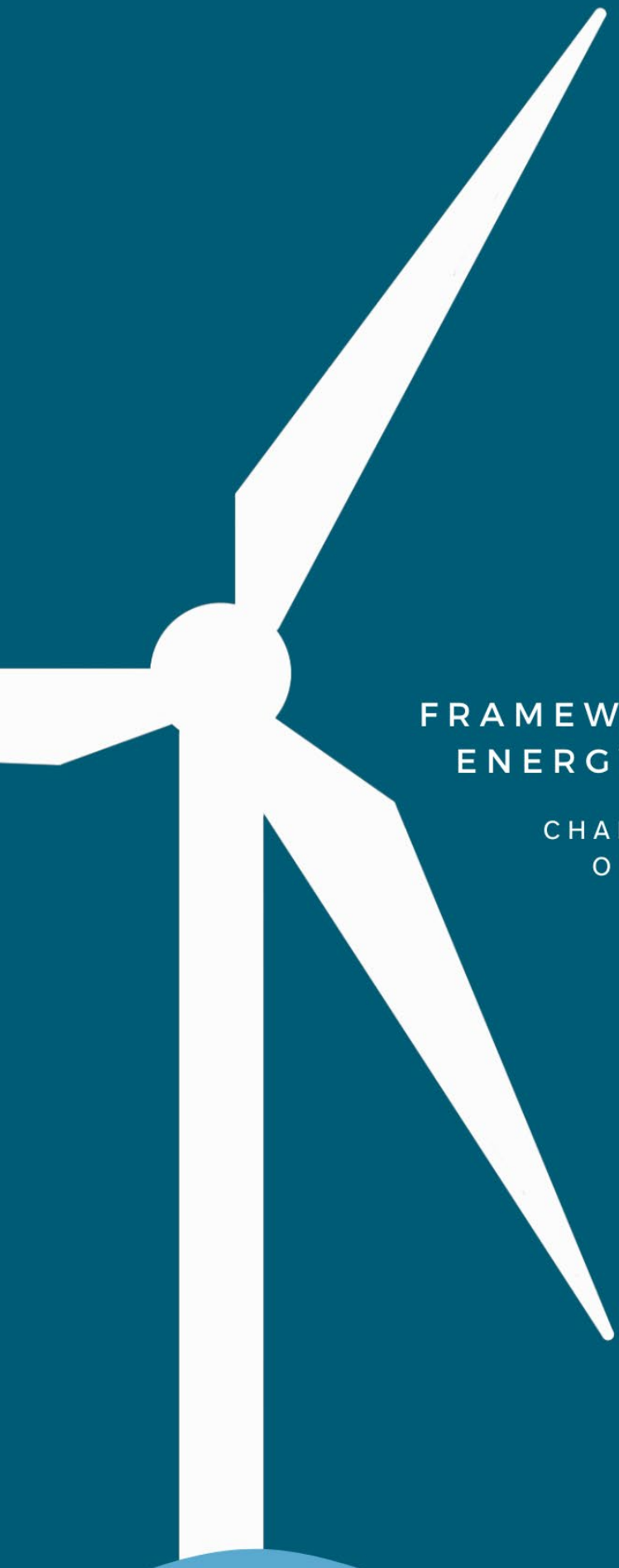

WINDMED

ENHANCING THE POLICY FRAMEWORK FOR OFFSHORE WIND ENERGY IN THE MEDITERRANEAN

CHALLENGES AND OPPORTUNITIES FOR OFFSHORE WIND POLICIES IN ITALY

SEPTEMBER 2024

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- *Alessandro Monti*, Assistant Professor in Energy Law and Sustainability, Faculty of Law
- *Michele Merrill Betsill*, Professor, Faculty of Social Sciences, Department of Political Science
- *Simon Westergaard Lex*, Associate Professor, Faculty of Social Sciences, Department of Anthropology
- *Haakon Lund*, Associate Professor, Faculty of Humanities, Department of Communication
- *Anne Bach Nielsen*, Postdoc, Faculty of Health and Medical Sciences, Department of Public Health
- *Jakob Dreyer*, Postdoc, Faculty of Social Sciences, Department of Political Science.

While all the abovementioned researchers have contributed to the WINDMED project in their different roles and capacities, the drafting of this report has been carried out by Alessandro Monti (Sections 1-6 and 8) and Jakob Dreyer (Section 7 and 8) with the precious support of student assistant Diana Spatafora. The report has been finalized in September 2024.

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Copenhagen, 30th September 2024

Alessandro Monti

Jakob Dreyer

Executive summary

Italy has considerable potential to become a leader in offshore wind development in the Mediterranean region. Although the initial and thus far only Italian offshore wind farm, which was inaugurated in 2022 off the coast of Apulia, is characterized by fixed-bottom foundations, the prospects for large-scale development of offshore wind in Italy heavily rely on floating projects, due to the considerable depths of Italian waters. The submission of grid connection requests to the Italian transmission system operator for a capacity exceeding 90 GW (as of September 2024) demonstrates the strong interest in offshore wind development in Italy on the part of both national and international market operators. At the same time, a considerable number of uncertainties persist regarding the prospects for Italy to deploy its offshore wind potential. In particular, the Italian regulatory landscape for floating offshore wind still requires further development, in order to provide the long-term vision that is needed to foster investments in this sector. This includes, among others, the establishment of mid-to-long-term targets, the roll-out of incentive schemes, the streamlining of permitting and authorization procedures, the creation of a national maritime spatial plan, as well as the expansion of essential infrastructure such as ports and the electricity grid. The report presents an analysis of the existing policy framework influencing the development of floating offshore wind in Italy, while identifying key areas where prospective regulatory interventions could facilitate the growth of this sector.

Key recommendations

Adoption of mid- and long-term targets

- Complement the target of 2.1 GW by 2030 set out in Italy's National Energy and Climate Plan by establishing mid- and long-term targets
- Targets for 2035 and onwards are needed to further expand the offshore wind sector

Establishment of a national Maritime Spatial Plan

- Adopt an Italian Maritime Spatial Plan as soon as possible to facilitate coordination between offshore wind and other activities
- Maritime Spatial Plans can ensure predictability in the allocation of sea space for offshore wind

Streamlining of permitting procedures

- Enhance coordination among different State and local authorities - consider the adoption of a one-stop-shop model
- Streamlined permitting process facilitate the approval of offshore wind projects

Ports

- Invest in harbor expansion and development for floating offshore wind
- Adequate port infrastructure is essential for manufacturing and assembly of floating installations

International cooperation

- Foster cooperation with offshore wind frontrunner countries such as Denmark
- Leverage EU regulation, support, and funding to accelerate offshore wind development.

1 Introduction

Wind energy plays a vital role in the decarbonization of the energy sector, representing, along with solar energy, the most promising renewable energy source for achieving large-scale electrification.[1] The potential for wind energy to replace fossil fuels as the primary source of electricity generation has been enhanced by technological advancements that have reduced costs and increased the generation capacity of wind turbines.[2] However, fully integrating this source into the energy mix requires large-scale policy interventions, to enable the build-up of generation capacity, and ensure that the overall infrastructure can accommodate the intermittent nature of this energy source.

The use of floating technologies is important for the expansion of offshore wind in Italy and in the broader Mediterranean region, which is characterized by significant sea depths. This is among the key distinctions between the offshore wind industry in the North Sea, where the growth of the offshore wind industry has been enabled by the relatively shallow waters, which have allowed the installation of numerous bottom-fixed wind farms. As technological developments continue to facilitate the construction of floating offshore wind farms, countries in the Mediterranean region are increasingly recognizing the potential of offshore wind energy to meet their energy needs and environmental goals. Moreover, initiatives to expand offshore wind capacity are an integral component of EU policies such as the European Green Deal, which establishes the framework for a sustainable energy transition in EU Member States. An increase in offshore wind generation capacity would allow Mediterranean countries to diversify their energy portfolio, thereby contributing to regional energy security and economic development, while aligning with broader efforts to combat climate change and reduce greenhouse gas emissions.

Nevertheless, the path towards the expansion of offshore wind in Mediterranean countries remains challenging, as numerous technical and policy challenges need to be addressed before the sector can reach its full potential. While the expansion of offshore wind could result in environmental, as well as social and economic benefits, enabling such expansion necessitates significant modifications to the regulation of national energy systems. Taking stock of these challenges, this report examines the potential for floating offshore wind in the Mediterranean through a case study on Italy. This specific jurisdiction has been selected as the first case study for the WINDMED project, in light of the large number of potential projects in the pipeline and the numerous normative interventions that have taken place over the last year. The report outlines the main features of the relevant policy and regulatory framework while suggesting ways in which this can be adapted to support the growth of this sector.

1.1 Scope and methodology

This report aims to provide an overview of the policy and regulatory framework for floating offshore wind in Italy, as it stands in September 2024. To achieve

[1] International Energy Agency, World Energy Outlook 2023 (IEA 2023).

[2] Veers P. et al., Grand Challenges: wind energy research needs for a global energy transition, (2022) 7(6) Wind Energy Science 2491.

this, several policy areas of particular relevance have been identified, which formed the basis of over twenty semi-structured interviews conducted with a wide range of public and private stakeholders involved in the Italian market. Through such interviews, which have taken place between November 2023 and May 2024, a wide range of stakeholders were consulted to gain insights into their perspectives on the policy challenges and opportunities for offshore wind in Italy. While a list of the interviewed stakeholders is provided below, the information gathered through these interviews is presented in this report in anonymized form. Therefore, when referring to specific issues that have been discussed during the interviews, there is no attribution of quotes to specific interviewees. The stakeholders that have been consulted for this project are presented as follows, divided by category:

OFFSHORE WIND DEVELOPERS

- Acciona
- Renext Solutions (Renexia Group)
- Hope Group
- BayWa r.e.
- Renantis
- BlueFloat
- Copenhagen Offshore Partners

CONTRACTORS

- Rosetti Marino
- SAET
- ILStudio Engineering & Consulting
- Vestas

INDUSTRY ASSOCIATIONS

- Associazione Nazionale Energia del Vento (ANEV)
- Elettricità Futura

NON-GOVERNMENTAL ORGANIZATIONS

- Offshore Wind and other marine renewable Energies in Mediterranean and European Seas (Owemes)
- Worldwide Fund for Nature (WWF)

INFRASTRUCTURE OPERATORS

- Terna S.p.A.
- Associazione Porti Italiani (Assoporti)

NATIONAL AND LOCAL AUTHORITIES

- Conferenza Permanente per i rapporti tra lo Stato, le Regioni e le Province Autonome di Trento e Bolzano
- Gestore dei Servizi Energetici (GSE)
- Italian Ministry of Environment and Energy Security
- Italian Ministry of Foreign Affairs
- PNRR-PNIEC Commission
- Apulia Region

Thanks to the diverse range of viewpoints that have been gathered, this report presents a detailed and comprehensive account of the opportunities and challenges encountered by the stakeholders involved in the Italian offshore wind industry. In addition to the abovementioned interviews, data were gathered through desk-based research, as well as through a workshop held in April 2024 at the Danish Foreign Ministry in Copenhagen. The workshop involved a delegation of Italian and Danish public and private stakeholders and provided an

opportunity to discuss and compare the different approaches to offshore wind policies in the two countries.

Considering the pioneering role played by Denmark in offshore wind, as the world's first offshore wind farm was established in 1991 in Vindeby, several references to the Danish policy framework for offshore wind have been included throughout this report. The long-standing experience with offshore wind in Denmark has fostered innovative policy developments, which have created a favorable normative framework for offshore wind. The inclusion of references to the Danish framework therefore provides examples of policy options which Italy can draw inspiration from, to develop effective offshore wind policies.

1.2 Outline

This report is structured as follows. Section 2 provides an overview of the offshore wind sector in Italy, describing the impact of geographical, technological, and economic factors on the development of offshore wind in this country. Section 3 examines the strategic objectives set by Italy, outlining the targets, planning, and institutional framework for integrating offshore wind energy into the national energy mix in a robust and sustainable manner. Section 4 outlines the permitting process and the fiscal and regulatory incentives designed to stimulate investment and growth within the offshore wind sector. Section 5 addresses the relationship between offshore wind and the development of essential infrastructure, such as the transmission grid and ports. Section 6 presents the key challenges arising at the intersection of offshore wind development and environmental protection, as well as the impact on local communities. Section 7 highlights the importance of international and EU collaboration, emphasizing the value of joint efforts in advancing the offshore wind sector, and explores the potential of partnerships between Italy and Denmark. Finally, Section 8 concludes the report.

2 Offshore wind in Italy: An Overview

Italy counts as one of the most promising markets for offshore wind development in the Mediterranean. With a coastline measuring 7,600 km, Italy has the 14th longest coastline in the world and the 5th longest in Europe. Moreover, Italy is characterized by favorable wind conditions, particularly around the islands of Sardinia and Sicily, and in the southern region of Apulia, with average wind speeds in these regions ranging between 6-9 m/s. These wind speeds are slightly lower than those found in the North Sea, which, due to its abundant and consistent wind resources, has been dubbed the 'green power plant of Europe' (Figure 1).[3]

Nevertheless, one key difference between the North Sea and Italian waters can be attributed to the different bathymetric profiles, as the greater depth of Italian and, more generally, Mediterranean waters, has so far limited the exploitation of offshore wind energy in this region.

The majority of installations in the North Sea utilize bottom-fixed technologies, which are technically feasible only in sea depths of up to 60 meters. In contrast, Italian waters are characterized by significantly greater sea depths, which, apart from a few exceptions such as some areas of the Adriatic Sea, are not suited for the use of bottom-fixed technologies (Figure 2).

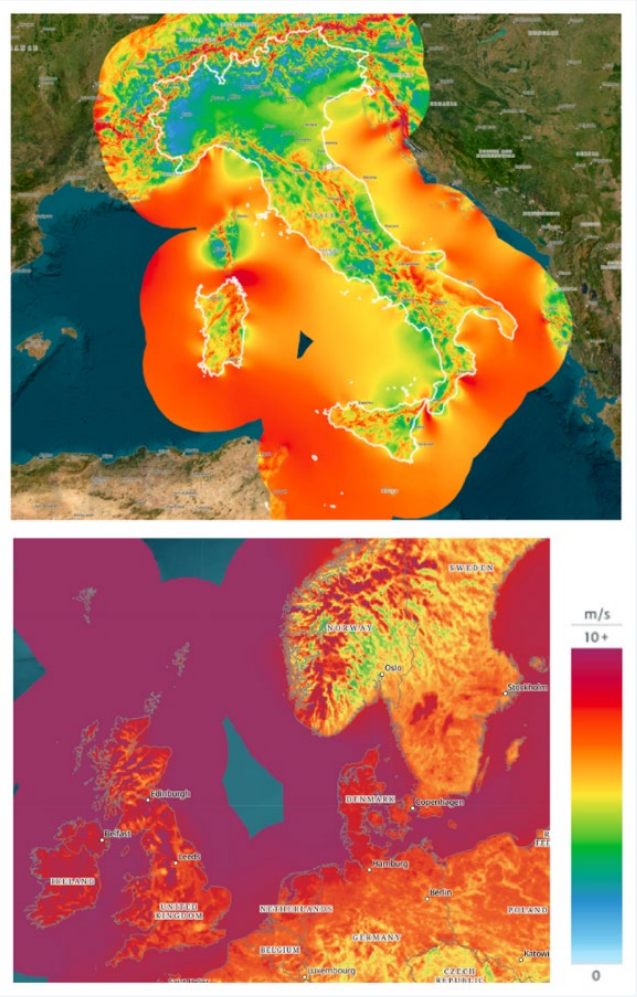


Figure 1: Mean wind speed at 100 m above sea level in Italy and in the North Sea. Source: https://globalwindatlas.info.

However, recent developments in floating offshore technologies have facilitated the narrowing of the existing gap in offshore wind exploitation. To provide an overview of the prospects for offshore wind development in Italy, this section highlights some key geographical and technological aspects as well as challenges and opportunities that may arise from the establishment of offshore wind farms in Italy.

[3] See 'The Esbjerg Declaration on The North Sea as a Green Power Plant of Europe', available at: <https://www.en.kefm.dk/Media/637884571703277400/The%20Esbjerg%20Declaration%20(002).pdf>. According to a recent study, mean wind speeds at the selected location for the Energy Island in the North Sea range between 10-11 m/s. See 'Site Wind Conditions Assessment Energy Island North Sea', available at: <https://ens.dk/sites/ens.dk/files/Energioer/2108_sitewindconditionassessment.pdf>.

Figure 2: Bathymetry in Italy and in the North Sea. Source: https://globalwindatlas.info.

2.1 Geographical and technological considerations

In 2022, wind energy in Italy accounted for approximately 6% of electricity consumption,[4] with the vast majority of this energy being derived from onshore wind. The first offshore wind farm in Italy – as well as in the entire Mediterranean region – was opened in 2022 in Taranto. It currently represents the sole operational wind farm in Italy, with a capacity of 30 MW. While the establishment of such a wind farm – named Beleolico – was an important first step for offshore wind development in Italy, the electricity it produces represents only a fraction of the nearly 12 GW of onshore wind capacity that have already been installed.[5]

Such a discrepancy is largely attributable to the distinctive geographical and bathymetric features of the Italian territory. As mentioned above, the depth of Italian waters makes the installation of bottom-fixed technologies quite challenging. Moreover, the Italian coastline is of great interest from a tourism and cultural perspective, which calls for the positioning of offshore wind farm projects at greater distances from the shoreline, in areas where the sea is deeper than 60 meters. Consequently, the only viable option for such sea depths is to install floating wind turbines (Figure 3), which in turn leads to higher costs and greater technological challenges.

While floating offshore wind farms are already operational in a limited number of European countries, including Norway, the UK, and Portugal, the technology is still at an earlier stage of development compared to its bottom-fixed counterpart, with only 277 MW of global floating installed capacity to date.[6] Nevertheless, the growing interest in this technology is demonstrated by a global pipeline for new floating projects of 244 GW.[7] Key technological challenges that need to be

[4] Terna, 'Copertura della domanda per fonte', available at: <https://www.terna.it/it/sistema-elettrico/statistiche/evoluzione-mercato-elettrico/domanda-copertura-fonte>.

[5] Terna, 'Dati statistici 2022', available at: <https://www.terna.it/it/sistema-elettrico/statistiche/pubblicazioni-statistiche>.

[6] IRENA, Floating Offshore Wind Outlook (IRENA 2024), p. 29. Available at: <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2024/Jul/IRENA_G7_Floating_offshore_wind_outlook_2024.pdf?rev=5677523af0114cde8eb19cb9221b4622>.

[7] Ibid. p. 6.

addressed for it to reach a higher level of market readiness include the assembly and design of floaters, the development of dynamic semi-submersible cables, and the construction of floating substations, along with the optimization of wind turbine design for floating structures and for the specific wind conditions in the Mediterranean.[8]

It should also be noted that the development of new technological solutions is a costly process, with both suppliers and developers needing to sustain significant financial challenges. This, in turn, requires the establishment of a stable and reliable market for floating offshore wind, which would create the needed level of demand to support the necessary investments. In the absence of a robust and reliable market, the high development costs can hardly be sustained, stalling progress and innovation in this field. In an emerging market like Italy, where the first floating offshore wind farm still needs to be installed, a concerted effort from all stakeholders, including policymakers, investors, and civil society representatives, is particularly needed to create an environment conducive to growth and innovation in the sector.

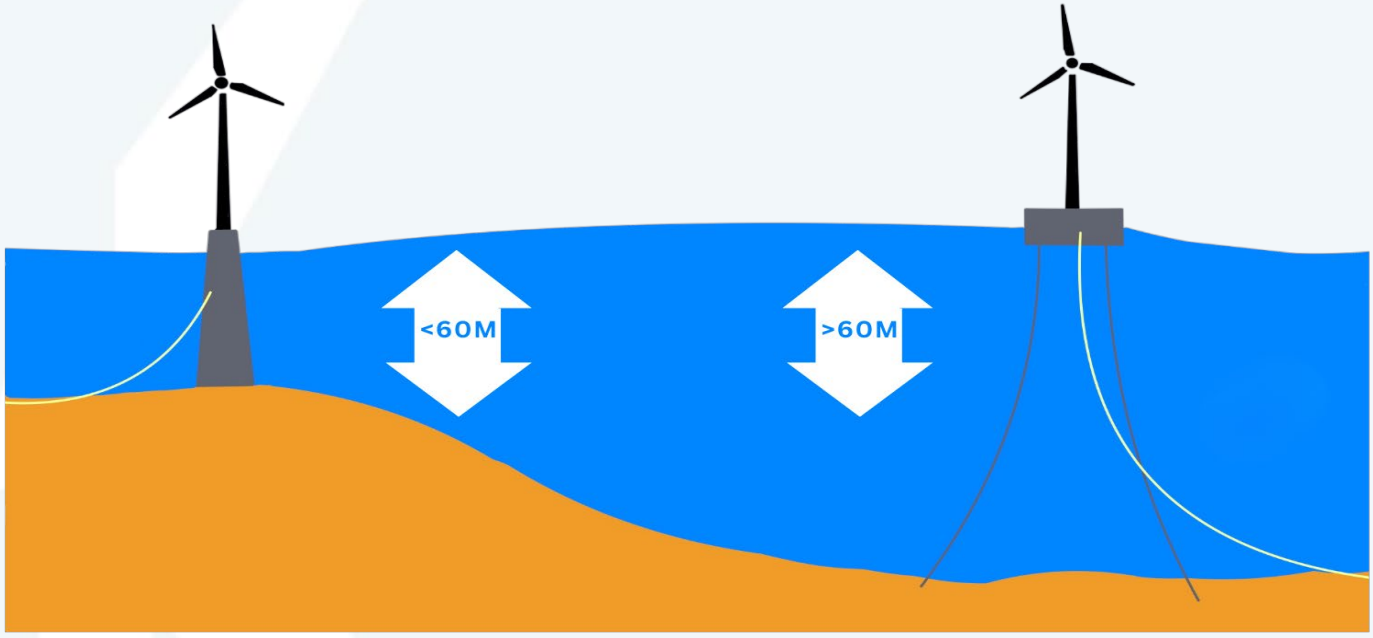


Figure 3: Bottom-fixed and floating installations according to different sea depths. Source: Own creation.

2.2 Potential and challenges for floating offshore wind in Italy

Despite the geographical and technological challenges mentioned above, Italy remains an attractive location for the development of floating offshore wind energy. The Global Wind Energy Council (GWEC) estimates that Italy's technical potential for offshore wind is 189 GW, of which 183 GW would have to be floating.[9] This untapped potential has attracted the interest of numerous

[8] For further analysis on these issues, see A. Zingales, 'L'impatto dell'Eolico Offshore Floating sulla rete e sul sistema Italia', L'Energia Elettrica (March-April 2023), p. 47.

[9] Global Wind Energy Council, Offshore Wind Technical Potential in Italy, available at: <https://gwec.net/wp-content/uploads/2021/06/Italy_Offshore-Wind-Technical-Potential_GWEC-OREAC.pdf>.

investors, as projects have been proposed for over 90 GW of capacity (Figure 4).[10]

Yet, most of these projects remain in the preliminary stages of development, and it is unclear how many will ultimately be realized in practice. Notably, important steps forward have been achieved in March 2024, as the 7 Seas Med project, situated off the western coast of Sicily, was granted a positive Environmental Impact Assessment (EIA), marking the first positive EIA for a floating offshore wind project in Italy. Furthermore, in July of the same year, another positive EIA was issued for the Agnes project, a bottom-fixed project situated in the Adriatic Sea off the coast of Romagna.

Unlocking the potential of floating offshore wind energy could bring about significant advantages for Italy, especially in terms of energy security, decarbonization, and industrial development. With regard to energy security, Italy is an energy-importing country, with an energy dependency rate of 74.6% (as of September 2024),[11] which, while decreasing from 79.2% in the previous year, is still well above the European average.[12] The energy sector, is particularly reliant on natural gas, which

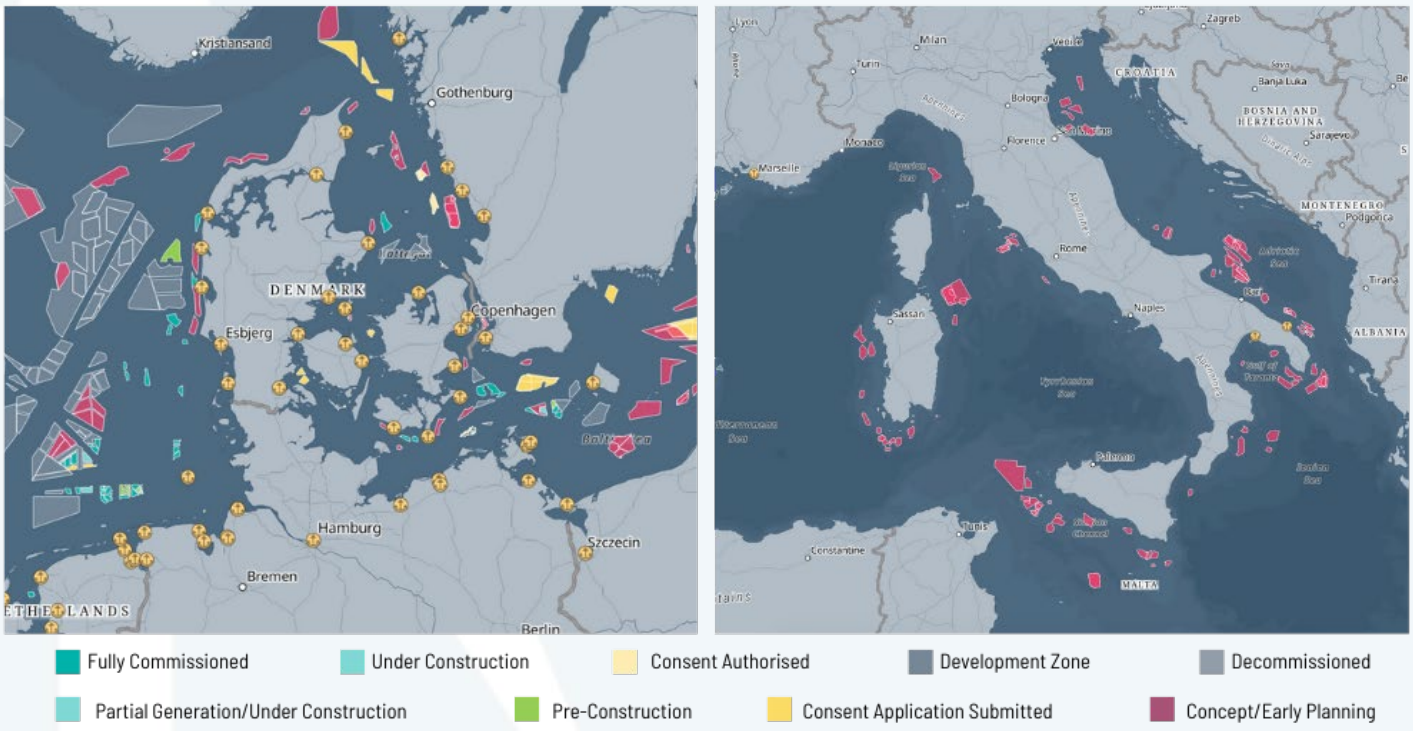


Figure 4: Proposed and constructed offshore wind farms in Denmark and Italy. Source: adaptation from https://www.4coffshore.com.

accounted for over 48% of total electricity

[10] 'Terna: entro il 2022 rilasciate soluzioni di connessione per 95 GW di nuovi impianti eolici offshore', available at <https://www.terna.it/it/media/comunicati-stampa/dettaglio/soluzioni-connessione-nuovi-impianti-eolici-offshore#:~:text=Entro%20la%20fine%20del%202022,complessiva%20di%20circa%2095%20GW>.

[11] Ministero dell'Ambiente e della Sicurezza Energetica, 'La Situazione Energetica Nazionale nel 2023', 4 September 2024, available at: <https://www.mase.gov.it/sites/default/files/Relazione%20Situazione%20Energetica%20Nazionale_%202023.pdf>.

[12] European Council, 'How dependent are EU member states on energy imports?', available at: <https://www.consilium.europa.eu/en/infographics/how-dependent-are-eu-member-states-on-energy-imports/>.

generation in 2022.[13] This results in Italy being highly susceptible to fluctuations in global energy markets, as demonstrated by the 2022 energy crisis that followed the Russian attack on Ukraine. Consequently, renewable energy sources such as solar and wind energy present an opportunity for Italy to increase its energy independence, giving rise to positive implications for the country's industrial growth.

In terms of decarbonization, Italy is bound by the EU objectives currently set out in the 'Fit for 55' strategy. In June 2024, the Italian government submitted the updated version of Italy's National Energy and Climate Plan (NECP) to the European Commission, setting a target of 66% greenhouse gas (GHG) emissions reduction by 2030 compared to 1990 levels in ETS-covered sectors.[14] In this context, decarbonizing the energy sector through the expansion of offshore wind can play an important role in achieving the envisaged reduction of GHG emissions.

With regard to industrial growth, the expansion of offshore wind presents a valuable opportunity for growth also in several additional sectors, including steel manufacturing, cable manufacturing, and floater assembly. Italy is already well-positioned to capitalize on these opportunities, with a strong industrial base and a leading role in steel production (as the second largest steel producer in the EU after Germany), along with a strong shipbuilding industry and the production of dynamic cables. The establishment of offshore wind farms at a level that is consistent with Italy's targets will bring about the need for expansion in these sectors. For instance, with regard to steel manufacturing capacity, it is estimated that between 4,000 and 5,000 tons of steel will be required for the assembly of a 15 MW wind turbine floater.[15] According to data from the Italian shipbuilding company Fincantieri, approximately 500,000 tons of steel in 3-4 years are needed to achieve the current target of 2.1 GW offshore wind by 2030.[16] Therefore, there would be significant growth opportunities for Italian industries, should the potential of floating offshore wind be effectively realized.

Finally, the establishment of an Italian value chain also represents an opportunity for the pursuit of the objectives set forth in the European Wind Power Action Plan, released in October 2023, which aims to reinforce the position of the EU's wind sector on the global market.[17] This entails facilitating collaboration among European companies, research institutions, and governments, thereby creating an environment conducive to technological advancement, the exchange of best practices, and the resolution of shared challenges, while aligning

[13] International Energy Agency, 'Where does Italy get its electricity?', available at: <https://www.iea.org/countries/italy/electricity>.

[14] Italian National Energy and Climate Plan (NECP), June 2024, available at: <https://www.mase.gov.it/sites/default/files/PNIEC_2024_revfin_01072024.pdf>.

[15] K. Balanda et al., 'The role of the local Supply Chain in the development of floating offshore wind power', (2022) IOP Conf. Ser.: Earth Environ. Sci. 1073 012010, p. 3.

[16] Camera dei Deputati, VIII e X Commissioni Riunite, Audizione informale: disegno di legge C. 1606 Governo, conversione in legge del decreto-legge 9 dicembre 2023, n. 181, 20 December 2023, available at: <https://documenti.camera.it/leg19/documentiAcquisiti/COM08/Audizioni/leg19.com08.Audizioni.Memoria.PUBBLICO.ideGes.26844.28-12-2023-17-48-36.334.pdf>.

[17] European Commission, COM/2023/669 final, 'European Wind Power Action Plan'.

with the broader European objectives of energy independence and sustainability.

Despite such opportunities, the advancement of the floating offshore wind industry in Italy is confronted with several regulatory and policy-related challenges. It is widely acknowledged that the establishment of a stable and predictable regulatory framework is of significant importance for the flourishing of investments in floating offshore wind. Given the high capital expenditures that are typically associated with floating offshore wind projects, market players are strongly aware of the need to rely on well-defined and realistic targets, streamlined permitting procedures, predictable and competitive incentive schemes, and concrete plans for infrastructural upscaling. Conversely, the absence of a comprehensive and predictable regulatory framework represents a significant obstacle to the full-scale development of the offshore wind sector, causing reluctance among national and international market players to make long-term commitments.

In this light, the following section presents an analysis of the key policy challenges currently faced by the Italian government, whilst simultaneously discussing the manner in which the Italian policy framework has evolved over time and how it compares to other EU markets.

3 Overarching policy strategies

This section examines some overarching elements that are considered essential for the establishment of a robust offshore wind sector, namely the setting of targets and the adoption of maritime spatial plans. While not directly affecting the realization and financing of offshore wind farms, which are more closely addressed in section 4, these overarching elements are paramount for the establishment of a favorable policy environment to offshore wind development. In particular, this section discusses the Italian policy landscape on these matters, while drawing comparisons from Denmark and other EU Member States.

3.1 Targets

By outlining the anticipated trajectory for offshore wind, targets play an important role in demonstrating political commitment and encouraging investors to allocate resources towards the sector. Italy's updated National Energy and Climate Plan (NECP), as submitted to the European Commission in June 2024, anticipates a substantial expansion of wind energy. The plan forecasts an overall increase in capacity from 11,290 MW in 2021 to 28,140 MW by 2030, thereby including 2,100 MW (2.1 GW) from offshore wind. Such a target is widely considered among stakeholders as a pragmatic compromise between ambition and realism, reflecting a viable yet forward-looking approach to expanding offshore wind capacity.

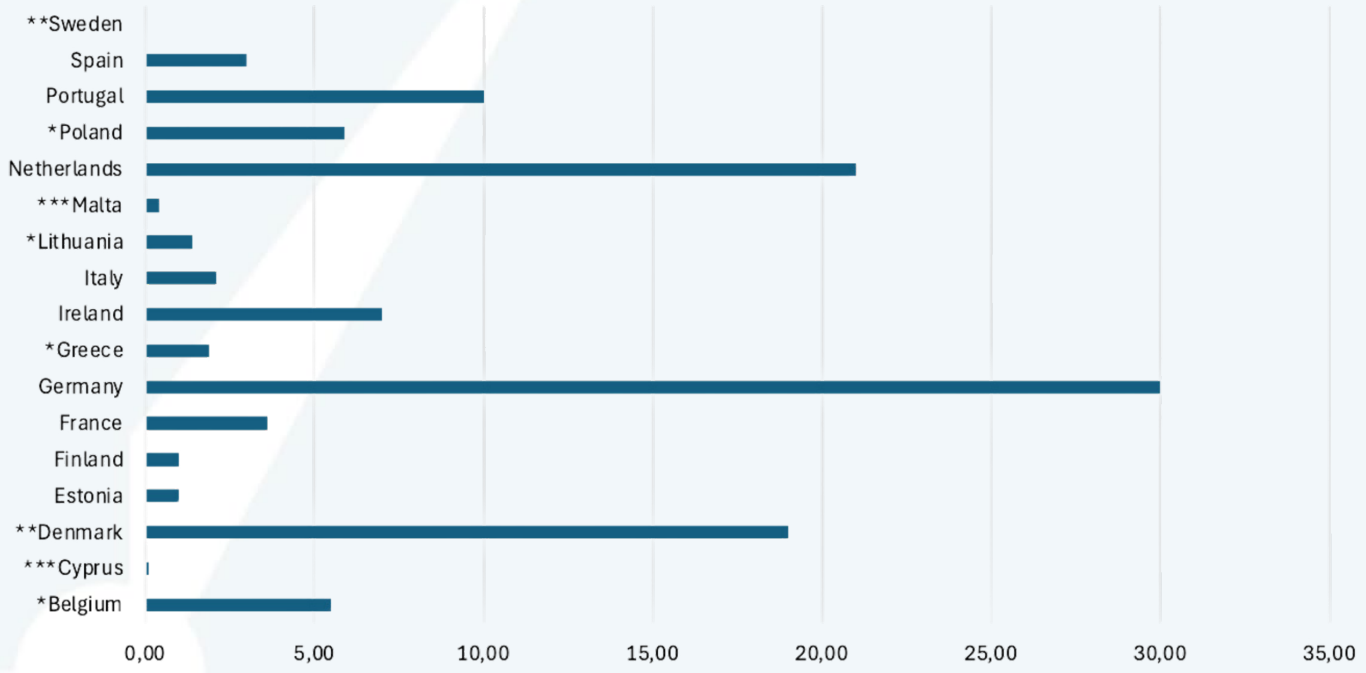
When compared to other EU Member States, including Mediterranean countries, Italy's target appears as slightly more modest. Besides Germany, which aspires to maintain its role as offshore wind leader in the EU with a target of 30 GW by 2030, Portugal leads among Southern European countries with a target of 10 GW. In the Mediterranean region, Spain and France aim for targets of 3.6 GW and 3 GW, respectively. Greece, on the other hand, has set an initial target of 1.9 GW by 2030 along with a more ambitious long-term target of 17.3 GW of installed offshore wind capacity by 2050. (Figure 5).

In this sense, the lack of mid-term and long-term targets from 2030 onwards has represented one of the main critiques that have been raised by several stakeholders, who have stressed the importance of improving the predictability of the Italian policy framework. In addition to the target laid out in the Italian NECP, a different and higher figure is also set in the FER 2 Decree, which provides the incentive framework for offshore wind projects. In fact, the latter provides incentives for up to 3.8 GW of offshore wind in auctions that are scheduled to be held until 2028,[18] although it is expected that a portion of this capacity will be installed after 2030.

Furthermore, the Decree on Go-To Areas (Aree Idonee), which was adopted in July 2024, has introduced regional targets for the installation of renewable energy capacity by 2030.[19] While the targets are not differentiated in terms of energy sources and therefore do not include specific targets for offshore wind, Article 2 of the Decree

[18] According to Article 10 of the FER 2 Decree, the operational rules are to be approved by the Ministry of Environment and Energy Security within 30 days from the entry into force of the Decree, and the first auction will be launched after 30 days from the entry into force of such operational rules.

[19] Ministry of Environment and Energy Security, Decree 21 June 2024, 'Disciplina per l'individuazione di superfici e aree idonee per l'installazione di impianti a fonti rinnovabili' (Suitable Areas Decree).



* Targets from the 2023 draft NECP.
** The draft did not specify targets, but rather outlined overall strategies and concluded political agreements.
*** Targets for 2050.

Figure 5: Overview of 2030 targets for offshore wind (in GW) within the European Union as of July 2024, as referenced in the National Energy and Climate Plans. Source: The 2023 drafts and the 2024 final updated National Energy and Climate Plans (NECPs) for the period 2021-2030.

specifies the modalities by which offshore wind farms account towards the regional targets. The initial draft Decree proposed that offshore wind farms would account for 40% of their nominal capacity towards the regional targets.

The proposal raised some concerns, as it appeared to hinder the expansion of offshore wind capacity, potentially reducing the political support such projects would receive at the local level. As a possible rationale for this differentiation, some have suggested that this was due to their more limited impact on the regional territory compared to onshore projects. However, in its final version the Decree was amended as to provide that offshore energy sources also account for 100% of their nominal capacity towards the regional targets (Figure 6).

Regione	Obiettivi di potenza aggiuntiva [MW]									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Abruzzo	4	65	196	454	640	850	1.086	1.350	1.648	2.092
Basilicata	145	204	329	543	748	973	1.218	1.486	1.779	2.105
Calabria	45	95	210	549	857	1.206	1.603	2.055	2.568	3.173
Campania	74	237	569	909	1.297	1.728	2.206	2.736	3.325	3.976
Emilia-Romagna	100	343	860	1.288	1.851	2.504	3.263	4.143	5.164	6.330
Friuli-Venezia Giulia	30	96	321	404	573	772	1.006	1.280	1.603	1.960
Lazio	82	305	544	933	1.346	1.829	2.396	3.059	3.835	4.757
Liguria	29	80	122	198	281	382	504	653	834	1.059
Lombardia	184	622	1.521	1.963	2.714	3.592	4.616	5.812	7.208	8.766
Marche	32	110	241	457	679	930	1.217	1.544	1.916	2.346
Molise	2	38	59	175	273	383	509	651	812	1.003
Piemonte	78	285	851	1.098	1.541	2.053	2.645	3.330	4.121	4.991
Puglia	163	507	876	1.672	2.405	3.213	4.104	5.084	6.165	7.387
Sardegna	34	175	468	998	1.553	2.207	2.980	3.892	4.969	6.264
Sicilia	144	473	952	1.842	2.764	3.847	5.120	6.616	8.375	10.485
Toscana	42	150	359	667	1.019	1.444	1.958	2.580	3.332	4.250
TrAA - Bolzano	11	41	120	139	186	239	298	364	438	515
TrAA - Trento	11	41	108	140	195	258	333	419	520	631
Umbria	15	60	135	279	429	609	823	1.079	1.384	1.756
Valle d' Aosta	1	4	10	27	47	75	112	162	231	328
Veneto	125	413	1.088	1.373	1.889	2.483	3.164	3.947	4.847	5.828
Totale	1.348	4.344	9.940	16.109	23.287	31.578	41.160	52.243	65.075	80.001

Figure 6: Regional targets for additional renewable energy capacity under Article 2, Table A, of the Suitable Areas Decree.

3.2 Maritime spatial planning

The absence of a definitive national strategy for the allocation of maritime space for offshore wind projects has been identified by stakeholders as a significant hurdle in the Italian offshore wind policy framework. This is connected to the wider issue concerning the delay in the implementation of Directive 2014/89/EU, which has resulted in the opening of an infringement procedure in May 2024 by the European Commission.[20] In fact, while Legislative Decree n. 201/2016 has established 'a framework for maritime spatial planning',[21] among others by identifying the issue areas to be addressed in maritime spatial plans,[22] a national maritime spatial plan is still missing. The adoption of such a plan would provide clarification on the areas that can be used for the development of offshore wind and ensure coordination among competing sea uses, thereby enhancing legal certainty for offshore wind developers.

In other EU Member States, maritime spatial plans already serve the purpose of identifying the areas in which offshore wind farms shall be located. By means of example, Denmark has allocated 30% of its maritime space for offshore wind development in its 2030 maritime spatial plan, delineating the macro-areas in which new offshore wind farms should be constructed. This provides an advantageous starting point for future offshore wind tenders. Similarly to Denmark, other EU Member States, such as Germany, have designated priority areas for the development of offshore wind energy development as part of their maritime spatial plan.[23]

While a national maritime spatial plan remains absent in Italy, regional initiatives have been launched with the objective of developing local maritime spatial plans. An example is provided by the Region Apulia, which has adopted a plan in 2022 identifying the concurrent uses of the sea space in the Adriatic and Ionian Seas adjacent to the region. Such a regional plan includes an indication of the areas to be generally used for energy purposes while mentioning under 'Specific objective 35' the need to reconcile the protection of habitats and landscapes with the production of energy from 'innovative renewable sources', such as offshore wind.[24]

While such regional plans can support the mapping of viable areas for offshore wind in the Italian sea space, it remains critical that a national plan be adopted in an expedited manner. This would not only ensure Italy's compliance with the aforementioned Directive, but also provide legal certainty regarding the areas where offshore wind can be developed. At the same time, another challenge towards the adoption of a national maritime spatial plan is given by the uncertainty concerning the perimeter of the Italian Exclusive Economic Zones. With Law n.

[20] European Commission, 'The Commission decides to refer ITALY to the Court of Justice of the European Union for failure to establish and communicate its maritime spatial plans', Press Release, 23 May 2024, available at: <https://ec.europa.eu/commission/presscorner/detail/en/IP_24_2674>.

[21] Legislative Decree n. 201/2016, Article 1.

[22] Including the production of energy from renewable sources, see Legislative Decree n. 201/2016, Article 5(1), lett. c).

[23] Bundesamt für Seeschifffahrt und Hydrographie, 'Maritime spatial planning', available at: <https://www.bsh.de/EN/TOPICS/Offshore/Maritime_spatial_planning/maritime_spatial_planning_node.html>.

[24] Region Apulia, Deliberation of the Regional Government n. 761/2022, available at: https://burp.regione.puglia.it/documents/20135/1916041/DEL_761_2022.pdf/1a93a882-231b-af19-f894-49670ed66728?version=1.0&t=1658826121030.

91/2021, the establishment of an Italian EEZ has been formally authorized, yet this requires finding an agreement with neighboring countries. While agreements have already been reached with some neighboring countries such as Greece and Croatia, other countries such as Algeria have unilaterally declared their EEZ, giving rise to international tensions and creating obstacles to the development of offshore wind, as developers would generally refrain from investing in disputed areas.

In conclusion, the lack of a national maritime spatial plan governing the location of offshore wind farms entails that it is the developers' responsibility to identify the optimal location for a specific project. This approach is also known as an 'open-door' scheme, whereby the developer is responsible for conducting a preliminary assessment of the potential feasibility of an offshore wind farm in a given area. Conversely, in markets where tender processes are in place, preliminary surveys are often conducted by the state, which identifies the areas to be auctioned in public tenders. In Denmark, for example, preliminary site investigations are conducted by the Transmission System Operator (TSO) Energinet, upon authorization from the Danish Energy Agency.[25] Similarly, also in other EU Member States preliminary assessments of areas are conducted by national authorities. This is the case in Germany, where the Federal Maritime and Hydrographic Agency (Bundesamt für Seeschifffahrt und Hydrographie) is responsible for conducting such analyses.[26]

The ex-ante identification of viable areas by state authorities is generally preferred by the industry, as it is considered beneficial 'to ensure that offshore wind projects are developed in a coordinated and strategic manner, with the Government playing a key role in site selection, planning, and decision-making'.[27]

[25] In 2022, for instance, the Danish Energy Agency issued permits to the TSO to conduct preliminary site investigations in the Kattegat II and Kriegers Flak II areas as well as the new location chosen for the Hesselø offshore wind farm. See Danish Energy Agency, 'The DEA issues permits for preliminary site investigations of three possible Offshore Wind Farms sites', available at: <https://ens.dk/en/press/dea-issues-permits-preliminary-site-investigations-three-possible-offshore-wind-farms-sites>.

[26] Bundesamt für Seeschifffahrt und Hydrographie, 'Preliminary Investigation of Sites', available at: <https://www.bsh.de/EN/TOPICS/Offshore/Offshore_site_investigations/offshore_site_investigations.html>.

[27] Wind Europe, 'Industry Position Key elements for offshore wind auction design', September 2023, available at: <https://windeurope.org/wp-content/uploads/files/policy/position-papers/20230927-WindEurope-position-paper-key-elements-for-offshore-wind-auction-design%20.pdf>, p. 3.

4 Permitting process and financial incentives

4.1 Governance model

It is widely recognized that establishing a single point of contact between developers and authorities is effective in 'promoting transparent, efficient, and fair permitting processes'.[28] This approach is also required by the EU Renewable Energy Directive (RED II), which under Article 16(1) requires that applicants 'should not be required to engage with more than a single contact point' during the permit granting process.

In this regard, Denmark provides a valuable example of the implementation of a 'one-stop-shop approach'. In the Danish system, developers engage exclusively with a single authority – the Danish Energy Agency – which is responsible for coordinating interactions with other authorities involved in the permitting of offshore wind farms, including ministries, governmental agencies, the TSO, etc. (Figure 7).

Figure 7: The Danish Energy Agency as one-stop-shop in the Danish system.

In Italy, conversely, the permitting process for offshore wind is characterized by a complex interplay between national and local authorities. Although the competence for the permitting of offshore wind projects is conferred upon the Ministry of Environment, numerous other national and local authorities are involved in the process and can influence its outcome.

4.2 Permitting process

The initial stage for developers planning to construct an offshore wind farm in Italy is to conduct preliminary investigations of the site in order to define the content of the environmental impact assessment more accurately. The outcome of these surveys is then submitted to the Ministry of Environment and Energy Security, which currently holds exclusive competence for the issuing of permits for offshore wind farms. However, the distribution of competence between national and regional administrations has undergone a series of shifts over time. The initial transfer of authority from the national to the regional level was enacted through Legislative Decree n. 387/2003, which was designed to align Italian legislation with the directives set forth by the European Union (EU) in 2001 (Directive 2001/77/EC). Subsequently, Law n. 244/2007 established that the state would assume exclusive competence for offshore wind farms. The current legislation, as set forth in Article 12, paragraph 3 of Legislative Decree n. 387/2003, provides that the authorization of offshore wind

[28] IRENA and GWEC, 'Enabling Frameworks for Offshore Wind Scaleup: Innovations in Permitting' (IRENA 2023), p. 10.

farms is subject to an authorization issued by the Ministry of Environment and Energy Security along with the Ministry of Infrastructure and Transport and with the input of the Ministry of Agriculture, Food Sovereignty and Forests. This is also referred to as the 'single authorization' (autorizzazione unica) and follows the completion of a so-called 'single procedure' (procedimento unico), which includes both the permit to operate the wind farm, as well as the concession for the utilization of the state-owned sea area. Additionally, a concession must be obtained from the Ministry of Infrastructure and Transport, with the involvement of other authorities that are competent for navigation matters. The application is then submitted by the developer to the Port Authority.[29]

Furthermore, paragraph 4 of Article 12 and paragraph 2, Article 7-bis of Legislative Decree n. 152/2006 requires that offshore wind farms must undergo a positive environmental impact assessment. In turn, the responsibility for conducting the aforementioned environmental impact assessment, which is a separate procedure from the 'single authorization', has been subject to repeated shifts in authority from the State to the Regions. Initially, the regions were entrusted with competence to approve these projects. However, over time, the competence was transferred to the state under Law n. 244/2007, and then back to the regions under Legislative Decree n. 4/2008, before eventually returning back to the state under Law n. 99/2009, which remains competent to this date.

The repeated transfer of competence between national and regional authorities has led to significant uncertainty among market operators, also in light of the numerous disputes that have arisen between national and regional authorities. In 2008, for instance, the region of Molise adopted a regional law prohibiting the establishment of any offshore wind farm on its territory. This legislation was promptly deemed in unconstitutional by the Constitutional Court on the grounds of its infringement upon the distribution of competence between the state and the regions. [30] Similarly, the Municipality of Taranto sought to challenge the authorization to construct the Beleolico offshore wind farm, in the proximity of the Taranto harbor, arguing that for such a 'near-shore' project, the Region Apulia would be the competent authority. In this instance, the claim was also dismissed by both the Regional Administrative Tribunal and, on appeal, by the Italian State Council.[31]

Following such numerous policy amendments to the distribution of competences, it is now clear that the authority to grant authorization and to conduct environmental impact assessments for offshore wind energy projects is conferred upon the State. Nevertheless, the duration of the permitting procedures remains a significant point of uncertainty. Article 12, paragraph 4, of Legislative Decree n. 387/2003, provides that the procedure for the issuance of the 'single authorization' must be completed within 60 days. However, this does not include the time that is needed for the completion of the environmental impact assessment, the length of

[29] See N. Spadaro, 'L'eolico offshore: difficoltà procedurali interne e spunti per una riflessione comparativa con la Gran Bretagna', Rivista Giuridica dell'Ambiente 4/2022, p. 1046.

[30] Italian Constitutional Court, decision n. 282/2009.

[31] Italian State Council, decision n. 3252/2015.

which is not easily predictable. The EIA for the 7 Seas Med project, for instance, which is the only floating wind project to have received a positive environmental impact assessment thus far, has taken approximately five years to be completed from the submission of the preliminary environmental study (in December 2019) to the issuance of the positive EIA (in March 2024).

In comparison, the Danish permitting process for offshore wind farms is regulated under the Renewable Energy Act (VE-loven).[32] This provides that two main procedures are available for obtaining the approval to establish offshore renewable energy installations: the government-run tender process and the "open-door" procedure initiated by the developers.[33] However, due to the potential for conflict with EU state aid regulations, the Open Door scheme has been suspended since February 2023, while the government assesses its compliance with EU law.

Consequently, the tendering process has become the exclusive means of approving new offshore wind developments in Denmark. Both the tender and open-door processes are subject to the same permits, namely a license to conduct preliminary investigations, a license to construct the electrical power plant, and a license to produce electricity from the electrical power plant (Figure 8).[34]

In the case of tenders, the government initially identifies a specific location for offshore wind projects, and subsequently invites the developers to bid for the contracts. Prior to the bidding process, the Danish TSO Energinet conducts a preliminary environmental assessment with the objective of mitigating potential risks and ensuring the viability of the projects. Following the bid the developer must submit an application for a pre-investigation permit, allowing for specific studies of the proposed location to be conducted. These investigations are typically focused on the environmental impact of the

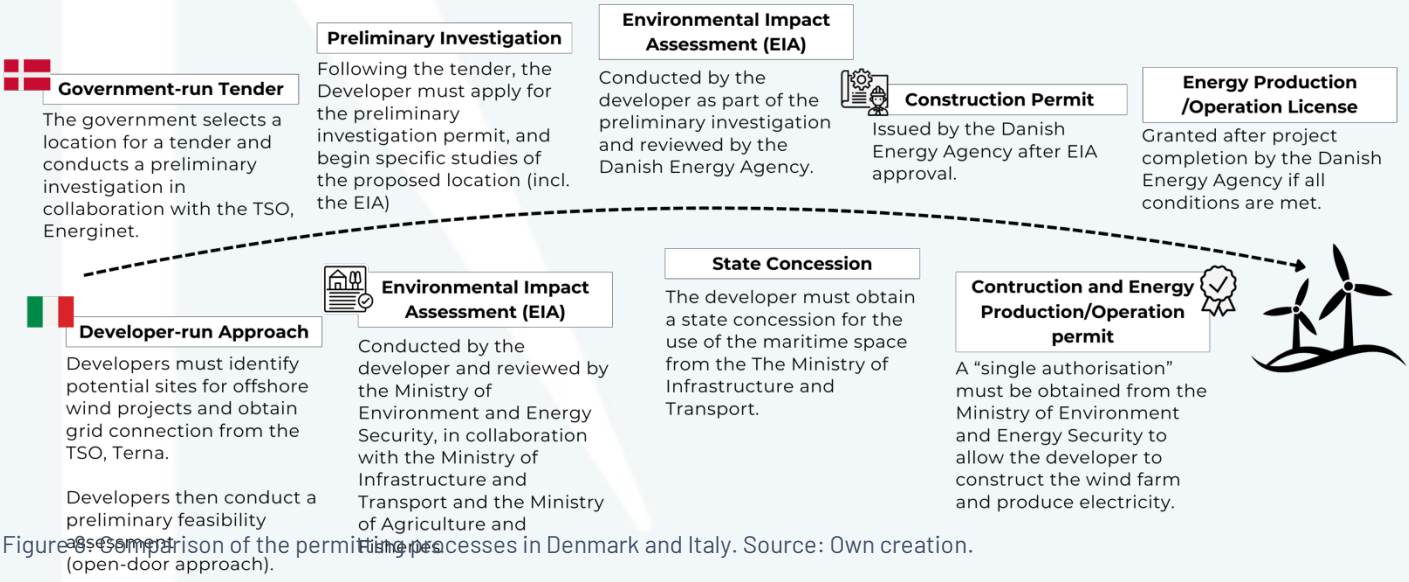


Figure 8: Comparison of the permitting processes in Denmark and Italy. Source: Own creation.

[32] Bekendtgørelse af lov om fremme af vedvarende energi, available at: <https://www.retsinformation.dk/eli/lta/2019/356>.

[33] Denmark's "Open Door" procedure permitted private developers to propose offshore wind projects without awaiting government tenders. It was suspended in 2023 due to concerns regarding compliance with EU state aid rules. The government is currently undertaking a review of the framework with a view to aligning it with EU regulations.

[34] Danish Energy Agency, 'The Danish Offshore Wind Tender Model', p. 12, available at: <https://ens.dk/sites/ens.dk/files/Globalcooperation/the_danish_offshore_wind_tender_model_final.pdf>.

project and require the submission of an environmental impact assessment report. The second required permit is the construction permit, which can only be issued once the EIA report has been reviewed and approved by the Danish Energy Agency. The final permit is the energy production permit, which confirms that all conditions set during the approval process have been met and allows the installation to begin generating electricity.

The Danish Energy Agency engages with the relevant authorities throughout the approval process to ensure that all applicable conditions are fulfilled. For existing offshore wind farms, developers may subsequently apply for an extension of the energy production permit and repowering, which involves upgrading or replacing existing turbines with newer, more efficient models. Furthermore, new offshore wind projects are required to incorporate nature-inclusive designs with the objective of positively impacting the marine environment and biodiversity, allocating a minimum of DKK 50 million per project for such initiatives.

4.3 Financial incentives

In order to achieve the Italian 2030 offshore wind target of 2.1 GW installed capacity, it is essential to ensure that investments in this sector are adequately remunerated, so that the market becomes attractive to both domestic and foreign investors. Given the incipient character of the Italian offshore wind market, as well as the technological novelty of floating wind technologies, public incentives remain a vital component to unlocking Italy's offshore wind energy potential.

Nevertheless, the approval of the regulatory framework concerning incentive schemes – the so-called FER 2 decree – has been characterized by numerous setbacks and delays. While the decree was first announced in 2018, and different drafts have been circulating since 2022, it was only in June 2024 that the FER 2 decree was eventually approved.[35]

The final version of the FER 2 decree provides incentives for a total capacity of 4.59 GW, of which 3.8 GW have been reserved for offshore wind farms. The allocation of these incentives will be conducted through a series of tenders to be held by the Gestore dei Servizi Energetici (GSE) between the years 2024 and 2028. For offshore wind, the applicable starting rate provided by the decree is 185 €/MWh. In accordance with Art. 5 of the Decree, following each auction round, the GSE evaluates the bidders based on the extent of the reduction offered with respect to the aforementioned starting rate. If the offers exceed the available auctioned capacity, the GSE will select projects based on their location in areas identified as 'suitable' under Articles 20 and 23 of Legislative Decree n. 199/2021. Priority will also be given to earlier applications. Regarding the qualifying criteria to participate in the auctions, under Article 3, paragraph. 2 of the Decree it is required that plants must have as a minimum received a positive environmental impact assessment, where required. At the time of writing,

[35] Italian Ministry of Environment, Decree 19 June 2024, 'Incentivazione degli impianti a fonte rinnovabile innovativi o con costi di generazione elevati che presentino caratteristiche di innovazione e ridotto impatto sull'ambiente e sul territorio', available at: <https://www.mase.gov.it/node/18946>. The decree entered into force on 13 August 2024.

only the two offshore wind projects that have already received such a positive EIA will be able to participate in the bids.

Appraising the FER 2 Decree, it can be noted that the incentive rate established in the Decree for offshore wind does not distinguish between bottom-fixed and floating technologies, despite the considerably higher costs associated with the latter. This point has been identified as a source of contention among the interviewed stakeholders, with several of them advocating for a more nuanced differentiation between the two technologies. Moreover, the absence of a mechanism linking the incentive rate and the potential shifts in the macroeconomic scenario such as fluctuations of the interest rate has also proven controversial. Lastly, the award mechanisms under the FER 2 Decree are exclusively based on economic criteria and do not take into account non-price criteria, contrary to the requirements set forth in Article 26 of Regulation (EU) 2024/1735 (Net-Zero Industry Act) for renewable energy auctions.

5 Infrastructural development

Infrastructural development represents an essential element for the establishment of a strong offshore wind sector in Italy. In this context, the expansion of ports and grids is identified as a significant enabler of offshore wind development and therefore subject to a closer examination in the following.

5.1 Ports

The development of the port infrastructure is key to the growth of the offshore wind sector. This is particularly the case with regard to floating offshore wind, which presents specific challenges concerning the assembly of floating platforms, in addition to the space requirements for wind turbines, which reach heights of up to 250 meters. Direct access to the sea is therefore required, as it is critical for the manufacture and assembly of the floating platforms and their subsequent shipment to the wind farm site. However, Italian ports are currently unable to provide such conditions due to significant spatial constraints. Consequently, the development of the floating offshore wind sector in Italy will require the refurbishment of specific ports to meet the demands of the industry.

In this regard, Article 8 of Decree-Law n. 181/2023, converted with modifications into Law n. 11/2024, has enabled the Ministry of the Environment to issue a call for the identification of at least two ports in Southern Italy, or in areas adjacent to sites in which the gradual phase-out of coal power is occurring, are to be identified as hubs for the design, production, and assembly of floaters, and other infrastructure that is instrumental to the production of offshore wind energy. The call was issued in April 2024 by the Ministry of the Environment, and as of September 2024, the ports are still to be identified.

The establishment of sea hubs for the value chain of the offshore wind industry is of significant strategic importance for the growth of the sector.[36] This is exemplified by the Port of Esbjerg, in Denmark, which represents an exemplary case study in port adaptation and development, showcasing how a port can effectively evolve to align with the demands of an emerging industry such as offshore wind. With a history dating back to 1868, the Port of Esbjerg has undergone a notable transition from a traditional fishing and commercial port to a pioneering hub for renewable energy, particularly offshore wind.

Over the past decade, the Port of Esbjerg has made significant strategic investments with the objective of enhancing its infrastructure in a manner that supports the offshore wind sector. The port has undergone an expansion of its quays and storage areas, thereby providing extensive space for the storage and assembly of wind turbine components. These areas have been designed to accommodate the considerable size and weight of modern wind turbines, with blades that can exceed 80 meters in length and nacelles weighing several hundred tons. These include specialized facilities and equipment such as heavy-duty cranes capable of lifting large components, reinforced quay areas to support heavy loads, and dedicated assembly areas where turbines can be pre-assembled before being transported offshore. The Port of Esbjerg plays an indispensable role in the logistics and supply chain

[36] H. Sornn-Friese et al., 'The port authority as system builder in cross-border regionalization: An exploratory study of port Esbjerg in the development of North Sea wind', (2023) 4 Marine Transport Research 100084.

for the offshore wind industry, serving as a base for numerous companies involved in the production, assembly, and maintenance of wind turbines, creating a comprehensive ecosystem that supports the entire lifecycle of offshore wind projects. The integration of these activities has the effect of streamlining operations, reducing costs, and enhancing efficiency in the deployment of offshore wind farms.

Esbjerg is not just a logistical center, but also a hub for innovation and training in the offshore wind sector. The port collaborates with educational institutions, research centers, and industry players to foster innovation in wind energy technologies and to train the workforce needed for the industry. Ongoing projects include the further expansion of port facilities, investments in digitalization to enhance operational efficiency, and continued collaboration with international partners to drive innovation and sustainability in the offshore wind sector.

The transformation of the Port of Esbjerg has had a significant economic impact, with positive effects on the local and regional economy. The project has resulted in the creation of hundreds of new jobs in the green energy sector, both within the port itself and in the wider region. From an environmental standpoint, the port's emphasis on offshore wind energy is instrumental in achieving Denmark's renewable energy objectives, thereby reducing carbon emissions and combating climate change. Moreover, the Port of Esbjerg has become a leader in the entire North Sea region, serving as a hub for cross-border cooperation.

Similarly, investment in the port infrastructure through the designation of offshore wind hubs has the potential to bring about considerable benefits for offshore wind development in Italy and the broader Mediterranean region. In light of the aforementioned considerations, it becomes evident that the coordination of institutional actors represents a significant challenge that must be addressed, as the development of the port infrastructure is in the sphere of competencies of multiple subjects – e.g. Port Authorities, municipalities, Ministry of Infrastructure and Transport, etc. Once the offshore wind hubs have been designed, it will be important to ensure productive and synergistic coordination among all the involved actors to leverage Italy's potential to play a central role in the expansion of offshore wind in the Mediterranean.

5.2 Grid

The growth of the offshore wind sector in Italy also presents significant challenges in terms of expanding the national grid, which must be capable of accommodating the additional capacity and ensuring reliable electricity supply in areas with high demand. This requires the resolution of several challenges, given that the largest industrial plants are located in the northern part of Italy, where demand is considerably higher than in other regions. Offshore wind projects, however, are largely located in the southern part of the country, particularly in Apulia and in the two islands of Sardinia and Sicily. Consequently, transmission capacity must be considerably expanded to facilitate the flow of electricity from the south to the north of the country.

Moreover, the incorporation of offshore wind projects into the grid system necessitates the installation of export cables and onshore substations to facilitate the connection of wind farms to the mainland. In Italy, the responsibility for these installations falls upon the developers, thereby representing an additional and significant cost factor for offshore wind projects. In other EU countries, however, the TSO or specialized public companies assume responsibility for handling these tasks. In Denmark, France, and Germany, for instance, the connection to the grid is carried out by the TSO, whereas in the U.K. this is carried out by a so-called Offshore Transmission Owner (OFTO).

In order to strengthen the interconnection across bidding zones, the Italian TSO, Terna, is currently developing a series of important infrastructural projects. These include the Hypergrid project, which aims to enhance existing backbones from alternating current to direct current, thereby doubling the interconnection capacity across the bidding zones. In addition, the Tyrrhenian Link project will provide an underwater link from Sardinia and Sicily to the mainland, reinforcing the overall grid. These projects will be of crucial importance to ensure that, once the planned offshore wind farms are operational, the centers of production – mostly located in Southern Italy and near the main islands – will be connected through the high-voltage grid to the main centers of demand – mostly located in Northern Italy.

As the number of proposed offshore wind projects increases, one of the potential challenges that may arise is ensuring that sufficient capacity is available on the grid. When presenting a project, developers need to submit a connection request to the Italian TSO Terna S.p.A., which, as provided under Legislative Decree n. 79/1999, has an obligation to grant a so-called 'general minimal technical solution' (soluzione tecnica minima generale, STMG), provided that the request is compliant with the technical rules.

Given that developers are currently able to identify any maritime areas for the potential establishment of new projects, and the TSO is subject to such a legal obligation, a wide range of projects have been submitted without undergoing a preliminary screening for their actual feasibility. This may result in a notable increase in the workload of the relevant authorities, which are required to allocate resources to the analysis of projects which may have very limited prospects of being realized in practice. Therefore, the introduction of an initial screening of viable projects could reduce delays and ensure that the resources of the permitting authorities are directed towards projects with concrete prospects of being completed.

6 Environmental and social considerations

While offshore wind farms play an important role in meeting climate goals by producing electricity from a renewable and sustainable source like wind, they also give rise to environmental challenges that need to be managed. One of the primary environmental concerns is the impact on birds, marine mammals, and the broader marine ecosystem.[37] In this sense, the noise pollution generated during both the construction and operation of offshore wind farms poses significant threats, along with the installation of network infrastructures, particularly underwater cables.

It is therefore important to achieve a balance between the positive impact of offshore wind farms in terms of climate change mitigation and the environmental harm that they may cause. In this regard, as emphasized by numerous of the interviewed stakeholders, the most effective solution to the challenge of balancing offshore wind development with ecosystem protection is an integrated approach to maritime spatial planning. This approach simultaneously identifies areas for offshore wind projects, while also considering the nature conservation measures and the establishment of marine protected areas.

As previously mentioned, Italy has yet to implement a maritime spatial plan. The introduction of a national maritime spatial plan represents a key strategic objective. This could prove beneficial in facilitating offshore wind development while ensuring a high level of environmental protection. In this regard, the Danish maritime spatial plan adopted in 2023 can serve as a valuable example, as it simultaneously allocates nearly one-third of the Danish Sea space for offshore wind and energy islands, while also increasing the extension of marine protected areas from 19% to 30%.[38]

In addition to the impact on natural ecosystems, the visual impact of offshore wind turbines represents a further element that sparks public opposition and is a key aspect in authorization processes. While the visual impact of offshore wind projects is a topic of concern worldwide, this issue is particularly relevant in areas characterized by a considerable presence of cultural heritage and touristic activities such as Italy, where the protection of the landscape even has constitutional relevance under Art. 9 of the Italian Constitution.

Consequently, the perception of offshore wind turbines in Italy displays a markedly higher level of sensitivity to the installation of offshore wind turbines than in North Sea countries such as Denmark. While offshore wind turbines are a rather well-accepted feature of the Danish landscape, with installations also located in close proximity to the city of Copenhagen, a primary consideration in Italian offshore wind projects is to minimize, or at best avoid, any visual impact of such projects. This necessitates the placement of offshore wind farms at a greater distance from the coastline.

It is crucial for developers to consider these factors when seeking acceptance from local communities

[37] See, generally, Galparsoro et al., 'Reviewing the ecological impacts of offshore wind farms', (2022) 1 Ocean Sustainability 1.

[38] Ingeniøren, 'Ny politisk aftale: Vindmøller og energiøer får knap en tredjedel af Danmarks havareal', available at: <https://ing.dk/artikel/ny-politisk-aftale-vindmoeller-og-energioeer-faar-knap-en-tredjedel-af-danmarks-havareal>.

for offshore wind projects, which has also been referred to by one of the interviewed stakeholders as a 'social license to operate'. In addition to the visual and environmental impact previously discussed, the establishment of offshore wind farms can present an obstacle to activities such as fisheries and shipping. Moreover, the construction of land infrastructure to connect offshore wind installations to the grid can also lead to opposition from local communities, albeit to a lesser extent than the construction of onshore wind farms.

While the permitting of offshore wind projects is a matter at the national level, regional involvement remains a vital element at various stages of the permitting process. Political support at the local level is therefore considered to be of great importance by the involved stakeholders, who have highlighted that opposition to offshore wind projects is frequently driven by ideological rather than project-related considerations. It can therefore be argued that the implementation of comprehensive communication strategies can increase public awareness of the advantages of offshore wind farms and help address any misperceptions about the impacts and benefits of renewable energy initiatives. These strategies would involve the dissemination of clear information on the environmental impact of offshore wind projects, as well as the economic advantages in terms of employment and advantages for electricity consumers.

7 EU policies and international cooperation

There is an increasing awareness within the global energy sector of the necessity for international collaboration, particularly in the development of renewable energy projects. However, there are several critical issues, particularly those relating to financing and stakeholder engagement, which must be addressed in order to guarantee the success of such initiatives.

7.1 EU offshore wind policies

The development of offshore wind energy in Italy is aligned with a broader EU agenda aimed at decarbonizing energy systems and enhancing energy security across member states.

The European Green Deal, which was adopted in 2019, is the European Union's strategy for transforming the EU into a climate-neutral continent by 2050. In light of geopolitical conflicts and declining European competitiveness, the incoming European Commission emphasizes combining the green transition with strengthening Europe's industrial base.[39] This represents a shift, whereby the EU leadership increasingly views renewable energy as a means of reaffirming its global competitiveness, industrial development and sovereignty, rather than merely a means to meet climate targets.

As part of this policy package, renewable energy, and particularly wind energy, plays a crucial role in the decarbonatization of the energy sector and ensuring European industrial competitiveness. By 2030, the EU has set itself the objective of expanding its offshore wind capacity to 111 GW, with a long-term goal of reaching 317 GW by 2050.[40] In 2023, the EU had a cumulative capacity of 18.3 GW offshore wind, so meeting the targets will require a significant increase in the rate of offshore wind rollout.[41]

Building on this agenda, Italy can benefit from several EU initiatives to meet its offshore wind energy targets. The REPowerEU package, which aims for EU energy independence from Russia by 2027 in light of Russia's full-scale invasion of Ukraine, offers financial support for the modernization of grid infrastructure. An essential component for integrating offshore wind energy. Furthermore, it requires the streamlining of the permitting process, which is crucial for accelerating the approval of projects. The Net Zero Industry Act (NZIA) further supports the domestic manufacturing of wind turbines by offering investment incentives and requiring the establishment of "one-stop-shops" to simplify approval procedures, thereby reducing delays in project rollouts.

It is recommended that public authorities give priority to the Recovery and Resilience Facility (RRF)

[39] The future of European competitiveness, available at: <https://commission.europa.eu/document/download/97e481fd-2dc3-412d-be4c-f152a8232961_en?filename=The future of European competitiveness _ A competitiveness strategy for Europe.pdf>.

[40] European Commission, 'Offshore renewable energy', available at: <https://energy.ec.europa.eu/topics/renewable-energy/offshore-renewable-energy_en#:~:text=In%20line%20with%20EU%20countries,of%20Europe's%20future%20electricity%20mix>.

[41] Wind Europe, 'Wind energy in Europe: 2023 Statistics and the outlook for 2024-2030', available at: <https://windeurope.org/intelligence-platform/product/wind-energy-in-europe-2023-statistics-and-the-outlook-for-2024-2030/>.

as part of the NextgenerationEU, which is crucial for funding infrastructure projects that support offshore wind. By streamlining project proposals, especially those focused on grid connections and port upgrades, public authorities can ensure swift access to EU funding. Furthermore, revenues from the EU Emissions Trading System (ETS) under the Fit for 55-package can be used to finance large-scale offshore wind projects.

In contrast, private actors may pursue financing through the Innovation Fund and European Investment Bank (EIB), both of which support large-scale renewable projects such as offshore wind. By forming collaborative partnerships with public authorities on co-financed projects, the probability of securing funds from programs like Connecting Europe Facility (CEF), will increase particularly for cross-border grid enhancements. By pursuing these strategies, Italy can harness EU funds to significantly expand its offshore wind capacity and meet its renewable energy objectives.

Italian companies and research institutions may also benefit from funding provided by the Innovation Fund and Horizon Europe to develop technologies like floating wind turbines that are well suited to the deeper waters of the Mediterranean. These initiatives offer grants and subsidies with the aim of reducing the capital costs of innovative offshore projects.

Finally, Italy is well-positioned to shape this new green industrial policy at an EU-level, where it can partner with other Mediterranean countries to push legislation that supports floating offshore wind solutions.

7.2 Cooperation Italy – Denmark

Cooperation with a nation like Denmark, which has been a forerunner in offshore wind development, is significant in promoting the exchange of knowledge and the adoption of best practices within the domain of offshore wind energy. International partnerships can facilitate Italy's access to experiences and solutions that have already contributed to making significant strides in offshore wind development. By working closely with Denmark, Italy can accelerate the expansion of its offshore wind energy sector, leveraging the institutional and policy advancements from the Danish model.

Denmark's comprehensive approach to offshore wind farm planning and its rigorous efforts in marine area protection offer valuable insights that Italy can draw upon to enhance its offshore wind strategies. By studying how Denmark has successfully implemented these practices, Italy can draw inspiration for the adoption of similar solutions, ensuring that its offshore wind projects are both sustainable and efficient. The Danish experience demonstrates that it is possible to achieve a harmonious balance between the advancement of renewable energy infrastructure and the preservation of marine ecosystems, through careful planning and the adoption of best practices that minimize environmental impacts while maximizing the benefits of renewable energy development.

Strategic cooperation between Italy and Denmark can be based on mutually beneficial leveraging each country's strengths across the entire offshore wind value chain. While acknowledging and respecting the differences in the stages of offshore wind

technology development between the two nations, this partnership can be based on the principles of mutual benefit, shared expertise, and a common vision for sustainable energy. The combination of Italy's emerging offshore wind sector with Denmark's established practices and technological advancements, both countries have the potential to achieve greater progress in the realization of their renewable energy goals. This synergy could not only facilitate technological and operational advancements but also a unified approach to addressing the global challenges associated with energy development, leading to the creation of a resilient and sustainable offshore wind energy sector that can effectively meet the energy demands of the future.

Italy's emerging offshore wind sector stands to gain considerably from Denmark's well-established practices, which encompass advanced wind farm planning, efficient project execution, and robust environmental protection. The implementation of these best practices will facilitate the resolution of the challenges associated with the development of offshore wind projects in Italy, including regulatory hurdles, environmental concerns and technological limitations. Conversely, Denmark can benefit from insights gained from Italy's unique geographical and environmental conditions, which can inform the development of more adaptable and resilient offshore wind technologies.

8 Conclusion

Italy is well-positioned to become a leader in the offshore wind energy industry in the Mediterranean region, particularly through the development of floating offshore wind projects. The country's extensive coastline and favorable wind conditions provide a strong foundation, but it is essential to develop a policy framework in order to attract long-term investments. Particularly, a number of challenges will need to be addressed with respect to strategic planning, permitting, and infrastructure.

The objective of 2.1 GW by 2030, as set out in Italy's National Energy and Climate Plan, marks a significant first step towards offshore wind development. However, when viewed in comparison to the targets of neighboring countries, the current objective may be regarded as relatively modest and not sufficient to provide long-term reliability on policy commitments. An important next step for Italy would therefore be to set clear mid- and long-term targets for offshore wind development to demonstrate Italy's commitment to renewable energy and provide the market with the stability needed to drive investments. Aligning these objectives with the wider EU agenda, such as that set out in the European Green Deal, will also help Italy to optimize the benefits of EU funding and regulatory support.

Another crucial objective is to streamline the permitting process, as the current system, which involves multiple authorities, creates uncertainty for developers. Italy could benefit from adopting a 'one-stop-shop' approach, as seen in Denmark, to simplify approvals and foster quicker project execution. Additionally, international cooperation with well-established offshore wind markets such as Denmark could serve as an effective tool to tackle both technological and regulatory challenges.

Infrastructural development, particularly in terms of ports and grid connections, is also a key priority. Italy's ports must be upgraded to handle the assembly of floating wind turbines, and grid infrastructure needs to be expanded to support the additional capacity from offshore wind. Investments in these areas will not only facilitate offshore wind projects but also stimulate broader industrial growth, particularly in southern Italy. Additionally, there is an urgent need for a national maritime spatial plan, which would ensure efficient allocation of maritime space while providing clarity for developers on suitable locations for offshore wind farms. With these industrial ambitions in mind, Italy can benefit from further leveraging existing EU funding and regulation. Italy is also well-positioned as a European agenda-setter, championing the rollout of floating offshore-wind solutions in the EU.

In conclusion, Italy holds a unique opportunity to lead offshore wind development in the Mediterranean, but realizing this vision requires decisive policy action and infrastructural investments. By addressing these challenges and capitalizing on international collaboration, Italy can unlock the full potential of its offshore wind resources and provide a substantial contribution to Europe’s sustainable energy future.

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