

欧州における浮体式洋上風力発電 のプロジェクトに係る最新動向調査

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はじめに

2050年のカーボンニュートラルに向けては、洋上風力をはじめとした再生可能エネルギーの普及拡大が欠かせない中、本年3月12日には、我が国の排他的経済水域（EEZ）における洋上風力の案件形成を促進等するための「海洋再生可能エネルギー発電設備の整備に係る海域の利用の促進に関する法律の一部を改正する法律案」が閣議決定されるなど、より幅広い海域における洋上風力の普及促進が求められる。

遠浅の海が少ない我が国において、豊富に存在する洋上風力発電のポテンシャルを最大限生かすためには、深海域にも対応可能な浮体式洋上風力発電の普及拡大が欠かせないところ。

欧州においては、着床式の適地への設置が進み、残されたポテンシャルが限られてきたところ、英国、ノルウェーを中心に浮体式洋上風力の実証が進み、大規模な発電所のライセンスの付与が行われるなど、浮体式洋上風力発電の本格的な普及に向けた動きが始まりつつある。

他方で、浮体の製造をはじめとしたサプライチェーンの課題も浮き彫りになっており、港湾などにおける検討も進められている。

このような背景を受け、本調査は、欧州における浮体式洋上風力発電に係るプロジェクトの動向、ライセンスの付与に係る募集の動向、浮体の製造拠点に係る検討の動向をまとめたものである。

本調査報告書が関係各位の参考となれば幸いである。

目次

はじめに

1. まとめ	1
2. European floating offshore wind project pipeline	3
2.1. Background of European floating offshore wind	3
2.2. Categorisation of floating offshore wind projects	4
2.3. Fully commissioned projects	5
2.4. Projects under construction, pre-construction, and in consenting stages	7
2.4.1. Under construction	7
2.4.2. Pre-construction and in consenting stages	8
2.5. Early concept projects with site exclusivity	12
2.6. Projects in the early concept stage without site exclusivity	13
3. Future floating development opportunities in Europe	29
3.1. United Kingdom – Celtic Sea leasing round	29
3.2. France – Sud de la Bretagne II (South of Brittany 2)	29
3.3. 2024 floating wind tenders in Spain and Portugal	29
4. Research on planned European manufacturing bases	33
4.1. Wind Works Jelsa, (Norway)	33
4.2. Port Talbot (Wales, United Kingdom)	37
4.3. Ardersier port transformation (Scotland, UK)	40
4.4. Port of Cromarty Firth upgrades (Scotland, UK)	40
4.5. Port of Nigg (Scotland, UK)	41
4.6. Port of Leith (Scotland, UK)	42
4.7. Fos sur Mer (France)	42
4.8. Norway offshore wind – a report has identified 14 installation and assembly ports for offshore wind with plans before 2030	43
5. Existing clusters and investment schemes in floating offshore wind	45

5.1.	Deep Wind, North of Scotland Offshore Wind Cluster (Scotland, UK)	45
5.2.	Bretagne Ocean Power, (Brittany, France)	45
5.3.	Wind'Occ, (Montpellier, France).....	45
5.4.	UK Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS)	46
6.	Floating offshore wind manufacturing facilities outside of Europe.....	47
6.1.	Humboldt Bay Project (California, US).....	47
6.2.	Sears Island Port Facility (Maine, US)	47

1. まとめ

本調査においては、欧州における浮体式洋上風力発電プロジェクトをプロジェクトのフェーズ毎に網羅的に整理するとともに、浮体式が含まれる今後のライセンス募集に係る情報をまとめ、さらには、欧州において検討されている浮体式洋上風力発電の建造インフラの整備に係るプロジェクトについて調査・整理を行った。

報告書の第2章では、欧州における浮体式洋上風力プロジェクトについて、設置済みのもの、建設中のもの、許認可手続中のもの、海域使用権を取得済みもの、初期段階のものに分けて整理等を行っている。

2023年時点において、欧州では、209MWの浮体式洋上風力発電が設置済みであり、そのうち100MWがノルウェー、79.5MWが英国に所在している。

さらに、開発の初期段階を超えて、許認可の手続を開始済（建設中を含む）のプロジェクトが21件存在する。この段階のプロジェクトの必ずしもすべてが実際に設置されるとは限らないが、その中には、英国における500MW規模のプロジェクトや、スウェーデンにおける2GW超のプロジェクトが複数含まれている。

加えて、ライセンスの公募等を経て海域の独占使用権を付与されたプロジェクトは48件存在しており、その多くが英国、イタリアのものである。英国においてはスコットランドにおけるScotWind（合計20海域、30GWの設備容量）が特に大規模なプロジェクトを擁している。まだFID等のスケジュールが明らかになっていないものが大半だが、イタリアにおいても、1GW超のプロジェクトが複数存在している。

その他、検討の熟度は様々だが、初期段階のプロジェクトが237件存在する。前述の国々に加えてスペイン、アイルランド、フィンランド、ポルトガル、フランスなどでも活発に検討が行われており、これらの国が、今後、浮体式洋上風力の市場となり得る可能性がある。

報告書の第3章では、今後のライセンス募集に係る情報をまとめた。30GWのうち19.3GWを浮体式としているScotWindの成功に続く形で、2025年の英国ケルト海の募集など浮体式を念頭においた募集が行われることが想定されている。

報告書の第4部以降では、浮体式洋上風力発電の製造拠点に係るプロジェクトを調査・整理した。これらのプロジェクトは欧州の港湾が中心となっている。英国では、

ScotWind や INTOG のプロジェクトによる浮体式洋上風力発電の開発に対応するため、既に複数の港湾が設備の改良を計画している。その他、ノルウェーやフランスにおいても、浮体式に特化した製造拠点の検討が行われている。加えて、既存のクラスターや米国における取組についても、背景情報として簡潔に調査・整理を行った。

2. European floating offshore wind project pipeline

2.1. Background of European floating offshore wind

Offshore wind (OSW) has emerged as a cornerstone in the plans of many countries to increase the capacity of low carbon electricity generation and reach net zero targets. In the last thirty years, OSW has been deployed at a commercial scale and demonstrated that it can be a cost-effective, reliable source of electricity. Both bottom-fixed offshore wind, which is most suitable for shallow waters, and floating offshore wind (FOW), which uses floating foundations that are tethered to the seabed with mooring and anchor configurations and is most suitable in deeper waters, have emerged as electricity generation solutions that are integral to future electricity generation plans.

An estimated 80% of OSW potential globally is within waters with a depth greater than 60m¹. The International Energy Agency (IEA) in 2019 estimated that FOW in the optimal locations would be able to reach the wind potential to meet the world's total energy demand eleven times over by 2040². Despite this potential, floating wind is a less mature technology than bottom-fixed offshore wind, and the industry is in relatively early stages of deployment. Those projects to date that have been installed at commercial scale, or any scale of more than 100 MW, are exclusively bottom-fixed.

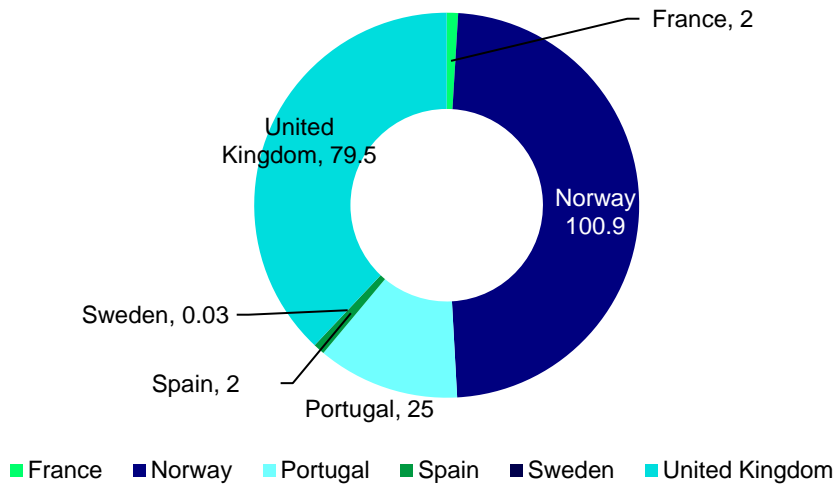
In the past fifteen years, there have been several significant projects in European floating offshore wind deployment. The first FOW pilot was the Norwegian Hywind demonstrator in 2009, and Hywind Scotland became the first pre-commercial wind farm, with 5 x 6 MW turbines, in 2017. Newer projects, including Kincardine (50 MW) and Hywind Tampen (95 MW), have further progressed the industry with increasing project capacities, further highlighting the future potential of floating offshore wind to reach commercial scales. Following the success of these pre-commercial projects, the European market is progressing with leasing rounds for FOW sites, and some countries have set specific floating offshore wind deployment targets³.

At present Europe is the leading continent for floating offshore wind deployment. France, Norway, Portugal, Spain, Sweden, and the United Kingdom have fully commissioned projects at demonstrator or pre-commercial scale (see Table 1). As of 2023, a total of 209 MW of net FOW has been installed throughout Europe with Norway having a total installed capacity of 100 MW and the United Kingdom following shortly behind with 79.5 MW.

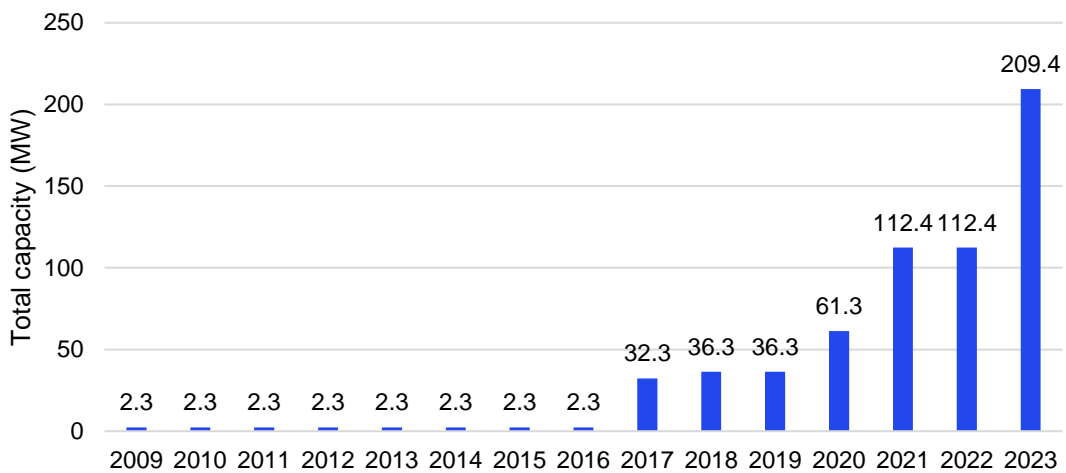
¹ Global Wind Energy Council, 2022, Floating Offshore Wind – A global opportunity. Source: [link](#).

² International Energy Agency, 2019, Offshore Wind Outlook 2019. Source: [link](#).

³ Wind Europe, 2021, Innovations in floating wind technologies key to further cost reductions. Source: [link](#).



☒ 1 Total installed capacity of floating offshore wind in Europe in 2023, in MW⁴



☒ 2 Cumulative floating offshore wind capacity in Europe⁴

2.2. Categorisation of floating offshore wind projects

To explain the status of FOW deployment in Europe, projects have been categorised in terms of their stage in the project life cycle. Projects progress from **early concept (with and without site exclusivity)** to the **development stage (consent application submitted and consent authorised)**, to **pre-construction, under construction**, and finally **fully commissioned**.

⁴ 4COffshore database, Accessed January 2024

The definitions of each category are provided below:

- **Early concept:** This is the preliminary stage of the project, pre-application tasks are taken such as environmental impact assessments and feasibility studies to help establish an appropriate design. Within this stage, it is likely that many of these projects will not reach fruition due to proposals being declined by authorities or becoming dormant due to them not being financially viable. Site exclusivity has not yet been granted.
- **Early concept with site exclusivity:** The project has been granted site exclusivity; the developers have gained development rights for a stipulated area of the seabed.
- The **Development stage** can be split into **consent application submitted** and **consent authorised:** The consent application submitted outlines that the application is awaiting a final decision from authorities. The consent authorised indicates that approval has been granted and that construction can take place if the developer is willing. The overall development stage can take between three and five years⁵.
- **Pre-construction:** The project has reached financial close or made a final investment decision following the designing of the OWF and the establishment of a construction strategy. The pre-construction phase typically lasts between one to three years.
- **Under construction:** Construction is in progress and none of the turbines are currently energised. Construction encompasses building components, adding anchor points, laying submarine cables, and installing connections to substations. The construction phase can last between two to four years.
- **Fully commissioned:** The components are installed, and the turbines are generating electricity to the grid.

For the purposes of this report, we have outlined projects in the order of most advanced first to least advanced. I.e., the fully commissioned projects are included first, and projects that are early concepts are included last.

2.3. Fully commissioned projects

表 1 details fully commissioned floating offshore wind projects in Europe.

⁵ Iberdola, Construction of an offshore wind plant. Source: [link](#).

表 1 Fully commissioned floating offshore wind projects in Europe⁶

Country	Project Name	Total Power Rating (MW)	WTG Capacity (MW)	Number of Turbines	Water Depth (m)	Floating Foundation Type	Site Exclusivity	Final Investment Decision	Date in operation	Project Owner
France	Floatgen Project	2	2	1	30-30	Barge - Concrete	17/01/2014	N/A ⁷	19/09/2018	BW Ideol (16.7%), Universität Stuttgart (16.7%), Fraunhofer-Gesellschaft (16.7%), RSK Environment (16.7%), Zabala Innovation (16.7%), École Centrale de Nantes (16.7%)
Norway	Hywind Tampen	95	8.6	11	250-300	Spar Floater - Concrete	08/04/2020	11/10/2019	23/08/2023	Equinor (42.1%), Petoro (30%), OMV (9.5%), Eni (9.3%), INPEX (4.8%), Wintershall DEA (4.3%)
Norway	TetraSpar Demonstrator - Metcentre	3.6	3.6	1	203-211	Semi-Spar - Steel	05/10/2018	13/02/2019	01/12/2021	Shell (46.2%), TEPCO (30%), RWE (23.1%)
Norway	UNITECH Zephyros by Hywind Technology	2.3	2.3	1	220-220	Spar Floater - Steel	01/01/2006	01/05/2008	01/12/2009	UNITECH Offshore
Portugal	WindFloat Atlantic (WFA)	25	8.4	3	100-100	Semi-Submersible Platform - Steel	01/08/2010	01/02/2018	22/07/2020	Ocean Winds (84.6%), Repsol (14.2%), Principle Power (1.2%)
Spain	DemoSATH - BIMEP	2	2	1	68-68	Barge - Concrete	01/11/2021	08/02/2020	18/09/2023	Saitec Offshore Technologies (33.3%), RWE (33.3%), Kansai Electric Power Co. (33.3%)
Sweden	SeaTwirl S1	0.03	0	1	125-125	Spar Floater - Steel	13/03/2015	N/A	06/10/2015	Ehrnberg Solutions AB
United Kingdom	Hywind Scotland Pilot Park	30	6	5	96-110	Spar Floater - Steel	30/10/2013	03/11/2015	18/10/2017	Equinor (75%), Masdar (25%)
United Kingdom	Kincardine - phase 1	2	2	1	52-61	Semi-Submersible Platform	30/06/2014	N/A	24/10/2018	Vinci
United Kingdom	Kincardine - phase 2	47.5	9.5	5	52-100	Semi-Submersible Platform	30/06/2014	01/06/2020	19/10/2021	Vinci

⁶ 4COffshore database, Accessed January 2024

⁷N/A – no information available

2.4. Projects under construction, pre-construction, and in consenting stages

2.4.1. Under construction

At present, there are just two European FOW projects under construction, both of which are in France. The two projects have a combined capacity of 30.2 MW (Figure 3). The French government has set an ambitious target of 2 Gigawatts (GW) installed each year from 2025 and 40GW by 2050⁸.

The FOW projects currently under construction are the Eolink 5 MW demonstrator and the Provence Grand Large (PGL) with an estimated 25.2 MW capacity.

The Eolink 5 MW demonstrator will generate at least 14GWh per year and is a ¾ scale prototype of a semi-submersible steel platform turbine⁹.

PGL on the other hand will be a larger project using 3 x 8.4 MW turbines.

The project will provide the equivalent of the electricity needs of 45,000 households and will be the first time a tension leg platform has been used in floating offshore wind¹⁰.



Figure 3 Concept image of the Eolink 5 MW demonstrator that is currently under construction¹¹

⁸ French Department of Ecological Transition, Offshore wind. Source: [link](#).

⁹ Eolink, 2020, 5MW – Pre-commercial demonstrator. Source: [link](#).

¹⁰ Provence Grand Large, 2023, Les trois éoliennes flottantes de Provence Grand Large ont été installées en mer avec succès. Source: [link](#).

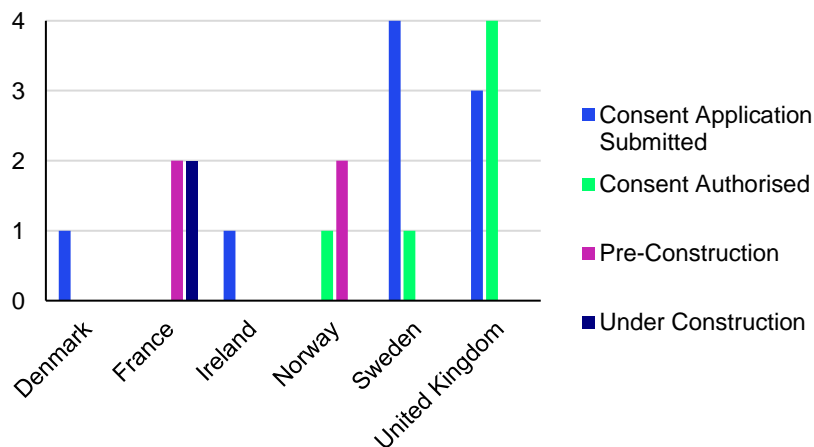
¹¹ Eolink, 2020, 5MW FOWT demonstrator to be tested at Centrale Nantes' SEM-REV offshore wind test site. Source: [link](#).



☒ 4 A concept image of one of the turbines of the Provence Grand Large project¹²

2.4.2. Pre-construction and in consenting stages

The United Kingdom has seven projects split across the consent authorised and consent application submitted stages. Six of these projects will use semi-submersible foundations and one will use a tension leg platform. The United Kingdom has implemented a target of up to 5 GW of new floating wind projects by 2030 and up to £160m of investment in floating offshore manufacturing and currently has the largest pipeline of floating projects in development.¹³ Additional projects in these stages in Europe can be found in Denmark, Ireland, Norway, and Sweden (☒ 5). It should be noted that there is a likelihood that not all projects in these stages will be constructed. The total projected capacity of projects in the construction and pre-construction stages demonstrates over 8,000 MW planned in Sweden (☒ 6).

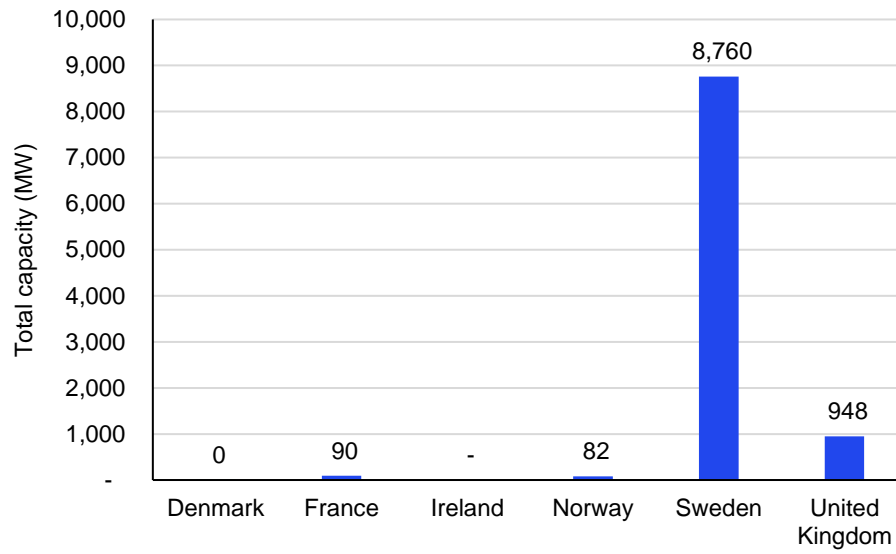


☒ 5 The total number of projects in Europe in the construction and pre-construction stages⁴

¹² Provence Grand Large, L'installation en mer des éoliennes flottantes. Source: [link](#).

¹³ HM Government, 2023, Offshore Wind Net Zero Investment Roadmap. Source: [link](#).

¹⁴ Ore Catapult, 2023, Ore Catapult's Floating Offshore Wind Offering. Source: [link](#).



☒ 6 The total project capacity (in MW) of projects in Europe in the construction and pre-construction stage⁴

表 2 Projects under construction, pre-construction, and consenting stages¹⁵

Country	Project Name	Total Power Rating (MW)	WTG Capacity (MW)	Number of Turbines	Water Depth (m)	Floating Foundation Type	Site Exclusivity	FID	Date in operation	Projected construction start date	Project Owner	Project stage
France	EOLINK 5 MW Demonstrator	5	5	1	33-33	Semi-Submersible Platform - Steel	03/12/2020	01/12/2022	30/09/2024	12/07/2023	ACCIONA (24.5%), Breizh Up, Crédit Agricole, Finistère Angels, VALOREM	Under Construction
France	Provence Grand Large	25.2	8.4	3	97-99	Tension Leg Platform - Steel	03/11/2016	28/11/2021	01/03/2024	23/05/2023	EDF (50%), Enbridge (25%), CPPIB (25%)	Under Construction
France	EolMed	30	10	3	50-72	Barge - Steel	22/07/2016	06/05/2022	01/07/2025	31/12/2024	Qair (75%), TotalEnergies (20%), BW Ideol (5%)	Pre-Construction
France	Golfe du Lion	30	10	3	60-82	Semi-Submersible Platform - Steel	03/11/2016	26/01/2022	01/09/2024	01/03/2024	Ocean Winds (80%), Caisse des dépôts et consignations (20%)	Pre-Construction
Norway	FLAGSHIP - Metcentre	11	11	1	203-211	Semi-Submersible Platform - Concrete	17/09/2020	24/02/2021	N/A	01/01/2026	Aker (63.8%), UNITECH Offshore (10.95%), Bouygues Travaux Publics (7.1%), Iberdrola (6.1%), DTU (2.4%), METCentre (2.3%), EDF (1.9%), CENER (1.7%), Zabala Innovation (1.7%), CoreMarine (1.4%)	Pre-Construction
Norway	SeaTwirl S2	1	1	1	100-100	Spar Floater - Steel	11/09/2020	N/A	01/09/2024	01/05/2024	Ehrnberg Solutions AB	Pre-Construction
Norway	METCentre future project(s) placeholder	70	0	6	209-252	Floating substructure undecided	N/A	N/A	N/A	N/A	METCentre	Consent Authorised
Sweden	Sotenäs Offshore Park	10	10	1	45-48	Tension Leg Platform - Steel	18/09/2020	N/A	N/A	N/A	FLOWOCEAN	Consent Authorised

¹⁵ 4COffshore database, Accessed January 2024

United Kingdom	Blyth Offshore Demonstrator - phase 2	58.4	14	5	52-58	Semi-Submersible Platform	06/08/2010	N/A	01/01/2026	01/01/2024	EDF (51%), Tenaga Nasional (49%)	Consent Authorised
United Kingdom	Erebus	100	18	7	65-85	Semi-Submersible Platform - Steel	19/08/2020	01/10/2024	N/A	01/01/2027	TotalEnergies (80%), Simply Blue Group (20%)	Consent Authorised
United Kingdom	Pentland	100	18	5	74-77	Semi-Submersible Platform - Steel	01/01/2017	01/01/2025	01/01/2027	01/04/2026	CIP (90%), Hexicon (10%)	Consent Authorised
United Kingdom	Pentland Floating Offshore Wind Demonstrator	15	15	1	74-97	Semi-Submersible Platform - Steel	01/01/2017	01/01/2025	01/12/2025	01/07/2025	CIP (90%), Hexicon (10%)	Consent Authorised
Denmark	Ærø Demonstration	0.011	0.011	1	4-6	Semi-Submersible Platform - Steel	24/08/2023	N/A	N/A	01/01/2025	H2mill ApS	Consent Application Submitted
Ireland	SmartBay	0	0	3	21-21	Mixed- (fixed and floating)	N/A	N/A	N/A	N/A	Marine Institute	Consent Application Submitted
Sweden	Cirrus	2,550	15	167	62-71	Mixed- (fixed and floating)	N/A	N/A	N/A	N/A	Mainstream (50%), Hexicon (50%)	Consent Application Submitted
Sweden	Dyning	2,500	15	167	100-137	Semi-Submersible Platform - Steel	N/A	01/01/2027	01/01/2030	01/01/2028	Mainstream (50%), Hexicon (50%)	Consent Application Submitted
Sweden	Mareld	2,500	15	165	185-453	Semi-Submersible Platform - Steel	N/A	01/01/2027	01/01/2031	01/01/2028	Hexicon (50%), Mainstream (50%)	Consent Application Submitted
Sweden	Poseidon Nord	1,200	20	81	61-222	Floating substructure undecided	N/A	31/12/2028	01/01/2033	01/01/2031	Vattenfall (85%), Zephyr (15%)	Consent Application Submitted
United Kingdom	Avalon	15	15	1	N/A	Tension Leg Platform - Steel	N/A	N/A	N/A	N/A	Ping Petroleum Plc (50%), Cerulean Winds (50%)	Consent Application Submitted
United Kingdom	Green Volt	560	16	35	100-115	Semi-Submersible Platform	24/03/2023	01/01/2025	01/08/2028	01/01/2026	TEPCO (50%), Eni (50%)	Consent Application Submitted
United Kingdom	White Cross	100	18	8	69-70	Semi-Submersible Platform	27/07/2021	01/01/2025	01/01/2027	01/01/2025	Vinci (81%), TEPCO (19%)	Consent Application Submitted

Legend: Successful projects from the 2022 Scotwind rounds are denoted in blue and successful INTOG projects are in purple.

2.5. Early concept projects with site exclusivity

In Europe, the United Kingdom, Italy, Spain, and France have projects in the early concept stage that have also been granted site exclusivity (Figure 7 · Figure 8). This means that, whilst the projects have a site designated for project development, they are not yet in the consenting stages. This is only possible in markets where developers apply for consent after receiving site exclusivity, and conducting additional surveys on the site, a more decentralised approach. For the UK projects, some of these projects have come in recent leasing rounds such as ScotWind and Innovation and Targeted Oil & Gas (INTOG).

The results of ScotWind were announced in 2022, with 17 successful sites (a mixture of bottom-fixed and floating offshore wind) comprising a total capacity of around 25GW. Three additional sites were included in a clearing round, giving a total number of 20 sites and 30GW capacity¹⁶. The 2022 Innovation and Targeted Oil and Gas (INTOG) leasing round was designed to encourage offshore wind innovation and support decarbonisation of oil and gas infrastructure. 19 bids were received (10 for Innovation and 9 for Targeted Oil and Gas), with 5 innovation sites and 8 targeted oil and gas sites successful¹⁷.

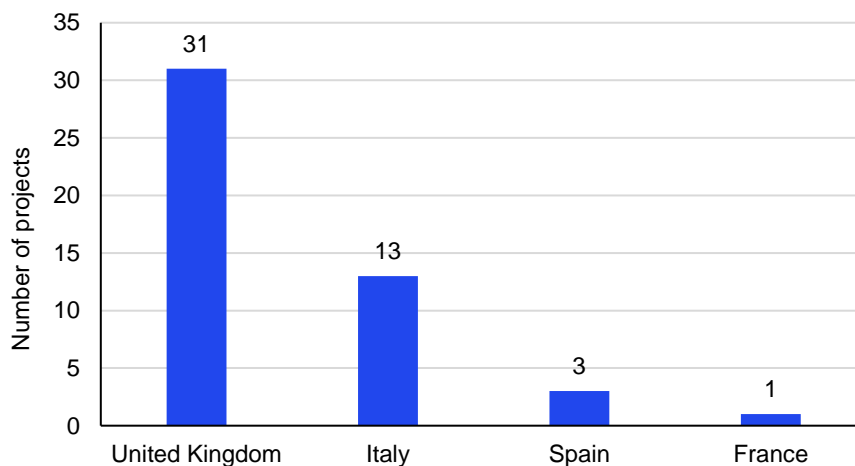


Figure 7 Number of early concept projects with site exclusivity⁴

¹⁶ Offshore Wind Scotland, ScotWind leasing round. Source: [link](#)

¹⁷ Offshore Wind Scotland, INTOG leasing round. Source: [link](#)

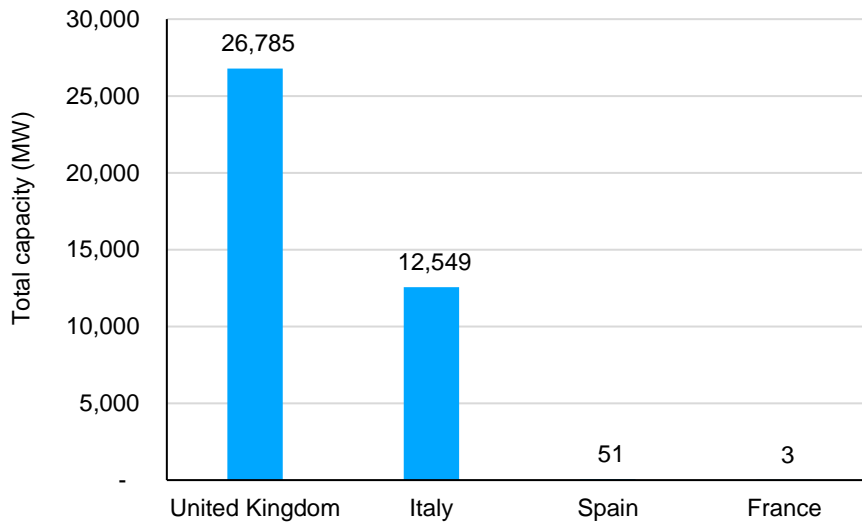
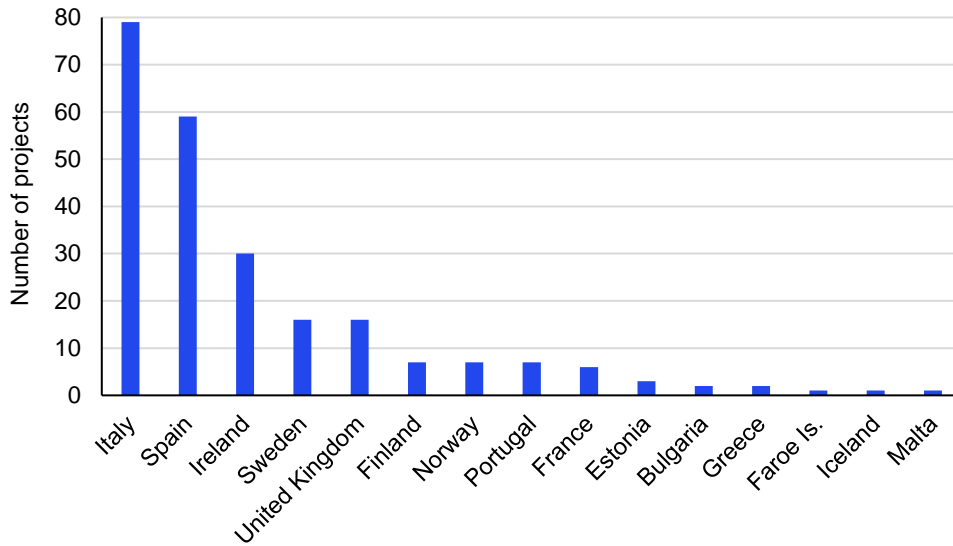


Figure 8 Projected capacity in MW of early concept projects with site exclusivity⁴

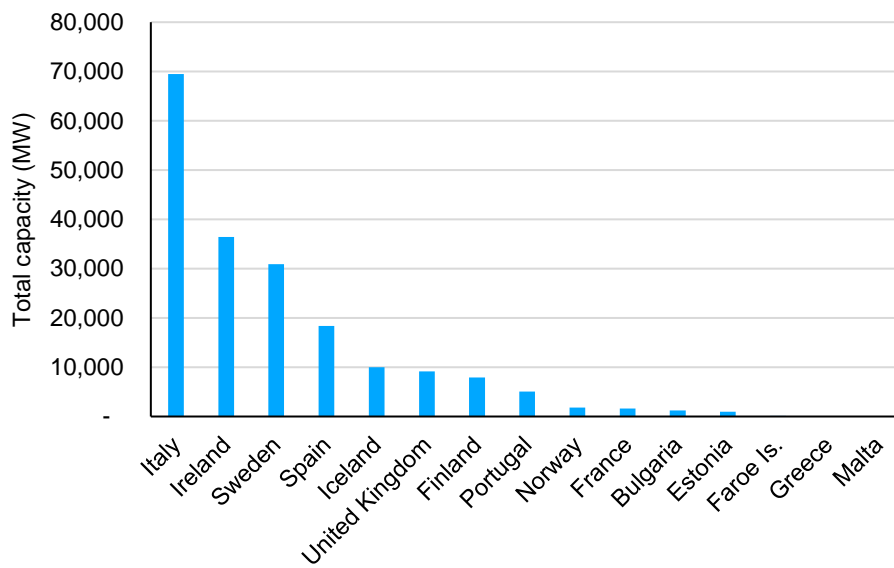
2.6. Projects in the early concept stage without site exclusivity

There are an estimated 237 FOW projects in Europe in the early concept stage. Early concept projects are in preparatory stages, and minimal information has been released on these projects to date. In some cases, this includes whether these will be floating or bottom-fixed projects, and some projects have sites in water depths where both may be possible. Where projects are assumed to be floating based on water depth but have not specified this publicly, these have been denoted within the table as “Not specified (Assumed to be floating)”.

It is expected that many of the projects in the early concept stage will not reach full commissioning, as there are numerous development stages to pass before this is possible, and final investment decisions will need to be taken. In Europe at present, Italy, Spain, and the United Kingdom have the greatest number of projects and greatest potential capacity in MW, in the early concept stages (Figure 9 • Figure 10).



☒ 9 Total number of projects in early concept stages without site exclusivity⁴



☒ 10 Projected capacity in MW of projects in the early concept stages without site exclusivity⁴

表 3 Projects in the early concept stage with site exclusivity¹⁸

Country	Project name	Total capacity (MW)	WTG capacity (MW)	Number of turbines	Water depth (m)	Floating foundation type	Site exclusivity	FID	Date in operation	Project owner
France	AFLOWT (Accelerating market uptake of Floating Offshore Wind Technology)	3	3	1	52-63	Semi-Spar - Steel	25/11/2015	N/A	2027	N/A
Italy	Barium Bay	1,110	15	74	50-57	Semi-Submersible Platform - Steel	31/12/2022	N/A	01/12/2030	Hope Group (50%), Galileo Energy (50%)
Italy	Brenda Energia	741	19	28	101-134	Floating substructure undecided	15/05/2023	N/A	N/A	Fred. Olsen
Italy	Eureka Wind	570	15	38	134-200	Semi-Submersible Platform - Steel	03/11/2023	N/A	N/A	Hope Group
Italy	Euribia	660	15	44	132-139	Semi-Submersible Platform - Steel	11/08/2023	N/A	N/A	3 Green
Italy	Lupiae Maris	525	15	35	94-119	Semi-Submersible Platform	31/12/2022	N/A	01/12/2030	Hope Group (50%), Galileo Energy (50%)
Italy	Repower FOWT Scandale	495	15	33	N/A	Semi-Submersible Platform - Steel	20/07/2022	N/A	~2026	Repower Renewable S.p.A.
Italy	Sardinia Northeast - AvenHexicon	2,000	25	86	142-1000	Semi-Submersible Platform	19/01/2023	N/A	N/A	Hexicon (50%), Avapa Energy (50%)
Italy	Sardinia Northwest - AvenHexicon	1,350	25	54	184-720	Semi-Submersible Platform	13/10/2022	N/A	N/A	Avapa Energy (50%), Hexicon (50%)
Italy	Sardinia South 1 - AvenHexicon	1,600	15	106	552-1000	Semi-Submersible Platform - Steel	19/01/2023	N/A	N/A	Hexicon (50%), Avapa Energy (50%)
Italy	Sardinia South 2 - AvenHexicon	750	15	50	580-1000	Semi-Submersible Platform - Steel	19/01/2023	N/A	N/A	Avapa Energy (50%), Hexicon (50%)
Italy	Scicli	750	15	50	144-200	Semi-Spar - Steel	02/11/2023	N/A	N/A	Ninfea Rinnovabili S.r.l.
Italy	Seawind Mazara	798	19	42	48-104	Floating substructure undecided	15/05/2023	N/A	N/A	Fred. Olsen
Italy	Sicily South - AvenHexicon	1,200	25	48	368-655	Semi-Submersible Platform	13/10/2022	N/A	N/A	Hexicon (50%), Avapa Energy (50%)
Spain	GEROA (Green Energy Research for Offshore Atlantic)	45	15	4	120-140	Barge - Concrete	28/02/2023	N/A	N/A	Saitec Offshore Technologies
Spain	PLOCAN hybrid floating wind platform	2	N/A	1	N/A	Semi-Submersible Platform - Steel	25/01/2022	N/A	N/A	Gazelle Wind Power
Spain	SEAWORTHY	4.3	N/A	1	N/A	Semi-Submersible Platform - Steel	26/11/2021	N/A	N/A	Floating Power Plant
United Kingdom	Arven	2,300	N/A	N/A	85-132	Semi-Submersible Platform - Steel	22/08/2022	01/01/2030	N/A	Mainstream (50%), Ocean Winds (50%)

¹⁸ 4COffshore database, Accessed January 2024

United Kingdom	Aspen	1,008	15	100	79-114	Semi-Submersible Platform - Steel	24/03/2023	01/01/2025	01/01/2029	Cerulean Winds
United Kingdom	Ayre	1,008	25	60	59-83	Tension Leg Platform - Steel	17/01/2022	31/12/2028	01/01/2033	Qair (42.5%), DEME Offshore (42.5%), Aspiravi (15%)
United Kingdom	Beech	1,008	15	100	113-159	Semi-Submersible Platform - Steel	24/03/2023	01/01/2025	01/01/2029	Cerulean Winds
United Kingdom	Bellrock	1,200	23	75	67-124	Semi-Submersible Platform - Concrete	11/04/2022	01/07/2027	N/A	Renantis (50%), Bluefloat (50%)
United Kingdom	Broadshore	900	16	31	64-90	Semi-Submersible Platform - Concrete	11/04/2022	01/07/2027	N/A	Bluefloat (50%), Renantis (50%)
United Kingdom	Buchan	960	16	60	74-104	Barge - Concrete	19/04/2022	N/A	N/A	BayWa (33.4%), Elicio (33.3%), BW Ideol (33.3%)
United Kingdom	Caledonia Offshore Wind Farm	2,000	25	150	45-61	Mixed-(fixed and floating)	17/01/2022	N/A	N/A	Ocean Winds
United Kingdom	CampionWind	2,000	N/A	N/A	63-86	Floating substructure undecided	17/01/2022	N/A	N/A	Shell (50%), Iberdrola (50%)
United Kingdom	Cedar	1,008	15	100	80-123	Semi-Submersible Platform - Steel	24/03/2023	01/01/2025	01/01/2029	Cerulean Winds
United Kingdom	Cenos	1,350	20	100	93-101	Floating substructure undecided	24/03/2023	01/01/2026	01/01/2030	TEPCO (50%), Eni (50%)
United Kingdom	Culzean Floating Wind Pilot Project	3	3	1	N/A	Semi-Submersible Platform	24/03/2023	N/A	N/A	TotalEnergies
United Kingdom	Flora	50	N/A	N/A	112	Floating substructure undecided	24/03/2023	N/A	N/A	BP
United Kingdom	Harbour Energy South INTOG	15	N/A	N/A	N/A	Floating substructure undecided	24/03/2023	N/A	N/A	Harbour Energy
United Kingdom	Havbredey	1,500	14	108	72-111	Floating substructure undecided	17/01/2022	N/A	01/01/2036	Northland (75.5%), ESB (24.5%)
United Kingdom	Llŷr 1	100	20	8	67-67	Floating substructure undecided	27/07/2021	N/A	N/A	Cierco (50%), SBM Offshore (50%)
United Kingdom	Llŷr 2	100	20	8	67-67	Floating substructure undecided	27/07/2021	N/A	N/A	Cierco (50%), SBM Offshore (50%)
United Kingdom	Malin Sea Wind	100	N/A	6	36-135	Floating substructure undecided	24/03/2023	N/A	N/A	ESB (33.3%), CATAGEN (33.3%), Dublin Offshore (33.3%)
United Kingdom	MarramWind	3,000	25	225	88-119	Floating substructure undecided	17/01/2022	30/09/2026	N/A	Iberdrola (50%), Shell (50%)
United Kingdom	Muir Mhòr	798	20	40	60-84	Semi-Submersible Platform	17/01/2022	N/A	01/01/2031	Fred. Olsen (50%), Vattenfall (50%)
United Kingdom	Ossian	3,600	15	270	60-84	Semi-Submersible Platform - Steel	11/04/2022	N/A	N/A	SSE (40%), Marubeni (30%), CIP (30%)
United Kingdom	Pembrokeshire Demonstration Zone	180	N/A	N/A	43-55	Floating substructure undecided	01/01/2018	N/A	31/12/2026	Cornwall Council
United Kingdom	Salamander	100	20	7	86-111	Semi-Submersible Platform - Steel	24/03/2023	01/01/2026	01/06/2029	Ørsted (80%), Simply Blue Group (18%), Seaway 7 (2%)
United Kingdom	Scaraben	99.45	N/A	N/A	70-108	Floating substructure undecided	24/03/2023	N/A	N/A	Bluefloat (50%), Renantis (50%)

United Kingdom	SENSEWind Demonstrator	2	2	1	52-62	Tension Leg Platform - Steel	16/08/2022	N/A	N/A	SENSE Wind Ltd
United Kingdom	Sinclair	99.45	N/A	N/A	100-112	Floating substructure undecided	24/03/2023	N/A	N/A	Bluefloat (50%), Renantis (50%)
United Kingdom	Stoura	500	N/A	N/A	100-126	Floating substructure undecided	22/08/2022	01/01/2031	01/01/2035	ESB
United Kingdom	Stromar	1,000	23	71	69-90	Semi-Submersible Platform - Concrete	11/04/2022	01/07/2027	2030-2033	Bluefloat (33.3%), Renantis (33.3%), Ørsted (33.3%)
United Kingdom	Talisk	495	15	33	108-123	Semi-Submersible Platform - Concrete	17/01/2022	01/01/2028	~2030	TechnipFMC (50%), Magnora (50%)
United Kingdom	Trivane Demonstrator	1	1	1	12.1-12.1	Barge - Steel	01/11/2011	N/A	N/A	Trivane Ltd
United Kingdom	Valorous	300	16	27	71-82	Semi-Submersible Platform - Steel	~2024	01/10/2026	01/10/2029	TotalEnergies (80%), Simply Blue Group (20%)

Legend: Successful projects from the 2022 Scotwind rounds are denoted in blue and successful INTOG projects are in purple.

表 4 Projects in the early concept stage without site exclusivity¹⁹

Country	Project Name	Total Power Rating (MW)	WTG Capacity (MW)	Number of Turbines	Water Depth (m)	Floating Foundation Type	Site Exclusivity	FID	Date in operation	Project Owner
Bulgaria	BG-2	1,250	N/A	N/A	64-69	Floating substructure undecided	N/A	N/A	N/A	Hooracán Ltd
Bulgaria	BLOW	5	5	1	22-31	Semi-Submersible Platform - Steel	N/A	N/A	01/10/2025	GSP Offshore (59.17%), EOLINK (17.34%), Petroceltic Bulgaria (4.6%), Bexco (2.82%), IREC (2.58%), BEIA Consult International (2.27%), MCE (2.15%), ACCIONA (2.02%), Maritime University of Constanta (1.99%), CEPS (1.91%), Fraunhofer-Gesellschaft (1.41%),
Estonia	Anker	1,000	~20	~36	30-78	Not Specified-(fixed or floating)	N/A	N/A	N/A	Mainstream
Finland	Bothnia	N/A	N/A	N/A	64-117	Not Specified (Assumed to be floating)	N/A	N/A	N/A	Ilmatar Offshore
Finland	Bothnia West	N/A	N/A	N/A	47-133	Mixed-(fixed and floating)	N/A	N/A	N/A	Ilmatar Offshore
Finland	Navakka	1,500	20	75-100	32-94	Floating substructure undecided	N/A	N/A	2030	Eolus Vind
Finland	Stormskär	2,000	20	100	8.9-80	Not Specified-(fixed or floating)	N/A	N/A	N/A	Ilmatar Offshore
Finland	Vågskär	1,960	20	98	25.3-69	Not Specified-(fixed or floating)	N/A	N/A	N/A	Ilmatar Offshore
Finland	Wellamo	2,000	15	70-100	64-115	Floating substructure undecided	N/A	N/A	01/01/2034	Eolus Vind (50%), Simply Blue Group (50%)
France	EOLINK 20 MW Prototype	20	20	1	N/A	Semi-Submersible Platform - Steel	N/A	N/A	N/A	N/A
France	EOLINK Commercial Wind Farm	250	15	17	N/A	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2029	N/A
France	EOLINK GW-Scale Wind Farm	1,000	20	50-67	N/A	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2032	N/A
France	EOLINK Pilot Wind Farm	40	10	4	15.5-24	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2027	N/A
France	NextFloat	6	6	1	50-65	Tension Leg Platform - Steel	N/A	N/A	N/A	X1 Wind
France	Sud de la Bretagne I	270	N/A	20	73-81	Floating substructure undecided	N/A	N/A	2031	RTE
Greece	MUSICA - phase 1	N/A	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	N/A
Greece	MUSICA - phase 2	N/A	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	N/A

¹⁹ 4COffshore database, Accessed January 2024

Iceland	HIP Atlantic	10,000	N/A	N/A	N/A	Mixed-(fixed and floating)	N/A	N/A	N/A	Hecate (50%), IPC (50%)
Ireland	ANIAR Offshore Array - phase 2	500	N/A	N/A	58-86	Floating substructure undecided	N/A	N/A	N/A	Aniar Offshore
Ireland	Arranmore Wind	1,000	N/A	N/A	43-85	Floating substructure undecided	N/A	N/A	N/A	Copenhagen Energy
Ireland	Atlantic Marine Energy Test Site	10	15	1	45-107	Floating substructure undecided	N/A	N/A	01/01/2026	SEAI
Ireland	Blackwater	1,500	N/A	100	51-80	Floating substructure undecided	N/A	01/01/2027	01/01/2030	Flotation Energy and Grupo Cobra
Ireland	Celtic Offshore Renewable Energy	1,680	N/A	168	65-84	Mixed-(fixed and floating)	N/A	N/A	N/A	FEXCO
Ireland	Celtic Two	800	N/A	55	76-82	Floating substructure undecided	N/A	N/A	N/A	ESB (50%), Ørsted (50%)
Ireland	Clarus	1,000	N/A	70	81-123	Floating substructure undecided	N/A	N/A	01/01/2035	Iberdrola (51%), DP Energy (49%)
Ireland	Cork Offshore Wind	1,000	N/A	N/A	96-113	Floating substructure undecided	N/A	N/A	01/01/2032	Source Galileo
Ireland	Emerald	1,300	15	30	80-96	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2038	Simply Blue Group
Ireland	Haven Offshore Array	N/A	N/A	N/A	30-86	Mixed-(fixed and floating)	N/A	N/A	N/A	Haven Offshore Array
Ireland	Inis Ealga Marine Energy Park	1,000	N/A	N/A	73-84	Floating substructure undecided	N/A	N/A	01/01/2036	Iberdrola (51%), DP Energy (49%)
Ireland	Kinsale	1,000	N/A	N/A	65-90	Floating substructure undecided	N/A	N/A	01/01/2030	InisOffshore
Ireland	Lir Offshore Array	2,000	N/A	100	53-72	Floating substructure undecided	N/A	N/A	N/A	Lir Offshore Array Ltd
Ireland	Moneypoint Offshore One	400	N/A	27	90-102	Floating substructure undecided	N/A	31/12/2026	01/01/2032	ESB (50%), Ørsted (50%)
Ireland	Moneypoint Offshore Two	1,100	N/A	67	99-100	Floating substructure undecided	N/A	31/12/2027	N/A	ESB (50%), Ørsted (50%)
Ireland	Munster Sea Wind	1,000	N/A	N/A	80-95	Floating substructure undecided	N/A	N/A	N/A	InisOffshore (50%), Warwick Energy (50%)
Ireland	North East Wind	2,500	N/A	N/A	44-107	Mixed-(fixed and floating)	N/A	N/A	N/A	Mainstream
Ireland	North Irish Sea Array 3	250	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Statkraft (50%), CIP (50%)
Ireland	Péarla Offshore Windfarm	1,000	N/A	N/A	63-71	Not specified (Assumed to be floating)	N/A	N/A	N/A	InisOffshore

Ireland	Rian Offshore Array (Phase 1)	2,500	N/A	250	115-130	Floating substructure undecided	N/A	N/A	N/A	Rian Offshore Array Limited
Ireland	Rian Offshore Array (Phase 2)	N/A	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Rian Offshore Array Limited
Ireland	SSE Tarbert Offshore Windfarm	N/A	N/A	N/A	83-90	Floating substructure undecided	N/A	N/A	N/A	SSE
Ireland	Tulca Offshore Array (Phase 1)	1,650	N/A	N/A	70-113	Floating substructure undecided	N/A	N/A	N/A	Tulca Offshore Wind
Ireland	Tulca Offshore Array (Phase 2)	2,240	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Tulca Offshore Wind
Ireland	Urban Sea	3,200	N/A	N/A	50-100	Spar Floater - Concrete	N/A	N/A	N/A	Enterprize Energy
Ireland	Valentia	920	N/A	56	108-144	Floating substructure undecided	N/A	N/A	N/A	Energy Co-op Ireland
Ireland	Valentia Phase 2	620	N/A	36	132-137	Floating substructure undecided	N/A	N/A	N/A	Energy Co-op Ireland
Ireland	Voyage Offshore Array	2,900	N/A	N/A	76-87	Floating substructure undecided	N/A	N/A	N/A	Voyage Offshore Array Limited
Ireland	West Ireland - Hexicon	2,000	N/A	N/A	N/A	Semi-Submersible Platform	N/A	N/A	N/A	Hexicon
Ireland	Western Star	1,350	15	90	97-108	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group (50%), EDF (50%)
Italy	Abruzzo 1	1,760	11	160	79-92	Floating substructure undecided	N/A	N/A	N/A	Qint'x
Italy	ALG	510	15	34	154-182	Semi-Spar - Steel	N/A	N/A	01/09/2027	BayWa
Italy	Apeneste	915	15	61	140-187	Floating substructure undecided	N/A	N/A	N/A	GR Value (50%), NewDevelopments (50%)
Italy	Atis	864	18	48	245-535	Floating substructure undecided	N/A	N/A	N/A	Eni (50%), Simply Blue Group (50%)
Italy	AvenHexicon TBC	2,150	N/A	N/A	148-210	Semi-Submersible Platform	N/A	N/A	N/A	Hexicon (50%), Avapa Energy (50%)
Italy	Bari - Hope Group	600	7.5	80	126-173	Floating substructure undecided	N/A	N/A	N/A	Hope Group
Italy	Barletta - REI	840	14	60	N/A	Floating substructure undecided	N/A	N/A	N/A	REI
Italy	Bluwind Brindisi	840	15	56	124-200	Floating substructure undecided	N/A	N/A	N/A	Carlo Maresca S.p.A. Group
Italy	Bluwind Civitavecchia	870	15	58	390-590	Semi-Submersible Platform	N/A	N/A	N/A	Carlo Maresca S.p.A. Group
Italy	Bluwind Manfredonia	825	15	55	111-216	Floating substructure undecided	N/A	N/A	N/A	Carlo Maresca S.p.A. Group

Italy	Bluwind Pozzallo	975	15	65	111-137	Semi-Submersible Platform	N/A	N/A	N/A	Carlo Maresca S.p.A. Group
Italy	BNW	504	15	34	110-135	Floating substructure undecided	N/A	N/A	N/A	BayWa
Italy	Brindisi Offshore 2.0	1,425	15	95	122-199	Semi-Submersible Platform - Steel	N/A	N/A	N/A	TG Energie Rinnovabili
Italy	BRN	504	15	34	101-136	Semi-Spar - Steel	N/A	N/A	N/A	BayWa
Italy	Calabria	555	15	37	420-1000	Floating substructure undecided	N/A	N/A	N/A	ACCIONA
Italy	Calypso	600	15	40	31-500	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Vestas
Italy	Civitavecchia A	225	15	15	139-206	Semi-Submersible Platform - Steel	N/A	N/A	N/A	European Energy
Italy	Civitavecchia B	375	15	25	352-414	Semi-Submersible Platform - Steel	N/A	N/A	N/A	European Energy
Italy	Del Toro 1	292.8	12.2	24	200-500	Semi-Submersible Platform - Concrete	N/A	N/A	N/A	Seawind Ocean Technology
Italy	Del Toro 2	292.8	12.2	24	200-500	Semi-Submersible Platform - Concrete	N/A	N/A	N/A	Seawind Ocean Technology
Italy	Dorada	1,620	15	108	22-428	Floating substructure undecided	N/A	N/A	N/A	Gruppo Macchia
Italy	Elymo A	585	15	68	69-87	Floating substructure undecided	N/A	N/A	N/A	NewDevelopments (50%), GR Value (50%)
Italy	Elymo B	435	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	GR Value (50%), NewDevelopments (50%)
Italy	Eolico offshore Molise	1,050	15	70	91-138	Semi-Submersible Platform - Steel	N/A	N/A	01/05/2034	Green Bridge
Italy	Fortevento	585	20	39	460-685	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Ocean Winds
Italy	Gargano Sud	1,088	16	68	14-22	Floating substructure undecided	N/A	N/A	N/A	SEANERGY
Italy	Golfo di Taranto	1,500	15	100	375-500	Not specified (Assumed to be floating)	N/A	N/A	N/A	Gruppo Macchia
Italy	Gulf of Gela	384	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Apollo Wind srl
Italy	Hannibal	250	17	25	58-113	Semi-Submersible Platform - Steel	N/A	N/A	N/A	CIP (50%), Eni (25.5%), CDP (24.5%)
Italy	HyMed	2,200	N/A	N/A	69-73	Floating substructure undecided	N/A	N/A	N/A	Aquaterra (50%), Seawind Ocean Technology (50%)
Italy	Ichnusa	504	17	50	177-200	Semi-Submersible Platform - Steel	N/A	N/A	N/A	CIP (50%), Eni (25.5%), CDP (24.5%)
Italy	Kailia Energia	1,200	12	98	82-119	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Bluefloat (50%), Renantis (50%)
Italy	Krimisa	1,116	18	62	1650-1790	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Eni (50%), Simply Blue Group (50%)

Italy	Manfredonia - Hope Group	945	15	63	170-414	Floating substructure undecided	N/A	N/A	N/A	Hope Group
Italy	Marche 1	840	10	84	50-55	Floating substructure undecided	N/A	N/A	N/A	Qint'x
Italy	Mazara del Vallo	1,110	15	74	24-100	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Mazar Wind srl
Italy	Mazara del Vallo 2	795	15	53	77-190	Semi-Spar - Steel	N/A	N/A	N/A	BayWa
Italy	Mazara del Vallo 3	810	15	54	48-104	Floating substructure undecided	N/A	N/A	N/A	BayWa
Italy	MDV	504	15	34	61-87	Semi-Spar - Steel	N/A	N/A	N/A	BayWa
Italy	MedWind	2,793	18	190	110-739	Semi-Submersible Platform	N/A	01/01/2026	01/01/2032	Renexia
Italy	Messapia	1,314	18	73	625-737	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Eni (50%), Simply Blue Group (50%)
Italy	Minervia Energia	675	15	45	810-1130	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Renantis (50%), Bluefloat (50%)
Italy	MoDiCa	510	15	34	47-97	Semi-Submersible Platform	N/A	N/A	N/A	BayWa
Italy	MoDiCa 2	510	15	34	130-426	Semi-Submersible Platform	N/A	N/A	N/A	BayWa
Italy	Monopoli	600	10	60	N/A	Floating substructure undecided	N/A	N/A	N/A	Geoambiente
Italy	Nereus	1,800	15	120	87-112	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Nereus S.R.L
Italy	Nora Energia 1	795	15	53	43-47	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Renantis (50%), Bluefloat (50%)
Italy	Nora Energia 2	600	15	40	995-1040	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Bluefloat (50%), Renantis (50%)
Italy	Nuovo Porto Pino	705	15	47	108-688	Semi-Spar - Steel	N/A	N/A	N/A	BayWa
Italy	Nurax	500	17	46	665-705	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2028	CIP (50%), Eni (25.5%), CDP (24.5%)
Italy	Odra Energia	1,300	15	90	110-346	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Renantis (50%), Bluefloat (50%)
Italy	Ostro	600	15	40	97-139	Semi-Submersible Platform	N/A	N/A	N/A	Ocean Winds
Italy	OWF 1 - Maxima Energia	1,140	15	76	N/A	Floating substructure undecided	N/A	N/A	N/A	Maxima Energy
Italy	OWF 2 - Maxima Energia	1,140	15	76	N/A	Floating substructure undecided	N/A	N/A	N/A	Maxima Energy
Italy	Parco Eolico Off-Shore Ionio	420	15	28	N/A	Floating substructure undecided	N/A	N/A	N/A	Geco srl
Italy	Parco eolico off-shore	800	15	54	108-125	Semi-Spar - Steel	N/A	N/A	N/A	NP Francavilla Wind

	Medio Adriatico									
Italy	Poseidon	1,008	17	100	1427-1567	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2034	CIP (50%), Eni (25.5%), CDP (24.5%)
Italy	Pozzallo Offshore Wind Park	800	15	54	78-131	Semi-Spar - Steel	N/A	N/A	N/A	NP Pozzallo Wind
Italy	Puglia - Iron Solar	525	15	35	94-119	Floating substructure undecided	N/A	N/A	N/A	Iron Solar
Italy	Puglia A	1,005	15	67	136-630	Floating substructure undecided	N/A	N/A	N/A	ACCIONA
Italy	Puglia B	930	15	62	N/A	Floating substructure undecided	N/A	N/A	N/A	ACCIONA
Italy	Ragusa	945	15	63	91-500	Floating substructure undecided	N/A	N/A	N/A	BayWa
Italy	Repower FOWT Sicilia	495	15	33	2020-2200	Semi-Spar - Steel	N/A	N/A	N/A	Repower Renewable S.p.A.
Italy	San Pietro Nord	510	15	34	118-126	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Ninfea Rinnovabili S.r.l.
Italy	San Pietro Sud	504	15	34	56-73	Semi-Submersible Platform - Steel	N/A	N/A	N/A	BayWa
Italy	Santa Maria di Leuca	675	15	45	630-717	Semi-Submersible Platform - Steel	N/A	N/A	N/A	DGM Global
Italy	Sardegna	480	15	32	500-1000	Floating substructure undecided	N/A	N/A	N/A	ACCIONA
Italy	Sardegna 1	555	15	37	N/A	Floating substructure undecided	N/A	N/A	N/A	Renexia
Italy	Sardegna 2	825	15	55	N/A	Floating substructure undecided	N/A	N/A	N/A	Renexia
Italy	Seabass	810	15	54	93-172	Semi-Submersible Platform	N/A	N/A	N/A	Gruppo Macchia
Italy	Sicilia 495 MW	495	15	33	158-195	Semi-Spar - Steel	N/A	N/A	N/A	Inergia
Italy	Sicilia A	1,020	15	68	500-790	Floating substructure undecided	N/A	N/A	N/A	ACCIONA
Italy	Sicilia B	1,005	15	67	500-790	Floating substructure undecided	N/A	N/A	N/A	ACCIONA
Italy	Thalassa	525	15	35	425-765	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Vestas
Italy	Tibula Energia	975	16	62	91-94	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Renantis (50%), Bluefloat (50%)
Italy	Trinacria	840	20	56	77-100	Floating substructure undecided	N/A	N/A	N/A	Ocean Winds
Italy	Tyrrhenian Wind	540	17	27	120-129	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2031	CIP (50%), Eni (25.5%), CDP (24.5%)
Italy	Vieste - Hope Group	1,200	15	80	170-234	Floating substructure undecided	N/A	N/A	N/A	Hope Group

Italy	Zefiro	3,150	15	210	200-1479	Semi-Spar - Steel	N/A	N/A	01/06/2029	Copenhagen Energy
Malta	MUSICA - phase 3	N/A	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	2020-2024	
Norway	Bluewater - Metcentre	5	5	1	225	Tension Leg Platform - Steel	N/A	N/A	01/12/2026	Bluewater
Norway	Draugen	140	14	10	N/A	Semi-Submersible Platform	N/A	N/A	N/A	Odffjell Oceanwind (34%), TrønderEnergi (33%), OKEA (33%)
Norway	GoliatVind	75	15	5	315-364	Semi-Submersible Platform - Steel	N/A	01/03/2024	01/12/2027	Odffjell Oceanwind (50%), Source Galileo (50%)
Norway	Utsira nord - phase 1	500	0	0	264-270	Floating substructure undecided	N/A	N/A	N/A	Ministry of Petroleum and Energy (Norway) (MPE)
Norway	Utsira nord - phase 2	500	0	0	256-282	Floating substructure undecided	N/A	N/A	N/A	Ministry of Petroleum and Energy (Norway) (MPE)
Norway	Utsira nord - phase 3	500	0	0	250-267	Floating substructure undecided	N/A	N/A	N/A	Ministry of Petroleum and Energy (Norway) (MPE)
Norway	Windcatcher	75	1	75	Oct-20	Semi-Submersible Platform	N/A	01/01/2024	N/A	Ferd AS (34%), North Energy (33%), GM Ventures (33%)
Portugal	Aguçadoura - Gazelle demonstration	0	0	0	29.5-37	Semi-Submersible Platform - Steel	N/A	N/A	N/A	
Portugal	Baywa r.e. Viana do Castelo	600	20	30	85-100	Floating substructure undecided	N/A	N/A	N/A	BayWa
Portugal	Botafogo	990	18	55	15-2319	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group (33.34%), FF New Ventures (33.33%), Grupo Amper (33.33%)
Portugal	Creoula	1,440	18	80	82-540	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group (33.34%), FF New Ventures (33.33%), Grupo Amper (33.33%)
Portugal	Nortada	2,000	N/A	N/A	60-79	Floating substructure undecided	N/A	N/A	N/A	PensionDanmark
Portugal	Offshore Island Porto Santo - OIPS	10	5	2	N/A	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Planeta Vibrante (33.3%), EEM (33.3%), AREAM (33.3%)
Portugal	WavEC	2	2	1	N/A	Tension Leg Platform - Steel	N/A	N/A	N/A	WavEC (50%), Marine Power Systems (50%)
Spain	Albaicín	510	15	34	97-425	Floating substructure undecided	N/A	N/A	N/A	Capital Energy
Spain	Almadraba	495	N/A	N/A	24-26	Floating substructure undecided	N/A	N/A	N/A	
Spain	Alwind	300	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Vinci
Spain	Andamana	240	10	24	49-355	Floating substructure undecided	N/A	N/A	N/A	elittoral
Spain	Atlantida	300	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Iberdrola

Spain	Bandama	195	15	13	88-442	Floating substructure undecided	N/A	N/A	N/A	Ferrovial
Spain	Breogán	510	15	34	182-195	Floating substructure undecided	N/A	N/A	N/A	
Spain	CANARRAY I	48	6	8	60-80	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Eni
Spain	CANARRAY II	132	5.5	24	50-150	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Eni
Spain	Canary Island Test Areas	310	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Gobierno de Canarias
Spain	Canawind 1	250	14.7	17	49-487	Floating substructure undecided	N/A	N/A	N/A	Vinci
Spain	Canawind 2	250	14.7	17	132-1060	Floating substructure undecided	N/A	N/A	N/A	Vinci
Spain	CARDON	50	12.5	4	61-92	Semi-Submersible Platform	N/A	N/A	N/A	Greenalia
Spain	Catwind	1,200	14.7	82	119-275	Floating substructure undecided	N/A	N/A	N/A	Vinci
Spain	Celta I	495	15	33	148-200	Floating substructure undecided	N/A	N/A	N/A	Ferrovial
Spain	Celta II	510	15	34	145-188	Floating substructure undecided	N/A	N/A	N/A	Ferrovial
Spain	Creus	510	15	34	119-179	Floating substructure undecided	N/A	N/A	N/A	
Spain	DUNAS	50	N/A	4	61-92	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Greenalia
Spain	Floating Offshore Wind Canarias (FOWCA)	225	18	15	49-677	Semi-Submersible Platform	N/A	01/01/2025	01/08/2028	Equinor (50%), Naturgy (50%)
Spain	Galwind	1,000	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Vinci
Spain	Gavina	500	15	37	121-275	Semi-Submersible Platform	N/A	N/A	N/A	Iberdrola
Spain	GOFIO	50	12.5	4	50-100	Semi-Submersible Platform	N/A	N/A	01/01/2027	Greenalia
Spain	Gran Canaria Este	144	12	12	5-500	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Ocean Winds
Spain	Gran Canaria Offshore Wind Power Project	210	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	
Spain	GUANCHE	50	12.5	4	61-92	Semi-Submersible Platform	N/A	N/A	N/A	Greenalia
Spain	Hivewind demonstration (PlemCat)	11	15	1	131-137	Semi-Submersible Platform - Steel	N/A	N/A	N/A	HiveWind LLC
Spain	Juan Sebastián Elcano	522	18	29	125-182	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group (33.34%), FF New Ventures (33.33%), Grupo Amper (33.33%)

Spain	La Pinta	990	18	55	359-930	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group (33.34%), FF New Ventures (33.33%), Grupo Amper (33.33%)
Spain	Lanzarote Este	50	12.5	4	48-972	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Ocean Winds
Spain	L'Emporda	510	15	34	119-200	Semi-Submersible Platform - Steel	N/A	01/07/2025	01/01/2029	Capital Energy
Spain	Mar de Agata	300	N/A	20	200-500	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Sener Group (50%), Bluefloat (50%)
Spain	Maresía	254	15	17	95-542	Floating substructure undecided	N/A	N/A	N/A	Capital Energy
Spain	Marino Drago	260	20	N/A	100-560	Floating substructure undecided	N/A	N/A	N/A	
Spain	Medfloat Pilot Parc	50	15	5	145-166	Barge - Concrete	N/A	N/A	01/01/2030	Saitec Offshore Technologies
Spain	Mencey	150	15	10	625-1048	Semi-Submersible Platform	N/A	01/01/2025	01/01/2029	Capital Energy
Spain	MOJO	50	12.5	4	61-92	Semi-Submersible Platform	N/A	N/A	N/A	Greenalia
Spain	MPS demo - BiMEP	2.5	N/A	1	32-89	Tension Leg Platform - Steel	N/A	N/A	01/01/2026	Marine Power Systems
Spain	MPS demo - PLOCAN	N/A	N/A	N/A	850-1274	Tension Leg Platform - Steel	N/A	N/A	N/A	Marine Power Systems (50%), PLOCAN (50%)
Spain	MUSICA - phase 4	N/A	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	PLOCAN
Spain	Nao Victoria	1,000	18	55	330-930	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group (33.34%), Grupo Amper (33.33%), FF New Ventures (33.33%)
Spain	Nautilus Demonstration	2	2	1	50-250	Semi-Submersible Platform	N/A	N/A	N/A	Seaway 7
Spain	Nordes Phase 1	525	15	35	278-1991	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Bluefloat (50%), Sener Group (50%)
Spain	Nordes Phase 2	675	15	45	541-806	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Bluefloat (50%), Sener Group (50%)
Spain	Ocean H2	6	N/A	2	N/A	Semi-Submersible Platform - Steel	N/A	N/A	N/A	Hexicon (50%), ACCIONA (50%)
Spain	Parc Tramuntana	500	15	33	106-174	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2033	Bluefloat (50%), Sener Group (50%)
Spain	Pe San Agustín I	49.9	10	5	45-142	Floating substructure undecided	N/A	N/A	N/A	
Spain	Poniente I	435	15	29	100-200	Floating substructure undecided	N/A	N/A	N/A	ABEI Energy
Spain	Poniente II	480	15	32	160-220	Floating substructure undecided	N/A	N/A	N/A	ABEI Energy
Spain	Salinas I	49.9	N/A	N/A	58-61	Floating substructure undecided	N/A	N/A	N/A	N/A
Spain	San Borondón	238	N/A	N/A	49-340	Semi-Submersible Platform	N/A	N/A	N/A	Iberdrola

Spain	San Brandan	490	N/A	N/A	146-200	Semi-Submersible Platform	N/A	N/A	N/A	Iberdrola
Spain	San Cibrao	490	N/A	35	143-180	Semi-Submersible Platform	N/A	N/A	N/A	Iberdrola
Spain	Talasa	50	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Naturgy
Spain	Tarahal	225	15	15	N/A	Floating substructure undecided	N/A	N/A	N/A	Bluefloat (50%), Sener Group (50%)
Spain	Timanfaya	50	12.5	4	57-500	Semi-Submersible Platform - Concrete	N/A	01/06/2025	01/01/2029	Capital Energy
Spain	Varuna	300	N/A	N/A	677-1000	Floating substructure undecided	N/A	N/A	N/A	N/A
Spain	Ventus Offshore Wind Farm	600	15	40	113-121	Floating substructure undecided	N/A	N/A	N/A	ABEI Energy
Spain	Volanteiro	510	15	34	131-182	Semi-Submersible Platform - Concrete	N/A	N/A	N/A	Capital Energy
Spain	WHEEL	6	6	1	N/A	Semi-Spar - Concrete	N/A	N/A	01/01/2027	ESTEYCO
Sweden	Baltic Edge	1,000	N/A	N/A	39-72	Not Specified-(fixed or floating)	N/A	N/A	N/A	LandInfra Energy AB
Sweden	Baltic Offshore Alpha	1,900	N/A	140	61-123	Floating substructure undecided	N/A	N/A	N/A	Statkraft
Sweden	Baltic Offshore Delta South	1,900	20	160	44-185	Mixed-(fixed and floating)	N/A	31/12/2028	01/01/2032	Statkraft
Sweden	Baltic Offshore Epsilon	2,740	25	184	50-100	Floating substructure undecided	N/A	N/A	N/A	Statkraft
Sweden	Erik Segersäll 1	2,000	25	100	100-183	Semi-Submersible Platform	N/A	N/A	01/01/2032	Deep Wind Offshore
Sweden	Erik Segersäll 2	2,000	25	100	100-100	Floating substructure undecided	N/A	N/A	01/01/2034	Deep Wind Offshore
Sweden	Erik Segersäll 3	2,000	25	100	100-100	Floating substructure undecided	N/A	N/A	01/01/2036	Deep Wind Offshore
Sweden	Heimdall	2,400	N/A	N/A	100-160	Floating substructure undecided	N/A	N/A	N/A	RWE
Sweden	Herkules	2,750	15 - 25	160	106-134	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group (50%), Eolus Vind (50%)
Sweden	Hudiksvall	1,500	N/A	N/A	35-73	Not Specified-(fixed or floating)	N/A	N/A	N/A	LandInfra Energy AB
Sweden	Kultje	2,150	30	143	82-108	Semi-Submersible Platform - Steel	N/A	01/01/2027	01/01/2030	Hexicon (50%), Mainstream (50%)
Sweden	Pleione	1,050	25	70	26.5-88	Floating substructure undecided	N/A	N/A	01/01/2031	OX2 (51%), IngKa Group (49%)
Sweden	Skagerrak Offshore Gamma	2,740	25	172	291-512	Floating substructure undecided	N/A	N/A	01/01/2032	Statkraft

Sweden	Skidbladner	2,200	25	147	12-170	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group (50%), Eolus Vind (50%)
Sweden	Sundsvall	1,200	N/A	N/A	50-88	Not Specified-(fixed or floating)	N/A	N/A	N/A	LandInfra Energy AB
Sweden	Vidar	1,400	N/A	91	160-291	Floating substructure undecided	N/A	01/01/2028	01/01/2031	Vattenfall (85%), Zephyr (15%)
United Kingdom	Celtic Deep phase 1	98	N/A	N/A	80-90	Spar Floater - Concrete	N/A	N/A	N/A	DORIS (formerly Offshore Design Engineering Ltd)
United Kingdom	Celtic Deep phase 2	300	N/A	N/A	80-90	Spar Floater - Concrete	N/A	N/A	N/A	DORIS (formerly Offshore Design Engineering Ltd)
United Kingdom	Dolphyn Project - full scale	2,000	10	400	N/A	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2035	ERM
United Kingdom	Dolphyn Project - pre-commercial (to be relocated)	10	10	1	N/A	Semi-Submersible Platform - Steel	N/A	01/12/2024	01/01/2027	ERM
United Kingdom	Dylan	300	10	N/A	90-106	Semi-Submersible Platform - Steel	N/A	N/A	01/01/2030	ERM (50%), Source Galileo (50%)
United Kingdom	Dylan Extension	1,000	N/A	N/A	80-118	Floating substructure undecided	N/A	N/A	N/A	Source Galileo
United Kingdom	Erebus (Commercial)	600	15	60	67-75	Semi-Submersible Platform - Steel	N/A	01/10/2028	01/01/2032	TotalEnergies (50%), Simply Blue Group (50%)
United Kingdom	Gwynt Glas	1,000	N/A	N/A	75-85	Floating substructure undecided	N/A	N/A	N/A	EDF (75%), DP Energy (25%)
United Kingdom	Llywelyn	300	N/A	20	72-86	Floating substructure undecided	N/A	01/01/2026	~2030	Bluefloat (50%), Renantis (50%)
United Kingdom	Myrddin	1,000	N/A	N/A	89-109	Floating substructure undecided	N/A	N/A	N/A	Source Galileo
United Kingdom	Nomadic Offshore Wind	500	N/A	N/A	55-110	Tension Leg Platform - Steel	N/A	N/A	31/12/2030	Simply Blue Group
United Kingdom	North Channel Wind 1	300	20	20	113-144	Tension Leg Platform - Steel	N/A	01/01/2027	04/01/2030	SBM Offshore
United Kingdom	North Channel Wind 2	100	20	7	122-157	Tension Leg Platform - Steel	N/A	01/01/2027	04/01/2030	SBM Offshore
United Kingdom	Olympic Wind	1,300	N/A	N/A	N/A	Floating substructure undecided	N/A	N/A	N/A	Simply Blue Group
United Kingdom	Petroc	300	N/A	20	69-83	Floating substructure undecided	N/A	01/01/2026	~2030	Bluefloat (50%), Renantis (50%)
United Kingdom	SENSEWind Pelastar Full-Scale Prototype	15	15	1	60-68	Tension Leg Platform - Steel	N/A	N/A	N/A	SENSE Wind Ltd

3. Future floating development opportunities in Europe

As floating offshore wind nears commercialisation, projects must secure sites in leasing rounds to progress in development. European countries have started to include sites at water depths suitable for floating wind, or indeed floating wind-specific leasing rounds. A comprehensive breakdown of future floating offshore wind tender opportunities is included in 表 5. This breakdown includes leasing rounds for which the foundation type is 'Mixed', i.e., projects may be either bottom-fixed or floating.

In addition, further information is provided for key upcoming floating offshore wind-specific leasing rounds in sections 3.1., 3.2, and 3.3, which are expected to take place in 2024. 表 5 has information detailing the leasing rounds highlighting if they are offtake, site, or site-only and offtake-only auctions which include purchasing the outputs of the electricity generated by the project whereas a site auction is solely the leasing of the seabed for development.

3.1. United Kingdom – Celtic Sea leasing round

The Celtic Sea leasing round (expected in 2024) will be the first leasing round for floating offshore wind in England and Wales (in the wider UK, the ScotWind leasing round included floating offshore wind). The leasing round will tender up to 4.5 GW capacity, with up to 1.5 GW available across three project development areas. The round comprises a total forecast investment of up to £19bn, with approximately 4,000 permanent jobs expected during the construction phase. The Crown Estate have estimated that the developments will require 260+ turbines, approximately 1,000 anchors, at least 300km of mooring lines, and at least 800km of cables²⁰. The first power production from the Celtic Sea projects is expected in 2030.

3.2. France – Sud de la Bretagne II (South of Brittany 2)

In France, the Sud de la Bretagne II leasing round is expected to be released in 2024. This will be an upcoming auction for a 500 MW floating wind project expected to be commissioned in 2033, with an expected 30-40 turbines²¹. The electrical connection to the grid will be for both projects led by Réseau de Transport d'Électricité (RTE), the electricity transmission operator in France.

Site selection for the tender has been supported by public debate organised by the French National Commission for Public Debate. The public debate has received participation from approximately 1,800 individuals and over 1,500 respondents on a questionnaire to identify ideal zones for deployment²².

3.3. 2024 floating wind tenders in Spain and Portugal

In 2022 Portugal committed to releasing tenders for 10GW of offshore wind capacity by 2030. This was followed in 2023 with the launch of an Expression of Interest stage²³. 50 participants expressed interest

²⁰ The Crown Estate, Celtic Sea leasing round – Information Memorandum. Source: [link](#).

²¹ Region Bretagne, Focus sur la filière de l'éolien en mer flottant. Source: [link](#).

²² Débat Public, Compte rendu du débat public, Eoliennes flottantes au sud de la Bretagne. Source: [link](#).

²³ OffshoreWind.biz, 2023, Portugal launches initial stage of offshore wind tendering process. Source: [link](#).

in this stage. The launch of the full tender is expected in 2024. The initial expected capacity for the tender was 3.5 GW, although it is now expected that the first tender will support a reduced 2 GW capacity²⁴.

Spain is also expected to open an offshore wind leasing round in the Canary Islands in 2024, delayed from a previous expectation that this would be announced in 2023. Spain has outlined an intention to develop 3GW of offshore wind by 2030, which the leasing round will support²⁵.

3.4. Italy – FER II Decree

In 2022 a draft FER II decree was circulated with a framework dedicated to future FOW auctions with 3.5GW planned before 2030, with 20-year contracts-for-difference and a proposed 165 EUR/ MWh cap²⁶.

Presently, Italy does not have any floating wind projects commissioned or under construction (☒ 5). However, there are 13 projects with site exclusivity (☒ 7).

The FER II subsidies will allocate support however it has been reported that there is further work to be done to ensure that legislation and permitting processes are updated before site auctions should take place, as there is a strong interest from developers as seen by the number of projects in the early concept stages (☒ 9)²⁷.

The Italian government is considering tenders for sites in the near future, but overall delays over the FER II framework, have led to only one 30 MW fixed OSW farm being commissioned since development of the sector commenced²⁸.

²⁴ Rivera, 2023, Portugal's offshore wind auction attracts 50 potential participants. Source: [link](#).

²⁵ OEDigital, 2023, Spain to announce offshore wind tenders this year. Source: [link](#).

²⁶ Aegir, 2022. With the FER II Decree on its way, Italy is gearing up for take-off as an offshore wind market. Source: [link](#).

²⁷ Aurora, 2022. Upcoming subsidies key to unlocking Italian offshore wind potential. Source: [link](#).

²⁸ Recharge, 2024. Massive floating wind farm to power three million homes tests Mediterranean seabed. Source: [link](#).

表5 Floating wind tenders in Europe²⁹

Country	Location	Name of sea area	Tender name	Predicted Total power rating (MW)	Water depth (m)	Expected date of tender	Expected date of power production (*Estimated)	Site / Offtake	Project authority	Foundation type
France	Brittany	Channel	Sud de la Bretagne II	500	N/A	2024	2033	Site + Offtake	Ministry of Ecological Transition	Floating
France	Normandy	TBC	Future Tenders	10000	N/A	31 December 2025	To be confirmed	Site + Offtake	Ministry of Ecological Transition	Mixed
Greece	Notio Aigaio	Aegean Sea	2026 Floating Tender(s)	2000	187-187	2025-2027	2030	Site / Offtake	N/A	Floating
Ireland	Ireland	TBC	Phase 3 Non-Grid Tender 1 + 2	2000	N/A	01 July 2025	To be confirmed	Site + Offtake	Department of Environment, Climate and Communications (DECC), Commission for Regulation of Utilities (CRU) and EirGrid	Mixed
Ireland	Ireland	TBC	Enduring Regime FF1	1500	N/A	01 April 2026	To be confirmed	Site + Offtake	Department of Environment, Climate and Communications (DECC), Commission for Regulation of Utilities (CRU) and EirGrid	Mixed
Ireland	Ireland	TBC	Enduring Regime FF1	2000	N/A	01 April 2027	To be confirmed	Site + Offtake	Department of Environment, Climate and Communications (DECC), Commission for Regulation of Utilities (CRU) and EirGrid	Mixed
Ireland	Ireland	TBC	Enduring Regime FF1	2000	N/A	01 April 2028	To be confirmed	Site + Offtake	Department of Environment, Climate and Communications (DECC), Commission for Regulation of Utilities (CRU) and EirGrid	Mixed
Ireland	Ireland	TBC	Enduring Regime FF1	2000	N/A	01 April 2029	To be confirmed	Site + Offtake	Department of Environment, Climate and Communications (DECC), Commission for Regulation of Utilities (CRU) and EirGrid	Mixed
Italy	TBC	TBC	TBC	4000	N/A	2025-2028	After 2030*	Offtake	Energy Services Manager GSE	Mixed
Norway	Rogaland	North Sea	Utsira nord - phase 1 -3	1500	~200	Q1 2024	To be confirmed		Ministry of Petroleum and Energy	Mixed
Portugal	North	Atlantic	TBC	~3500 ³⁰	N/A	Q4 2024	2030*	Site	Ministry of Environment and Energy Transition	Floating
Spain	Canary Islands	Atlantic	TBC	2400	N/A	Q4 2024	To be confirmed	Site + Offtake	Ministry for the Ecological Transition and Demographic Challenge	Floating
United Kingdom	Celtic Sea	Celtic Sea	Leasing Round 5 (Celtic Sea)	4500	N/A	March – April 2024	2030*	Site	The Crown Estate England & Wales	Floating
United Kingdom	UK	TBC	Allocation Round 6	~10000 (~350 floating)	N/A	27 March 2024	To be confirmed	Offtake	Department for Energy Security and Net Zero (DESNZ)	Mixed
United Kingdom	UK	TBC	Allocation Round 7	~4000 (~600 floating)	N/A	01 March 2025	To be confirmed	Offtake	Department for Energy Security and Net Zero (DESNZ)	Mixed

²⁹ 4COffshore database, Accessed January 2024

³⁰ The initial proposal was for 3.5GW of capacity. It is expected that this may be reduced to 2GW in the first tender.

United Kingdom	UK	TBC	Allocation Round 8	~4000 (~3180 floating)	N/A	01 March 2026	To be confirmed	Offtake	Department for Energy Security and Net Zero (DESNZ)	Mixed
United Kingdom	UK	TBC	Allocation Round 9	~38900 (mixed)	N/A	2028-2033	To be confirmed	Offtake	Department for Energy Security and Net Zero (DESNZ)	Mixed (predominantly floating)

4. Research on planned European manufacturing bases

This section provides an overview of planned European manufacturing bases for floating offshore wind platforms. These are expected to be based around construction ports, where the floating substructures are manufactured, and where the turbine may be assembled with the floating substructure.

As previously described, floating offshore wind farms that have been constructed to date have comprised relatively few turbines and at small scales. For these small-scale floating wind farms, it has been possible to utilise existing port facilities for the construction of floating foundations.

For early pre-commercial floating projects, several ports have supported construction: Aberdeen (UK), Cromarty Firth (UK), Dundee (UK), Ferrol (Spain), Lorient (France), Nouvelle (France), Rotterdam (Netherlands), Skipavik-Gulen (Norway) and Stord (Norway)³¹.

However, as the industry expects to progress to larger scale projects (that may extend to hundreds of turbines per project) there is a need for increased specialisation of ports to facilitate floating offshore wind substructure manufacturing. This specification will require hundreds of millions of £GBP worth of investment for individual ports to provide the required services.

Given that commercial opportunities are still several years away, the industry in Europe is in the early stages of planning for future manufacturing facilities, securing investment, and early-stage construction activities. The most significant imminent opportunity for commercial development of floating offshore wind is in the UK through the ScotWind leasing round. As a result, a large amount of activity to date regarding the preparation of manufacturing facilities can be observed in Scotland.

This opportunity was outlined in a UK Department for International Trade report, which demonstrates a need for over 1000 floating offshore wind substructures in Scotland by 2032³².

Details of proposed developments for FOW manufacturing facilities and revitalising ports are included below and summarised in 表 6.

4.1. Wind Works Jelsa, (Norway)

At present Jelsa is a quarry however there are plans to transform the site into a low-emission facility for the wind industry, producing concrete foundations and assembling wind turbines for floating offshore wind farms across Europe. The project, established by NorSea, Suldal municipality and Ryfylke IKS, is due to be completed by either 2027 or 2028 to be in line with construction at Utsira Nord floating offshore wind farm³³. The facility is strategically located in the North Sea to service other key OSW markets (表 11) and will aim to construct 70 floating turbines each year³⁴.

³¹ The Crown Estate, 2023, Guide to a floating offshore wind farm. Source: [link](#).

³² UK Department for International Trade, 2022, Floating offshore wind manufacturing in Scotland. Source: [link](#)

³³ TU, 2021, Quarries could become shipyards for offshore wind. Source: [link](#).

³⁴ OffshoreWind.biz, 2023, Norway to get floating wind foundation production and assembly facility. Source: [link](#)



☒ 11 A map highlighting the connectivity of the proposed WindWorks Jelsa

The quarry has a depth of 40 metres below sea level, with an area of approximately 450,000m² (Phase I) and up to 900,000m² (Phases I and II)³⁵.

The facility will be constructed in two phases and will comprise:

- A multipurpose production yard
- Water treatment
- Batching plant
- Wind Turbine Generator (WTG) installation yard and launching system (which comprises a moving pontoon to manage FOW structures and lower structures into water)
- WTG unloading quay
- Barge for wet storage (floating production facility)
- Offices and warehouses for dry storage

³⁵ Norsesea Group, Exploring new industrial adventure in Ryfylke - [link](#)

- Heavy load quay with adjacent storage area³⁶.



☒ 12 Animation of FOW construction in future at the WindWorks Jelsa port³⁶



☒ 13 Animation of spar FOW foundation towed out from WindWorks Jelsa port. Green structure is barge for wet storage³⁶

³⁶ Source: WindWorks Jelsa - [link](#)

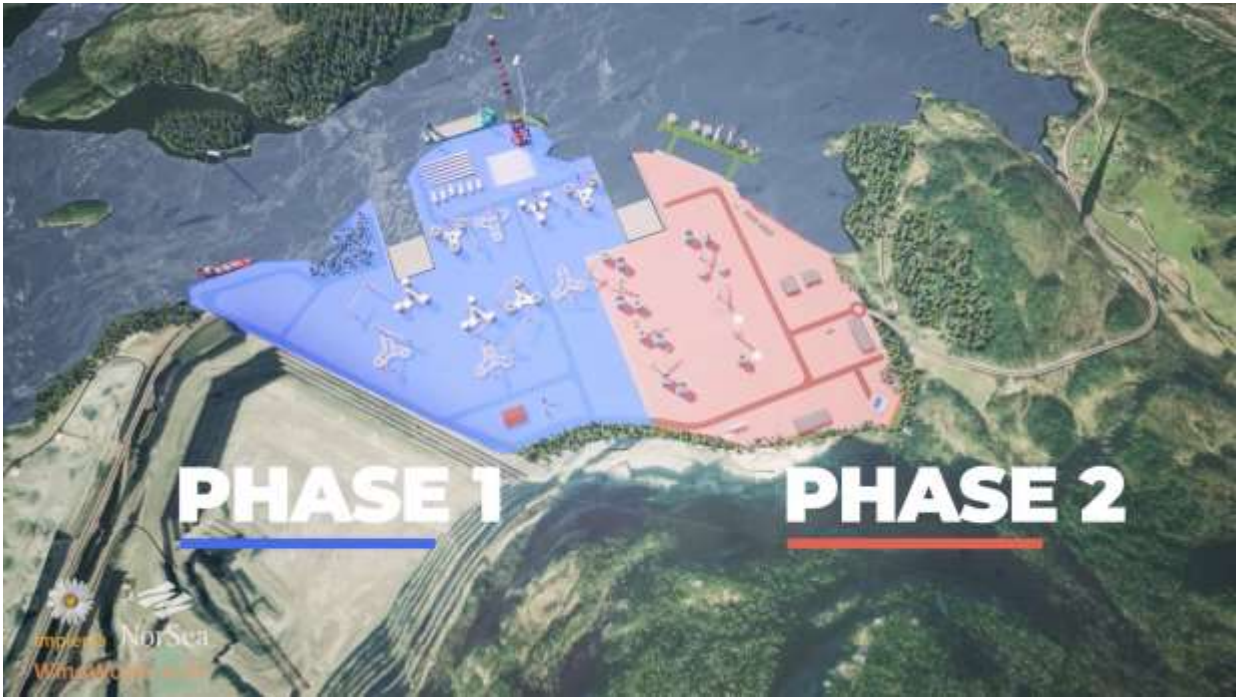


图 14 Aerial view of future WindWorks Jelsa port infrastructure³⁶



☒ 15 Current view of Jelsa quarry prior to development³⁷

4.2. Port Talbot (Wales, United Kingdom)

Port Talbot is an essential port in Wales, and there are plans in place to revitalise the existing port into a floating offshore wind-specific port supporting the Celtic Sea supply chain. The port is ideally positioned as it is located 120 kilometres away from the Celtic Sea FOW areas that have been outlined in the upcoming Celtic Sea leasing rounds³⁸. The three stages of development for the port are as follows:

- 1) **Creation of a heavy lift facility**, as the assembly of components will be undertaken elsewhere initially, this interim solution will enable components such as blades and towers to be mated with associated substructures prior to them being towed.
- 2) **Development of a new quay**, to assemble and create substructures within Port Talbot and would create an uptick of wider activity onsite.
- 3) **Creation of a manufacturing cluster**, to accommodate the growing supply chain in the region, e.g. storage and preassembly of components³⁹.

Associated British Ports is the owner of Port Talbot and is planning on investing over £500 million to transform the port into a hub for floating offshore wind. BW Ideol As has recently signed a Memorandum of Understanding (MOU) with Associated British Ports (ABP) to investigate the viability of a floating foundations manufacturing facility in Port Talbot⁴⁰. The project has the overall potential to create approximately 16,000 new employment opportunities in the sector and could ultimately attract an additional £5.5 billion in the form of inward investment in the wider economy³⁸.



☒ 16 The existing port and plan for Future Port Talbot, ABP³⁹

³⁷ Norsesea Group, Exploring new industrial adventure in Ryfylke. Source: [link](#).

³⁸ OffshoreWind.biz, 2023, BW Ideol, ABP to Explore Serial Production of Floating Wind Foundations at Port Talbot. Source: [link](#).

³⁹ OffshoreWind.biz, 2023, BW Ideol, ABP to Explore Serial Production of Floating Wind Foundations at Port Talbot. Source: [link](#).

⁴⁰ BW Ideol, 2023, BW Ideol teams up with ABP in Port Talbot on floating foundation industrialisation for the Celtic Sea Source: [link](#).

To help face the systematic challenges that are being faced at Port Talbot the main missions outlined in the Future of Ports report are:

1. Decarbonising energy (FOW, Energy generation)
2. Decarbonising manufacturing (Carbon Capture, Manufacturing cluster)
3. Decarbonising logistics (Rail connection to help transfer sustainable fuels, Marine fuels)
4. Creating growth environments (Town growth through creating an R&D village, Environmental growth)

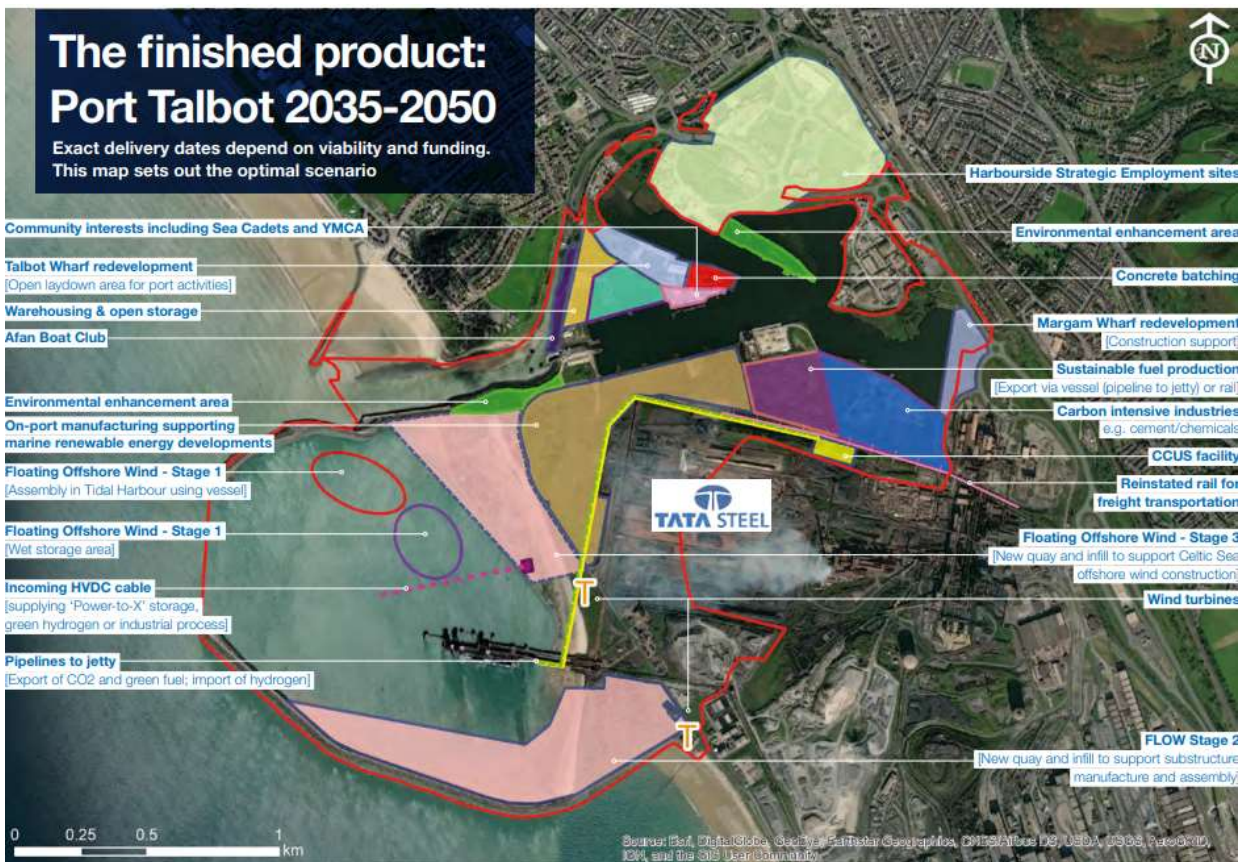
The methods outlined in the plans to decarbonise and reduce the overall carbon footprint of Port Talbot are by placing onshore wind turbines around the harbour, installing a solar plant on a 13-acre site on the wharf for a 3-5MW site (☒ 17). Carbon capture and hydrogen or a blend of the two has been proposed by ABP to decarbonise the port and manufacturing cluster before 2050. Port Talbot is home to Tata Steel which is currently the largest emitter within the cluster (☒ 18) A graphic of a proposed method of reducing the carbon footprint of Port Talbot.



☒ 17 A graphic of the proposed Talbot Wharf solar installation³⁹



18 A graphic of a proposed method of reducing the carbon footprint of Port Talbot³⁹



19 Projection of Port Talbot after the revitalisation project is completed³⁹

4.3. Ardersier port transformation (Scotland, UK)

Work started in 2021 for a £20m upgrade to Ardersier port, near Inverness, Scotland, UK. The plans included:

- A dedicated 34ha floating wind manufacturing hub for concrete foundations – an exclusive partnership with BW Ideol.
- A concrete plant.
- Additional services for oil rig decommissioning and 'green steel' manufacturing⁴¹.

Results from feasibility studies have demonstrated that the port will be able to deliver damping pool floaters equivalent to 1GW per year. £300m of US investment is supporting the port upgrades⁴².



☒ 20 Graphic of Ardersier port transformation, BW Ideol⁴³

4.4. Port of Cromarty Firth upgrades (Scotland, UK)

Port of Cromarty Firth, Invergordon, Scotland, UK has been identified as having potential for floating substructure fabrication and assembly due to existing infrastructure and high technical capability, as well as geographical proximity to ScotWind floating wind sites.

Around £110m of infrastructure investment is planned to support with:

- Large fabrication and assembly facilities
- Deep water quaysides
- Sheltered deep water anchorages

⁴¹ BW Ideol, 2021, Work starts on Ardersier Port transformation. Source: [link](#).

⁴² ReNews, 2023, Scottish port secures £300m for energy transition upgrade. Source: [link](#).

⁴³ BW Ideol, 2022. Source: [link](#).

- Dry docks
- Wet docks
- Laydown and storage areas
- Heavy lift and servicing facilities⁴⁴

4.5. Port of Nigg (Scotland, UK)

The Port of Nigg in Scotland is today the UK's largest energy port and has over 1,200m of deepwater quaysides, dry dock facilities and is the largest offshore wind staging port in the UK.

There are currently two FOW projects proposed for the Port of Nigg.

The first was announced in 2021 and was for the construction of the largest offshore wind tower facility in the UK (☒ 21). The £110m plant at the port would create 400 direct jobs and reskilling opportunities for oil and gas employees in the region and ultimately produce 135 towers each year from 2023⁴⁵. However, to date, there is little evidence that this project has been realised.



☒ 21 Graphic of proposed Nigg Offshore Wind facility⁴⁵

⁴⁴ UK Department for International Trade, 2022, Floating offshore wind manufacturing in Scotland. Source: [link](#).

⁴⁵ SSE, SSE backs UK's largest offshore wind tower facility to be built in Scotland. Source: [link](#).

The second project for the Port is the Superhub for industrialised FOW that has received over £120m of investment from both the private sector and the Scottish and UK governments⁴⁶. The port will achieve a superhub status through:

- Land development – development of 420m ultra deep-water quayside and additional expansion to extend the overall site to be >1,000,000 sqm.
- Manufacturing – the creation of an HVDC cable factory and production of rolled steel tubulars.
- Fabrication of floating offshore wind platforms
- Assembly of floating offshore wind platforms
- Operations and maintenance services for floating offshore wind farms⁴⁷

4.6. Port of Leith (Scotland, UK)

The second largest OSW hub in the UK is the Port of Leith in Scotland which in 2022 received £50m of private investment. Forth Ports, the port operator, forecasted the creation of 3,000 direct and indirect jobs on the 175-acre site, and work is projected to start after 2025⁴⁸.



☒ 22 Graphic of the outer berth at the Port of Leith⁴⁸

4.7. Fos sur Mer (France)

Fos has been selected as the manufacturing port for two small-scale floating offshore wind farms to date – Ocean Wind's Les Eoliennes Flottantes du Golfe de Lion and Provence Grand Large with EDF

⁴⁶ Renewables Now, Scotland's Port of Nigg to host GBP 110m-plus offshore wind tower factory. Source: [link](#).

⁴⁷ The Port of Nigg, Transforming the Port of Nigg into offshore renewables superhub. Source: [link](#).

⁴⁸ Edinburgh News, 2022, Edinburgh's Port of Leith gets major boost from latest OSW farm announcement. Source: [link](#).

Renewables. These are small-scale projects with three turbines each. There is some consideration of adaptation to the quay and extension at Fos, which could presently assemble six to seven floaters, to support up to 20 floaters to serve the French and Italian markets⁴⁹.

The €500m project owned by Eiffage metal will construct an 80ha site with a 1,000m long quay providing storage areas of between 40 to 50ha, the port is hoping to then encourage the establishment of industry on-site to manufacture steel and concrete floaters. This wider plan is being put forward for a national public debate or more detailed consultation towards the end of 2024, if approval is granted the work will commence in 2026 following FID with the project to be established by the end of 2028⁵⁰⁵¹.

4.8. Norway offshore wind – a report has identified 14 installation and assembly ports for offshore wind with plans before 2030

A recent report published by Norwegian Offshore Wind identified that only ports with plans to develop areas and specifications for assembly and installation by 2030 would be able to support the first commercial projects. The report estimated that 65% of the capacity to be developed will support floating offshore wind specifically. There remain some challenges around space for port upgrades, social acceptance of port infrastructure upgrades, and adequate financing for expansion. Therefore, these plans may not all be delivered⁵².

⁴⁹ Offshore, 2023, Eiffage Metal scaling up capacity for future floating offshore wind parks. Source: [link](#).

⁵⁰ Source: reNEWS, 22 February 2025 Issue 522.

⁵¹ Marseille Fos, Lancement officiel du projet DEOS: Le Port de Marseille Fos prévoit d'accueillir une filière éolien offshore d'ici 2028. Source: [link](#).

⁵² Norwegian Offshore Wind, Norwegian offshore wind ports can create billions in value annually by 2023. Source: [link](#).

表 6 Planned Manufacturing bases in Europe⁵³

Manufacturing base name	Country	Description	Estimated investment amount (CAPEX)	Production capacity	Construction start date	Project Owner	Manufacturing of floaters start date	Estimation of number of jobs created
Fos sur Mer	France	Manufacturing port to be updated to support EFGL and PGL	~€550,000,000	~25 turbines a year	~Q3 2026	Eiffage Metal	2028	1,500 manufacturing jobs and 200 additional jobs in assembling turbines
WindWorks Jelsa	Norway	Production and assembly facility for steel and concrete for floating OSW (800,000m ²)	N/A	1 GW per year /70 turbines a year	2023-2032	Implenia (41%) NorSea (41%)	N/A	N/A
Ardersier Port	United Kingdom	Creation of a dedicated manufacturing hub for floaters.	£20,000,000	1 GW per year	N/A	Ardersier Port Authority	~2030	~1,000
Port Talbot	United Kingdom	Port revitalisation for the Celtic Sea supply chain	£500,000,000	N/A	N/A	ABP	N/A	Up to 16,000
Inverness & Cromarty Firth Green Freeport	United Kingdom	Floating offshore wind manufacturing and port revitalisation covering Invergordon, Nigg and Inverness	£52,000,000 (from the UK government)	N/A	N/A	N/A	N/A	Up to 25,000
Port of Leith	United Kingdom	Creation of a new facility for offshore wind berth and marshalling of OSW components and creation of a deep water turbine integration site.	£40,000,000 to £50,000,000	N/A	2025	Forth Ports	N/A	2,000 direct and 1,000 indirect jobs
Port of Nigg	United Kingdom	Port expansion, addition of 420m to the quay	£120,000,000	N/A	N/A	Global Energy Group	N/A	N/A

⁵³ Data aggregated from multiple sources, and references across the body of text.

5. Existing clusters and investment schemes in floating offshore wind

Alongside the planned manufacturing facilities, we have also outlined some examples supporting schemes to support floating offshore wind manufacturing in Europe. Several of these initiatives are industry clusters.

Industry clusters are concentrations of organisations within an industry in a geographic area. These may be supply chain organisations, innovators, educational and research institutions, training centres, etc. In some cases, there are fiscal incentives for that geographical area, such as tax breaks, to encourage companies to establish themselves within a cluster area. The Humber Cluster in the United Kingdom is a key OSW cluster, formed around the port of Hull near Hornsea OSW projects⁵⁴. Existing clusters and investment schemes will play a key role in the commercialisation of floating offshore wind as they will facilitate work and collaboration across a wide range of members.

5.1. Deep Wind, North of Scotland Offshore Wind Cluster (Scotland, UK)

Deep Wind is the leading offshore wind supply chain cluster across Europe specialising in floating and fixed offshore wind in deeper waters, covering 25 harbours and ports across 70% of Scotland's coast⁵⁵. Over 380 out of the total 860 members are within the Floating Offshore Wind Subgroup, which plans to help establish a wider supply chain for offshore wind. The subgroup comprises floating wind developers, ports seeking to develop facilities for floating offshore wind, supply chain companies (from Europe, Japan, and the USA), and companies from the oil and gas industry with experience deploying floating structures across the North Sea⁵⁶.

5.2. Bretagne Ocean Power, (Brittany, France)

Bretagne Ocean Power is another example of a floating offshore wind cluster with 40 hectares (ha) of port infrastructure dedicated to OSW and 190 businesses working across the entire value chain⁵⁷. The cluster supports 7 offshore wind farms in construction and is prepared to support the 750MW floating wind project in the south of Brittany.

5.3. Wind'Occ, (Montpellier, France)

Wind'Occ is another existing initiative supporting the development of the floating offshore wind sector. Its members include academia, higher education institutions, and companies based within the Occitanie region. The Occitanie region has a target for 800MW of floating wind to be in

⁵⁴ The Humber Offshore Wind Cluster Prospectus. Source: [link](#).

⁵⁵ Offshore Wind Scotland, DeepWind Cluster. Source: [link](#).

⁵⁶ Department for International Trade, Floating Offshore Wind Manufacturing. Source: [link](#).

⁵⁷ Bretagne Ocean Power. Source: [link](#).

operation by 2030 and Wind'Occ aims to develop the skills within 150 companies within the sector⁵⁸.

5.4. UK Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS)

Whilst the UK FLOWMIS scheme is not a specific manufacturing facility, this is an initiative from the UK government to increase manufacturing capability in the UK for floating offshore wind. The scheme is a fund of up to £160m that will award grants for port infrastructure development to enable the delivery of floating offshore wind in the UK⁵⁹.

⁵⁸ Business France, Wind'Occ. Source: [link](#).

⁵⁹ UK Government, 2023, Floating Offshore Wind Manufacturing Investment Scheme (FLOWMI). Source: [link](#).

6. Floating offshore wind manufacturing facilities outside of Europe

To provide additional context to the scale and investment associated with European FOW projects supplementary examples of FOW facilities have been provided within this section.

6.1. Humboldt Bay Project (California, US)

The US government has recently awarded a grant (\$427m) to develop the Humboldt Bay area to act as California's first OSW energy hub⁶⁰. The proposed 1,200-foot wharf and terminal will assist in the maintenance, construction, and assembly of FOW farms located in the north of California⁶¹.

6.2. Sears Island Port Facility (Maine, US)

Unlike the European facilities identified in sections 4.1 and 4.2, the US government is leading the development of the FOW manufacturing facility, as opposed to the private sector-led initiatives proposed in Europe. The State of Maine has selected Sears Island to be the site of a state-owned port facility developed to service the FOW industry⁶². The site will have 100 acres of land dedicated to port infrastructure will help to build the local supply chain demands as FOW industrialises.⁶³

⁶⁰ Offshore Engineer, 2024, California port gets \$427m boost for new offshore wind infrastructure. Source: [link](#).

⁶¹ OffshoreWIND.biz, 2024, Californian Port to get USD 400+ Million for Floating Wind Terminal. Source: [link](#).

⁶² Maine Offshore Wind Initiative. Source: [link](#).

⁶³ State of Maine (2021) Mills Administration Announces Steps to Prepare for Offshore Wind Investments at Maine's Ports. Source: [link](#).