anything between 6 to 13 weeks.
  The assessment comprises a suite of environmental surveys that assess the potential impacts, mitigation measures, and residual and cumulative effects associated with the project development. The EIA process can take up to 3 years to complete and is subject to public consultation in Scotland[32], and consultations with various stakeholders that may be impacted by the project (e.g. local authorities, appointed consultees, local communities, special interest groups, etc.) A Habitat Regulations Appraisal (HRA) is performed as part of the EIA to conform with the conservation of habitats and species regulations. In addition to Marine Licence, the wildlife, seabed, Harbour work, and other relevant consents and licenses may be required depending on the projects.
- A Development Consent Order is granted under the Planning Act 2008 (as amended), which incorporates a number of consents, including a marine licence and onshore consents. In Wales, the marine licence is determined by Natural Resources Wales.

[30] https://www.offshorewindscotland.org.uk/the-offshore-wind-market-in-scotland/scotwind-leasing-round/

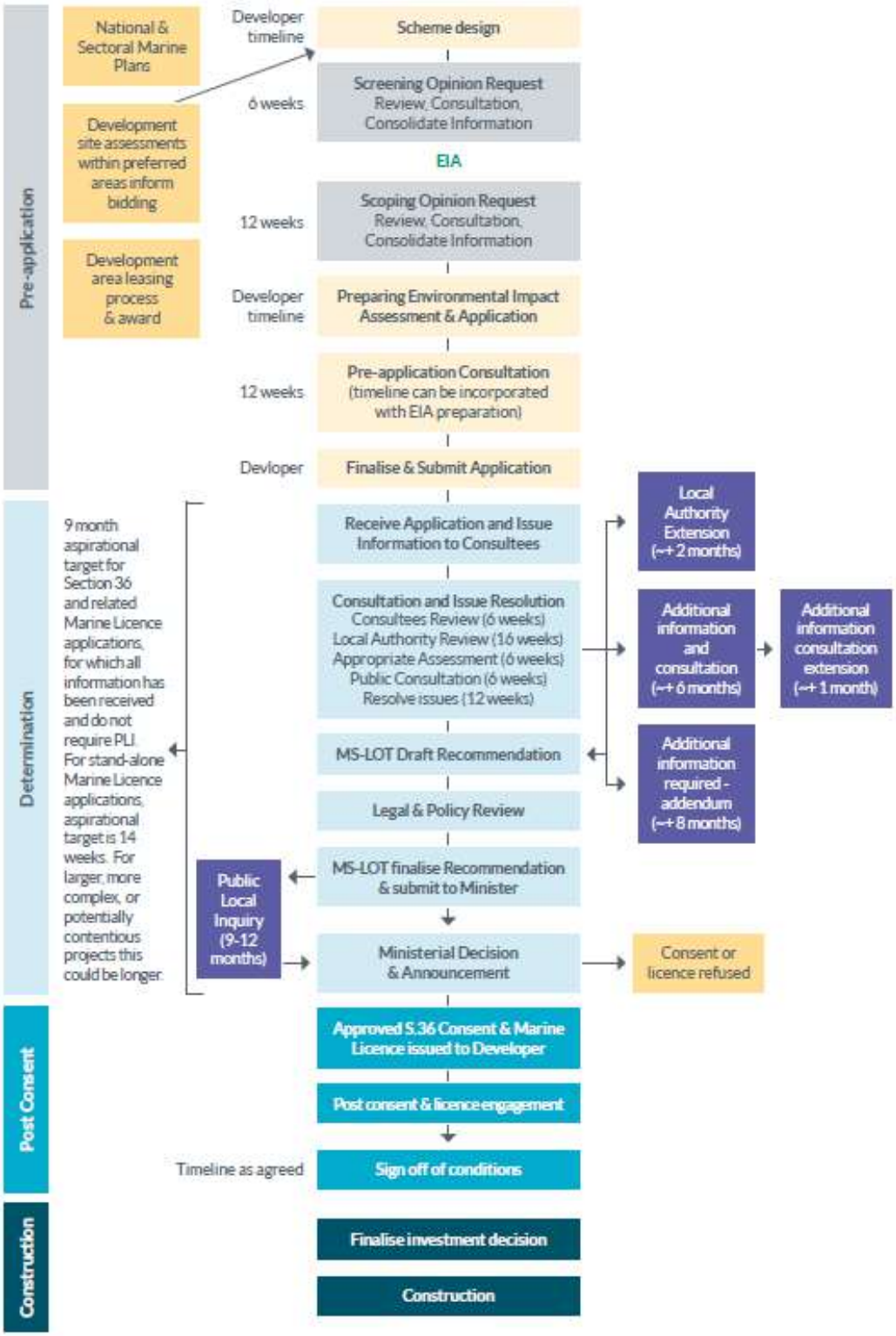
[31] https://www.thecrownestate.co.uk/media/2861/guide-to-offshore-wind-farm-2019.pdf

[32] TCE https://www.thecrownestate.co.uk/media/2861/guide-to-offshore-wind-farm-2019.pdf

[2]- https://ore.catapult.org.uk/wp-content/uploads/2021/09/FOW-CoE-FOW-Development-and-Consenting-Process-Risks-and-Opportunities-Public-Summary.pdf

Aspect of Process	England	Scotland	Wales
Marine Licence application	Although no statutory timescale for determining marine licence applications, MMO aims for a decision within 13 weeks of receiving all relevant information and fee. DCO process has its own timescales.	MS-LOT aims for 14 weeks from application submission.	No statutory timescales for determining Marine Licence applications for ORE projects, which are considered as 'Band 3' projects, i.e. complex applications, and will be decided on a case-by-case basis. DCO process has its own timescales.
Additional consents that may be required	Wildlife licence, seabed survey licence, SSSI consent, Harbour Works licence from relevant authorities. EPS licence.	Other approvals and consents may be needed from Transport Scotland, Scottish Environmental Protection Agency, Harbour Authorities and NatureScot.	Wildlife licence, seabed survey licence, SSSI consent, Harbour Works licence from relevant authorities.

Summary of OSW consents needed for OSW across the UK administrations


Pre-application
Determination
Post Consent
Construction
National & Sectoral Marine Plans
Development site assessments within preferred areas inform bidding
Development area leasing process & award
Developer timeline
6 weeks
12 weeks
Developer timeline
12 weeks
Devloper
Scheme design
Screening Opinion Request Review, Consultation, Consolidate Information
EIA
Scoping Opinion Request Review, Consultation, Consolidate Information
Preparing Environmental Impact Assessment & Application
Pre-application Consultation (timeline can be incorporated with EIA preparation)
Finalise & Submit Application
Receive Application and Issue Information to Consultees
Consultation and Issue Resolution
Consultees Review (6 weeks)
Local Authority Review (16 weeks)
Appropriate Assessment (6 weeks)
Public Consultation (6 weeks)
Resolve issues (12 weeks)
MS-LOT Draft Recommendation
Legal & Policy Review
MS-LOT finalise Recommendation & submit to Minister
Ministerial Decision & Announcement
Local Authority Extension (~+2 months)
Additional information and consultation (~+6 months)
Additional information consultation extension (~+1 month)
Additional information required - addendum (~+8 months)
Consent or licence refused
Public Local Inquiry (9-12 months)
9 month aspirational target for Section 36 and related Marine Licence applications, for which all information has been received and do not require PLI. For stand-alone Marine Licence applications, aspirational target is 14 weeks. For larger, more complex, or potentially contentious projects this could be longer.
Approved S.36 Consent & Marine Licence issued to Developer
Post consent & licence engagement
Timeline as agreed
Sign off of conditions
Finalise investment decision
Construction

An example of development and consenting timeline (based on Marine Scotland's Consenting & Licensing Guidance for Offshore Wind, Wave & Tidal Energy Applications, 2018)[33]

Step 3- Construction, Installation & Commissioning: Engineering, procurement, construction and installations can only go ahead once all consents and licences have been obtained.

- The front-end engineering and design (FEED) studies are used to develop and continuously refine to understand the integrated wind farm systems and inform environmental impact studies. The findings will be used in the procurement, construction and installation stages. The output of FEED studies also provides "greater cost certainty in the development process" and, in turn, auction prices in the Contract for Different auction systems[34].
- As the sector matures, and depending on the developers' needs and capabilities, some projects may look to award EPCI (Engineer Procure Construct Install) contracts to supply and install what is required for the wind farm[35]

Ref[36]-

9) *Provide details about the technical issues related to the electrical connection between the FOWT plant and the onshore grid, Please provide a summary.*

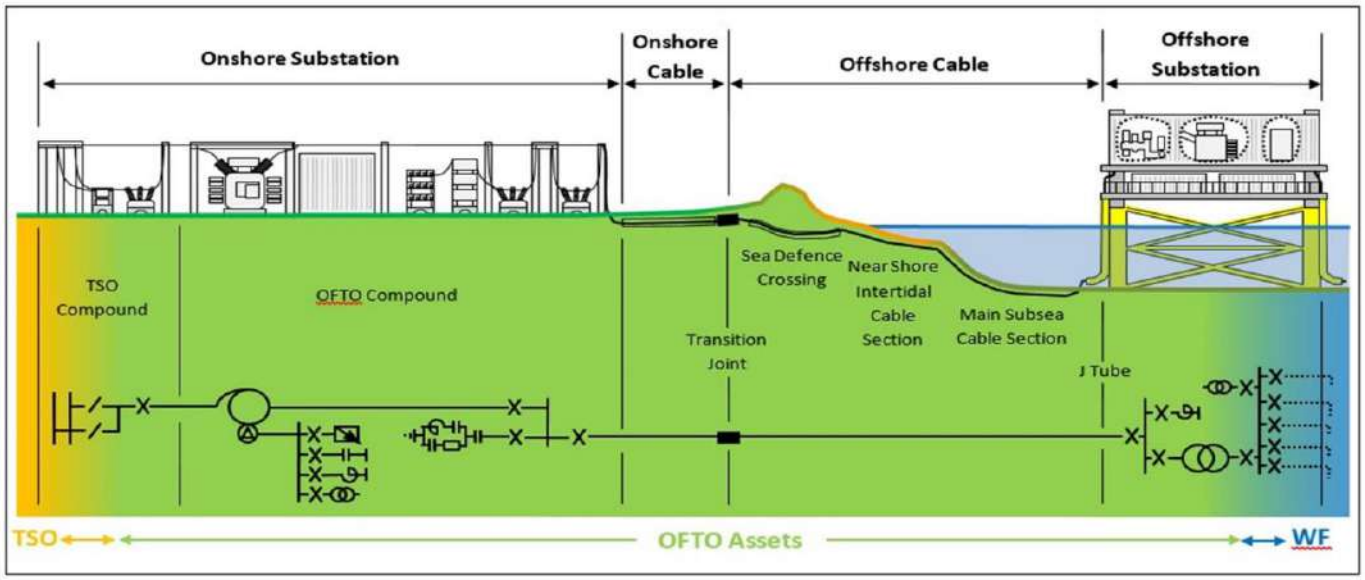
1. **Robustness of cables:** The further offshore the wind farms are, the more robust the subsea power cables are required to have higher generation capacity and greater lengths and voltage. This includes the inter-array cables connecting individual wind turbines together and export cables transmitting generated power to the grid.

2. **Upgrade of grid infrastructure:** In the UK, current grid infrastructure is not suitable for future developments of offshore wind due, in part to the lack of suitable infrastructure, i.e. grid

[33] https://ore.catapult.org.uk/wp-content/uploads/2021/09/FOW-CoE-FOW-Development-and-Consenting-Process-Risks-and-Opportunities-Public-Summary.pdf
[34] FEED studies- 0https://www.thecrownestate.co.uk/media/2861/guide-to-offshore-wind-farm-2019.pdf
[35] https://guidetoanoffshorewindfarm.com/procurement-structures#:~:text=EPCI%20stands%20for%20engineer%2C%20procure,of%20which%20will%20be%20turbine
[36] https://www.dnv.com/expert-story/maritime-impact/Fresh-breeze-for-offshore-wind-farms.html

connection points, in coastal areas close to potential sites.

3. **The UK's Offshore Electricity Transmission Owner (OFTO):** operate and maintains electrical transmission assets. These assets include onshore & offshore substations and onshore & offshore cables (see figure next slide). Ofgem, the UK's Office of Gas and Electricity Markets regulatory authority, licences activities of generators, transmission operators (TSOs), Distribution operators (DSOs) and suppliers.
    - Ofgem ensures a competitive tender process is followed in which offshore transmission assets are sold and transmission licences are granted. The assets and licences are for the transmission of electricity generated by an offshore wind farm to bring it onto the onshore grid. A competitive process ensures that generators are partnered with transmission owners, the most efficient and competitive players in the market[37].
    - In the UK, Energy Act 2004 forbids developers to own transmission assets. The developers will build all the transmission systems and divest these asses to a licensed OFTO. Via a regulated tender process, qualifying tenders can bid to own these assets to be awarded a transmission license [38] [39]



Offshore transmission Assets (OFTO)[40]

10) Concerning the environmental impact analysis, what are the minimum requirements to be met?

In the UK, wind farm developers are required to submit an application for consent under Section 36 (S36) of the UK Electricity Act 1989 to construct and operate an offshore wind farm. They are required to apply for Marine Licences for the wind farm and associated export cables.

[37] Ofgem https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/offshore-electricity-transmission-ofto

[38] Energy Act 2004- https://www.legislation.gov.uk/ukpga/2004/20/contents

[39] Ofgem https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/offshore-electricity-transmission-ofto

[40] OFTO Ref- https://cigre.org.uk/web-cont1001/uploads/CIGRE-UK-July-2019-Webinar.pdf

As part of the application, an Environmental Impact Assessment (EIA) report is required. The EIA is a process of identifying "potential impacts and resultant effects (both beneficial and adverse) of a proposed development throughout all phases, including construction, operation and maintenance, and decommissioning. The potential impacts identified for each phase of development are assessed for the development in isolation and cumulatively with other nearby developments".The EIA is a process that is continuously updated based on "technical expertise with reference to industry best practice guidance and principles"[41].

The suite of environmental surveys establishes a baseline for these assessments as a result of[42]

1. Changes to atmospheric and oceanic dynamics due to energy removal/modifications
2. Electromagnetic field effects of marine species from power cables
3. Habitat alterations to benthic and pelagic fish and invertebrate communities
4. Underwater noise effects on marine species
5. Structural impediments to wildlife
6. Changes to water quality
7. Human Impact Studies
8. Onshore environmental surveys

Example of environmental receptors relevant to Floating Offshore wind farms [adapted from report[43]]

[41] EIA Non technical summary https://marine.gov.scot/sites/default/files/eia_report_volume_1_-_non-technical_summary_redacted.pdf

[42] https://www.sciencedirect.com/science/article/pii/S096456912100096X

[43] OREC, Floating Offshore Wind Development and Consent Process- Risks & Opportunities. 2021

11) Concerning the operation and maintenance phase, is there any specific regulation in your country?

Operation and Maintenance (O&M) provisions are mainly provided by three key actors in the UK: (1) the project owner who is responsible for all services associated with commissioning, installation, operations, decommissioning; strategic, operational approaches, procurements, etc. (2)- the wind turbine original equipment manufacturers (OEMs) who are responsible for the first years of operations as a minimum, providing maintenance associated to the equipment warranties. The OEM contracts vary, with some including responsibility of onshore infrastructure and offshore logistics. (3)- the offshore transmission owner (OFTO)- owning and operating offshore transmission infrastructures.

Each key player will ensure safe operations by supporting the operations of the wind turbines, the balance of plant and associated transmission systems, and maintaining the physical integrity of the wind farm and optimum electricity generation. There are specific regulations in place to ensure safe operations in the UK. Some of these are covered under different O&M service packages

The required O&M services are contracted by various types of contract packages driven by various factors such as strategic approaches to offshore wind O&M and commercial flexibility for contractors. These contracts are put in place once the final investment decision (FID) is confirmed and will detail the O&M plans and activity strategies associated with risks and assigned responsibilities.

Offshore wind operation and maintenance share many challenges and are driven by unique economic pressures, which means that optimum models and modes of operation are key for the sector to mature, particularly for floating offshore wind.

Radar mitigation – Working with the Offshore Wind Industry Council and Ministry of Defence to put in place suitable mitigation that addresses challenges with radar interference from offshore wind turbines.

Equipment warranties- In the UK, the OEMs continue to dominate O&M activities equipment warranties are sold alongside the capital plant. The warranties are typically of five years providing guaranteeing a minimum level of availability on the condition that they have responsibility for day-to-day maintenance activity[44].

Availability-based contracts linked to production targets: OEM warranty to guarantee a certain level of availability of plant linked to the production

Various O&M approaches post-warranty period: O&M Function in house or O&M provision with O&M provider, or hybrid approach

Offshore logistics:

- **Safety & regulatory factors**
- **Equipment payload**
- **O&M Workboats Personnel carrying capacity**: Regulatory change to allow more than 12 passengers per vessel as part of the International Maritime Organisation (IMO) remit.

[44] http://csmres.co.uk/cs.public.upd/article-downloads/Offshore-wind-guide-June-2013-updated.pdf

- **Subsea Inspections**- The requirements for environmental and technical inspection of the subsea elements of wind projects are an already significant aspect of O&M provision
- **Standardised training**: standardised training requirements for the range of roles required. These will inevitably emerge, and therefore, an opportunity exists for providers to help shape this process now and benefit from the outcome in the years ahead. This is particularly for the case of re-skilling personnel who are changing sectors, as illustrated by the example of 3sun (see case study 8)

12) *What is the legislation for the farm's end-of-life? Is a decommissioning plan required? Please indicate if there are special rules for site conditions after decommissioning is implemented.*

In the UK, decommissioning is currently the default option as an end-of-life planning for offshore wind. This means developers are required to remove all wind farm components to restore the seabed to its prior condition. According to a report by Offshore Renewables Catapult, "Over 3.5GW of global offshore wind capacity will reach its end of operational life by 2035 if no other action is taken. This is estimated that about 600 offshore wind turbines will need to be decommissioned by 2030, with 72% secured in monopiles."

There is currently no standard legislation to specify the best practices after operational life ends with decisions strongly driven by the physical conditions, theoretically admissible lifetimes of turbines, site conditions, country legislation, logistical difficulties and environmental impact. There are, however, existing guiding principles "where any damage done to the environment will need to be remediated by the owner"[45].
There has been significant research on strategies for delaying decommissioning, such as extending the life of the assets and total or partial repowering[46].

[45] https://iopscience.iop.org/article/10.1088/1742-6596/1222/1/012035/pdf
[46] https://ore.catapult.org.uk/wp-content/uploads/2021/04/End-of-Life-decision-planning-in-offshore-wind_FINAL_AS-1.pdf

13) *Are stakeholder consultations performed during the authorisation process? If yes, please specify details in the table below:*

Stakeholder category	**Phase of the authorization process**	**Type of opinion requested (mandatory, non-mandatory)**	**Methodology (notice published online, organisation of specific events etc.)**
Local Planning officers or national Planning officers (if deemed to be a national strategic infrastructure)[47]	Early consultation to identify site, local communities, consultation strategy, assess facilities, boundaries, services, etc.[48]	*Informal discussion that is Non mandatory, but advised process to assess likelihood of planning permission and foreseeable oppositions.*	*Online and face-to-face engagements with local authorities, and representative of loca or regionall communities.*
Environmental Stakeholders: Relevant consultants such as environmental organisation, marine organisation and marine interest groups (e.g. local fishing community, harbour & port,...)	Site selection and feasibility stage-investigation of impact of local ecology, marine life, migratory bird routes	*Mandatory and the engagement process is contingent on UK region's regulatory framework for offshore wind.*	
Community consultations involving local stakeholders and residents		*Mandatory process addressing transmission and generation aaasets, and impact on local communities*	*Online consultation to capture concerns, feedback, access project schedules and other details linked to development*
Representatives of local stakeholder groups	Engagement throughout installation, operation and decommissioning phase	Best practice to enable continuous engagements with local community and address any issues p arising from project's final application for consent,	*Coordinated engagements in the form of meetings, inter-community exchange drop ins,*

[47] https://www.bp.com/en_gb/united-kingdom/home/news/press-releases/community-consultations-launch-for-uk-offshore-wind-projects.html

[48] https://iea-wind.org/wp-content/uploads/2021/11/Offshore-Wind-Stakeholder-Engagement-KEEGAN-May-31st-2021.pdf

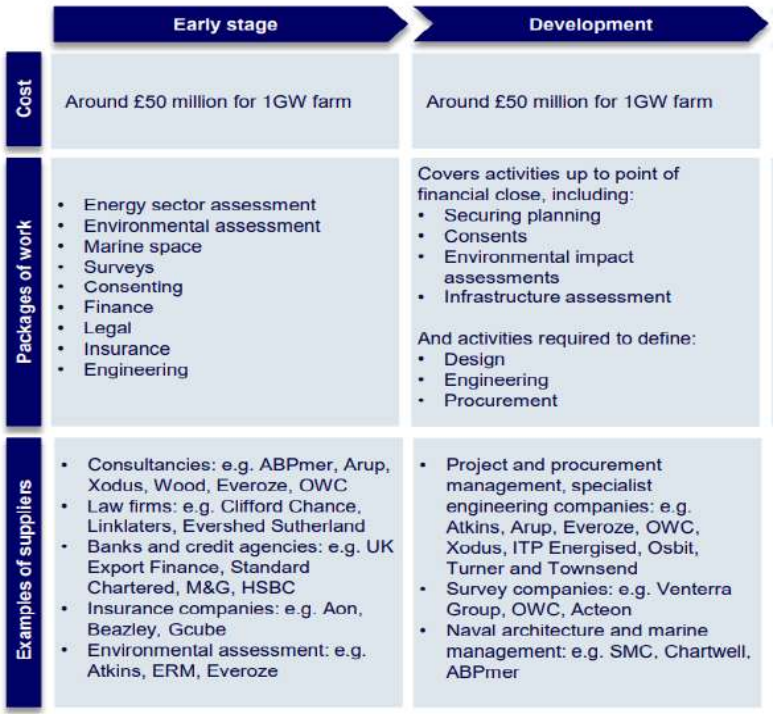
		with anticipated communication activities to construction, installation and operation & maintenance (O&M) phases.[49]	*workshop, site/port visits…*[50]

14) *What are the economic costs associated with the consenting process (if any)? Please specify the total cost or the cost for individual steps if relevant.*

Total costs associated with consenting processes will vary by regions, sites and local issues, exchange rate, contracting conditions, work required, etc.. Based on a typical 1GW project, the total costs for consenting process will be around £50million, equating to £50,000 per MW. Assumptions based on a typical 1GW project using 10MW turbines, quoted in 2018 prices.

49 https://windenergyigert.umass.edu/sites/windenergyigert/files/OFFSHORE%20WIND%20SCOTLAND%202012.pdf

50 https://wfo-global.org/environmental-stakeholder-engagement-in-offshore-wind-what-is-it-exactly/



Lifecyle of an offshore wind farm[51,52]

15) *Please provide any additional relevant information.*

NA

Section 3 barriers and enablers

16) *Provide a list and describe the most critical barriers and bottlenecks of the consenting process in your country.*

Barrier name[53]	**Type (technical, political, administrative etc.)**	**Description**

[51] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1167856/offshore-wind-investment-roadmap.pdf

[52] https://guidetoanoffshorewindfarm.com/wind-farm-costs

[53] https://ore.catapult.org.uk/wp-content/uploads/2021/09/FOW-CoE-FOW-Development-and-Consenting-Process-Risks-and-Opportunities-Public-Summary.pdf

Duration of decision-making processes	Administrative	The lack of synchronisation between the schedules of Contracts for Difference (CfD) rounds and the leasing processes for The Crown Estate (TCE), along with the protracted consent decision process for offshore wind projects taking several years, could potentially impede the feasibility of implementing offshore wind proposals within the required timeframe to achieve the United Kingdom's Net Zero and decarbonization goals. Stakeholders perceive the Development Consent Order (DCO) process timelines as more transparent compared to other consent procedures such as Section 36, Transport & Works Act, or the Marine Scotland Licensing Operations Team (MS-LOT) licensing regime. However, there is a risk of misalignment with the planning process for onshore supply chain infrastructure, such as ports, which might result in delays in development opportunities.
Insufficient regulatory resource to process applications	Political	Insufficient resources within regulatory bodies can lead to extended timelines for making consent decisions, especially when dealing with intricate applications. To facilitate the expansion of Floating Offshore Wind Turbines (FOWT) and similar offshore renewable sectors, a diverse skill set spanning various disciplines such as engineering, environmental science, health and safety, logistics, management, and regulatory expertise is essential. In the short and medium run, it may be possible to fulfil some of these skill demands by drawing from other sectors, such as the oil and gas industry. However, for the long-term sustainability of these sectors, a dedicated focus on and investment in skills development and training will be imperative.
Lack of strategic and spatial planning in all geographic areas	Planning	Diverse marine planning procedures exist across the nations of the United Kingdom, and the competition for maritime territory underscores the necessity for enhanced spatial planning in offshore regions. This could entail the potential prioritisation of various activities, representing a significant transformation in the approach to marine planning across all UK regions.
Lack of suitable grid infrastructure in coastal areas close to potential sites	Processing	The optimal sites for Floating Offshore Wind (FOW) installations may be located far from suitable grid connections, leading to extra expenses and environmental consequences associated with extending cabling to reach grid connection points. The development and integration of grid infrastructure are widely acknowledged as significant hurdles for future Offshore Wind (OSW) projects. Public investment and government support are essential to address these infrastructure challenges. Additionally, the actions taken to bolster fixed OSW initiatives could also prove beneficial for the advancement of FOWT.

Maintain/reduce transmission costs	Processing	Over a span of five years, large variations in transmission tariffs throughout the United Kingdom render certain Scottish OSW and FOWT locations financially unfeasible.
Evolving evidence base, uncertainty, precautionary approach	Technical	Being an emerging technology, there are uncertainties surrounding the environmental effects of FOWT. These uncertainties could potentially lead to heightened expenses and longer approval processes during the consenting phase.
Consenting complexity	Political	There are regional disparities and multiple jurisdictions involved in the approval process, each with their unique consenting criteria. Projects may span across multiple jurisdictions, raising concerns about the lack of clarity and understanding regarding how the transboundary consenting and post-consenting procedures will be managed and coordinated.
Timing of HRA/environmental assessment process	Political / Processing	There is a notable difference in the leasing process between Scotland and the rest of the United Kingdom. In Scotland, the process involves a comprehensive evaluation that includes constraints assessments, opportunities analysis, public consultation, stakeholder engagement, plan-level Habitats Regulation Appraisal (HRA), Strategic Environmental Assessment (SEA), and Socio-Economic Impact Assessment (SEIA) before making sites available for leasing bids. This approach ensures that the selected sites are not only potentially feasible for wind farms but also thoroughly assessed for suitability. In contrast, in England and Wales, these aspects have not been examined in as much detail, which places a higher level of risk on developers.
Resourcing for licensing and consenting in general	Administrative	There is a recognized shortage of human resources available to handle the processing of applications, and this situation is exacerbated by the turnover of experienced personnel within regulatory bodies during the time it takes to secure consents.

17) *Are simplification measures for the consenting process currently being developed/implemented in your country? If yes please give a brief description of those currently being implemented*

The Marine Licensing operations team adopts a one-stop-shop approach to streamline the process of consenting and licensing. This means that when requested, they handle applications for various permits and licences, including Section 36 Consent, deemed planning permission, Marine Licences, EPS licences, and basking shark licences all at once. This approach is designed

to simplify the process, making it more efficient and less burdensome for applicants, stakeholders, and regulatory authorities. The goal is to create a smoother and more user-friendly experience for all parties involved in the application and approval process.

18) *Provide a list and describe the most relevant enablers of the consenting process in your country.*

Enabler number[54][55]	**Type (technical, political, administrative etc.)**	**Description**
1.Established and experienced regulatory regime	Political & Processing	Covering the whole offshore wind project life cycle, from leasing to consenting, to operation and decommissioning, with actions underway to accelerate the processing and consenting timeline
2.Streamline the planning process and accelerate deployment of offshore wind	Planning and Processing	These include the creation of a Fast Track consenting process for Nationally Significant Infrastructure Projects. The Offshore Wind Environmental Improvement Package (OWEIP) will help to reduce offshore wind consenting time from up to four years to one year, whilst ensuring we continue to meet our environmental commitments.
3.Updating the Energy National Policy Statements	Political	Work is ongoing to amend the National Policy Statements (NPSs) to ensure they reflect the importance of energy security and net zero, the role of offshore wind in delivering them and strengthen the priority of renewable energy infrastructure.
4.Putting legislation in place to streamline the offshore wind consenting process	Political	Through the Energy Bill, the department for Energy Security and Net Zero will introduce the Offshore Wind Environmental Improvement Package which includes regulations to adapt environmental assessments for offshore wind, enable strategic compensation and introduce Marine Recovery Funds.

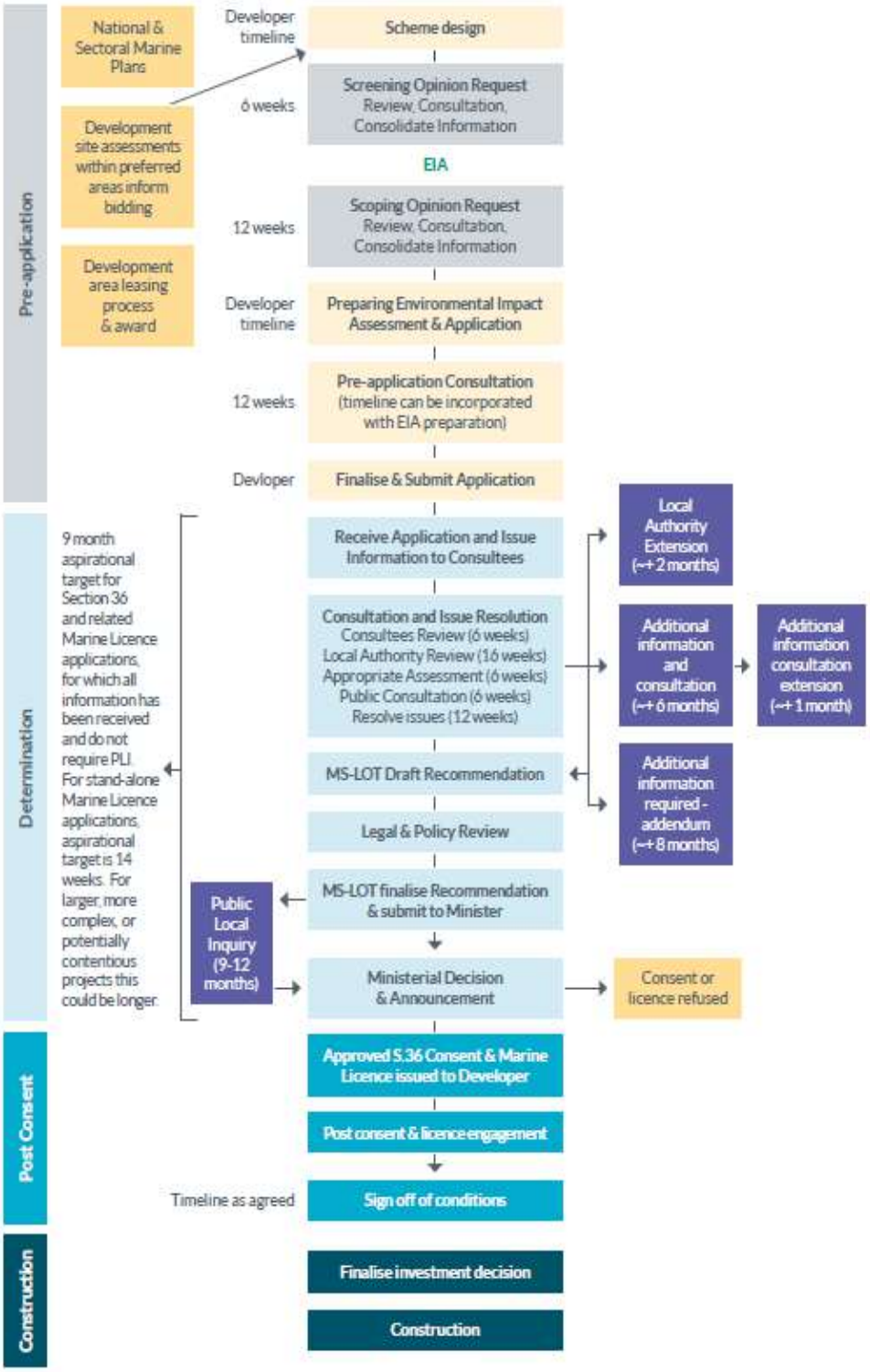
[54] Policy paper, Offshore wind net zero investment roadmap, (2023). https://www.gov.uk/government/publications/offshore-wind-net-zero-investment-roadmap/offshore-wind-net-zero-investment-roadmap

[55] Energy Security Bill factsheet: Offshore wind environmental improvement package (2023). https://www.gov.uk/government/publications/energy-security-bill-factsheets/energy-security-bill-factsheet-offshore-wind-environmental-improvement-package

5.Providing power to Habitats Regulation Assessments (HRA)	Political & Processing	By providing a power to tailor HRA processes the government can ensure environmental protection is addressed early in the consenting process. This will allow adequate time to resolve discrepancies in evidence and data, inform and create ecologically robust compensatory measures and subsequently speed up the consenting process.
6.Strengthening the Renewable National Policy Statements to reflect the importance of energy security and net zero	Political	Alongside the OWEIP, British Energy & Security Strategy (BESS) also sets out several other measures that will help reduce the offshore wind consenting route from up to four years to one. The government has also created the Offshore Wind Acceleration Task Force. Furthermore, through BESS, the government is also establishing a fast-track consenting route for priority cases where quality standards are met, by amending Planning Act 2008 so that the relevant Secretary of State can set shorter examination timescales.

Example

19) *If possible provide an example of a completed authorisation process analysing the relevant points: time needed to complete the procedure, barriers/bottlenecks, problems and lessons learnt*



20) Are there any other relevant topics to mention that are specific to your country? If yes please provide a short summary.