
# Floating Offshore Wind Vision Statement

June 2017

Wind EUROPE

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WindEurope

windeurope.org

# KEY MESSAGES

## 1. FLOATING OFFSHORE WIND IS COMING OF AGE

Floating offshore wind is no longer confined to R&D. It has now reached a high 'technology readiness level.' It is also using the latest technology available in the rest of the offshore wind supply chain.

## 2. COSTS WILL FALL

Floating offshore wind has a very positive cost-reduction outlook. Prices will decrease as rapidly as they have in onshore and bottom-fixed offshore wind, and potentially at an even greater speed.

## 3. WE ARE A UNITED INDUSTRY

Europe has long been the global leader in offshore wind. Floating offshore wind will take advantage of cost reduction techniques developed in bottom-fixed offshore wind thanks to the significant area of overlap between these two marine renewable energy solutions.

## 4. FLOATING MEANS MORE OFFSHORE WIND

An increase in offshore wind installations is needed in order to meet renewable electricity generation targets set by the European Commission. Improving conditions for floating offshore wind will enhance the deployment of overall offshore wind capacity and subsequently support the EU in reaching the 2030 targets.

## 5. EUROPEAN LEADERSHIP NEEDS EARLY ACTION

If Europe is to keep its global technological leadership in offshore wind, it needs to move fast to deploy floating offshore wind and exploit its enormous potential.

# 1.
# INTRODUCTION

Floating Offshore Wind (FOW) holds the key to an inexhaustible resource potential in Europe. 80% of all the offshore wind resource is located in waters 60 m and deeper in European seas, where traditional bottom-fixed offshore wind (BFOW) is not economically attractive.

Under the right conditions, FOW can be a significant driver supporting the energy transition. If Europe is to keep its global technological leadership in offshore wind, it needs to move fast to deploy floating offshore wind and exploit its enormous potential.

There are currently four substructure designs for floating offshore wind: barge, semi-submersible, spar buoy and tension leg platform. The first three are loosely moored to the seabed, allowing for easier installation, while the tension leg platform is more firmly connected to the seabed. This allows for a more stable structure.

While FOW technology was previously confined to R&D, it has developed to such an extent that the focus is now moving into the mainstream power supply. The technology readiness level (TRL) related to semi-submersible and spar buoy substructures has entered a phase (>8) in which the technology is deemed appropriate for launch and operations. The barge and the tension leg platform (TLP) concepts are projected to reach this stage in the coming years.

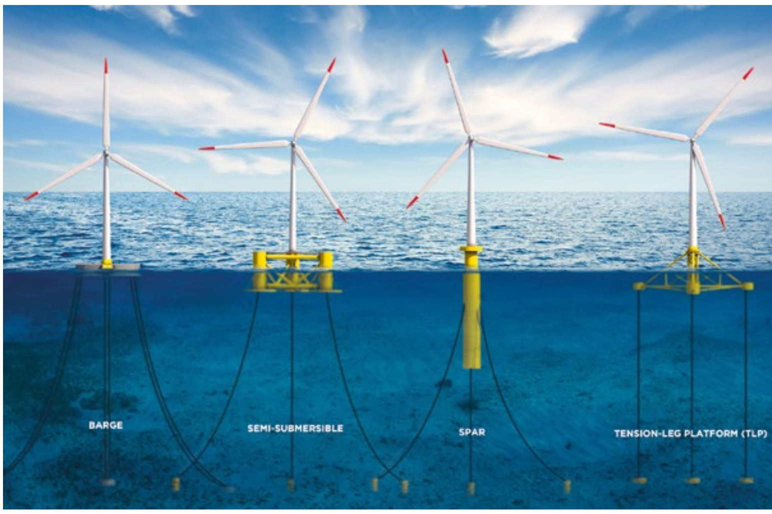
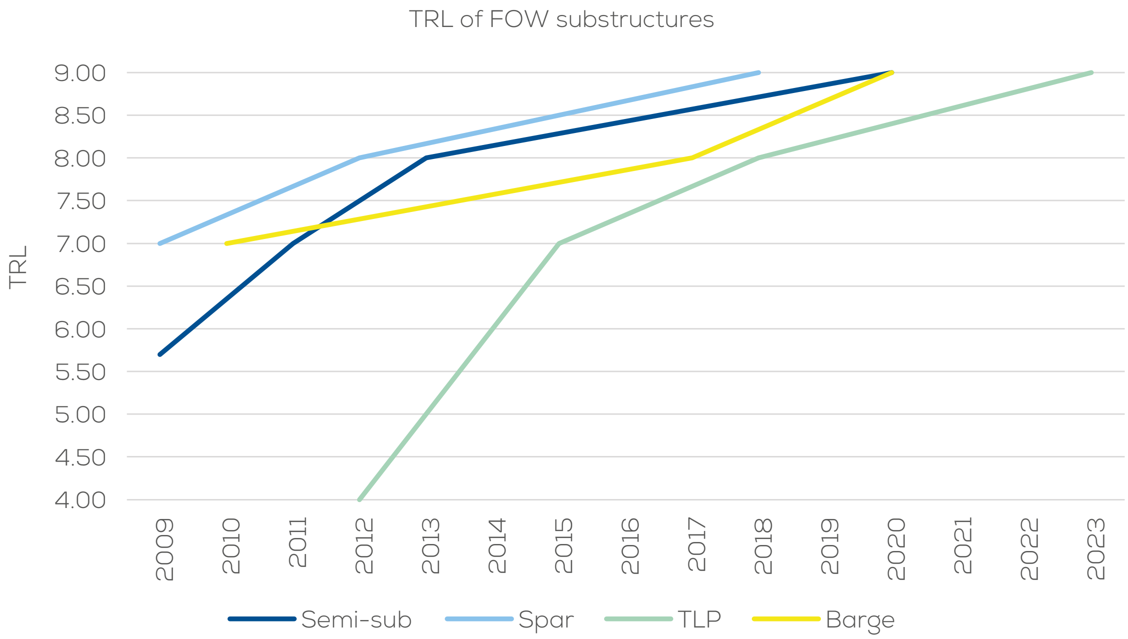


**FIGURE 1**

**Technology Readiness Level of Floating Offshore Wind substructures**




Source: The Crown Estate[1] and WindEurope

## 1.1 BENEFITS AND POTENTIAL

FOW allows power generators to tap into areas with much higher wind speeds. At farther distances from the shore, the wind blows stronger and its flow is more consistent. By using FOW, developers can make use of larger areas avoiding wake effects from nearby wind turbines or other wind farms.

Also, larger wind turbines that will be developed in the near future, for example 12-15 MW, can be installed on FOW substructures. The combination of larger wind turbines, producing energy for longer lifetimes and larger projects, could make FOW economics as attractive as BFOW.

FOW projects can also have a smaller impact on environmental surroundings when used in far-from-shore projects, as noise and visual pollution will be less of a concern in deep, remote offshore marine areas.

Europe has an exceptionally high potential for FOW. At 4,000 GW, it is significantly more than the resource potential of the US and Japan combined. FOW will allow countries like Norway, Portugal or Spain, where the potential for BFOW is very limited, to enter the offshore wind industry.

**TABLE 1**

**Potential for FOW**

| COUNTRY / REGION | SHARE OF OFFSHORE WIND RESOURCE IN +60m DEPTH | POTENTIAL FOR FLOATING WIND CAPACITY |
|---|---|---|
| **Europe** | 80% | 4,000 GW |
| **USA** | 60% | 2,450 GW |
| **Japan** | 80% | 500 GW |
| **Taiwan** | - | 90 GW |

Sources: MOFA and Carbon Trust[2]

1. www.thecrownestate.co.uk/media/5537/km-in-gt-tech-122012-uk-market-potential-and-technology-assessment-for-floating-wind-power.pdf
2. www.thecrownestate.co.uk/media/5537/km-in-gt-tech-122012-uk-market-potential-and-technology-assessment-for-floating-wind-power.pdf
www.mofa.gov.tw/Upload/RelFile/2508/111034/25bcd458-67d7-4ed4-994b-128a7ba49d17.pdf

## 1.2 BARRIERS

Despite its immense potential, there has not been a single utility-scale FOW project commissioned yet. Technology is no longer a barrier, but there are other challenges to overcome if FOW is to move quickly into the mainstream of power supply.

Two major and interlinked challenges are access to investments and political commitment.

### INVESTMENTS

As the industry is still in its early stages, it needs investor commitment to facilitate the transition into the mainstream. Projects require significant investments and their bankability could be eased through financial instruments that address long-term uncertainty, such as guarantees and other hedging instruments. Governments could play a role by bridging public and private financing to offer such financial instruments.

FOW also needs sustained investments in research and innovation to accelerate cost reduction, particularly in those technologies very close to commercialisation.

### POLITICAL COMMITMENT FOR FURTHER DEVELOPMENT

Generating optimal solutions requires investments in technology. This is likely to be carried out mainly by industry. However, if there are no incentives (i.e. demand) to develop new technologies, companies are less likely to shift R&D efforts away from existing products. Therefore, in order to facilitate this industrial development, governments around Europe should acknowledge the potential of FOW and aim to integrate the technology into its planning of energy infrastructure.

Broad political commitment would add to the financial security of projects, and industry and investors will thus be more likely to increase development commitments and investments.


Photo: Principal Power

Photo: GE Renewable Energy

# 2. WHY FLOATING OFFSHORE WIND?

## 2.1 COMPLIMENTARITY WITH BOTTOM-FIXED AND SYNERGIES

While FOW is a new sub-industry in wind power generation, it has strong technological ties to BFOW. FOW will be able to benefit from existing offshore wind technologies, whilst adding value in the further development of the overall industry.

FOW complements the BFOW industry by adding more capacity to the supply chain and by introducing new technology and developers. This will improve not only the existing conditions of the industry, but will also speed up technological development, as more overlapping research will be carried out on turbines, cabling, electrical inter-connections and operation and maintenance (O&M).

FOW will also allow the industry to explore new regions, thereby widening the market and adding to the investment and volume needed to meet cost-reduction goals. This will additionally enhance economic conditions in certain regions and generate trickle-down effects into supporting sectors.

In the same way that BFOW followed the progress from onshore wind and allowed an increase in wind power capacity in Europe, FOW has the potential to further increase offshore wind power capacity. Indeed, deeper offshore areas represents 60-80% of the offshore wind potential in Europe.

FOW can also be an alternative solution to BFOW, as it can be more easily installed in areas with poor seabed conditions and would also allow for the potential recycling of currently abandoned sites (initially studied for bottom-fixed).

This is exemplified by a project in the UK, where The Crown Estate has leased out 47 GW of seabed. WindEurope has observed that around 12 GW of that space has been cancelled. Part of this area could potentially form a floating pipeline.

# 2.2 FOW AS A MEANS TO REACH 2030 TARGETS

European leaders have committed to reaching an EU-wide target of at least 27% share of energy from renewables by 2030. In order to reach this target and further enhance the energy transition, it is vital that policymakers acknowledge the potential of various renewable energy technologies, including FOW.

FOW can be an excellent component of the energy mix. It offers a continuous and stable supply of electricity given the characteristics of the wind resource available at distances further from the shore where water depths are higher. FOW could allow more countries to benefit from offshore wind to meet their renewable energy ambitions, especially those where the conditions to develop BFOW are less attractive.

Some pre-commercial projects have already been initiated around the world. In Europe, Portugal and France have introduced projects that are likely to go online as early as 2018. In Scotland the first project will be commissioned in 2017.

The industry is ready to gear up for commercialisation. Several projects are already backed by key players in the finance and insurance services in Europe.

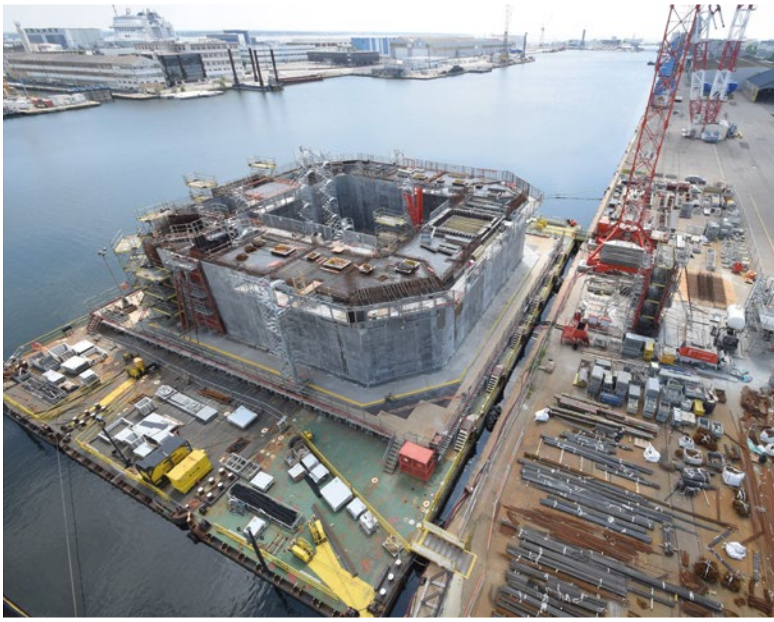


Photo: Ideol-Bouygues Travaux Publics

**TABLE 2**
**Floating offshore wind projects in Europe**

| PROJECT NAME | CAPACITY | COUNTRY | EXPECTED COMMISSIONING DATE |
|---|---|---|---|
| **Dounreay Tri** | 2 x 5 MW | Scotland | 2018 |
| **Gaelectic** | 30 MW | Ireland | 2021 |
| **Hywind Scotland** | 30 MW | Scotland | 2017 |
| **WindFloat Atlantic** | 30 MW | Portugal | 2018-2019 |
| **Kincardine** | 48 MW | Scotland | From 2018 |
| **French pre-commercial farms** | 4 x 25 MW | France | 2020 |
| **Antlantis / Ideol project** | 100 MW | UK | 2021 |

Source: WindEurope

## 2.3 COMPARABLE COST REDUCTION TRAJECTORY

In recent years, we have already witnessed significant cost reductions in both the onshore and BFOW sectors. FOW is anticipated to follow a similar downward trajectory. FOW costs are expected to decrease by 38% leading to 2050 while the IEA floating offshore wind experts suggest that there can be up to a 50% cost reduction by 2050.

There are several other factors which may also lead to further cost reductions. One of the key advantages of FOW is that turbines will be located in areas with much higher average wind speeds, giving turbines the ability to harness the best possible wind resources without depth constraints. The capacity factor can thus be improved and lead to an increased generation of electricity. With higher capacity factors, the levelised cost of energy (LCOE) will therefore be reduced.

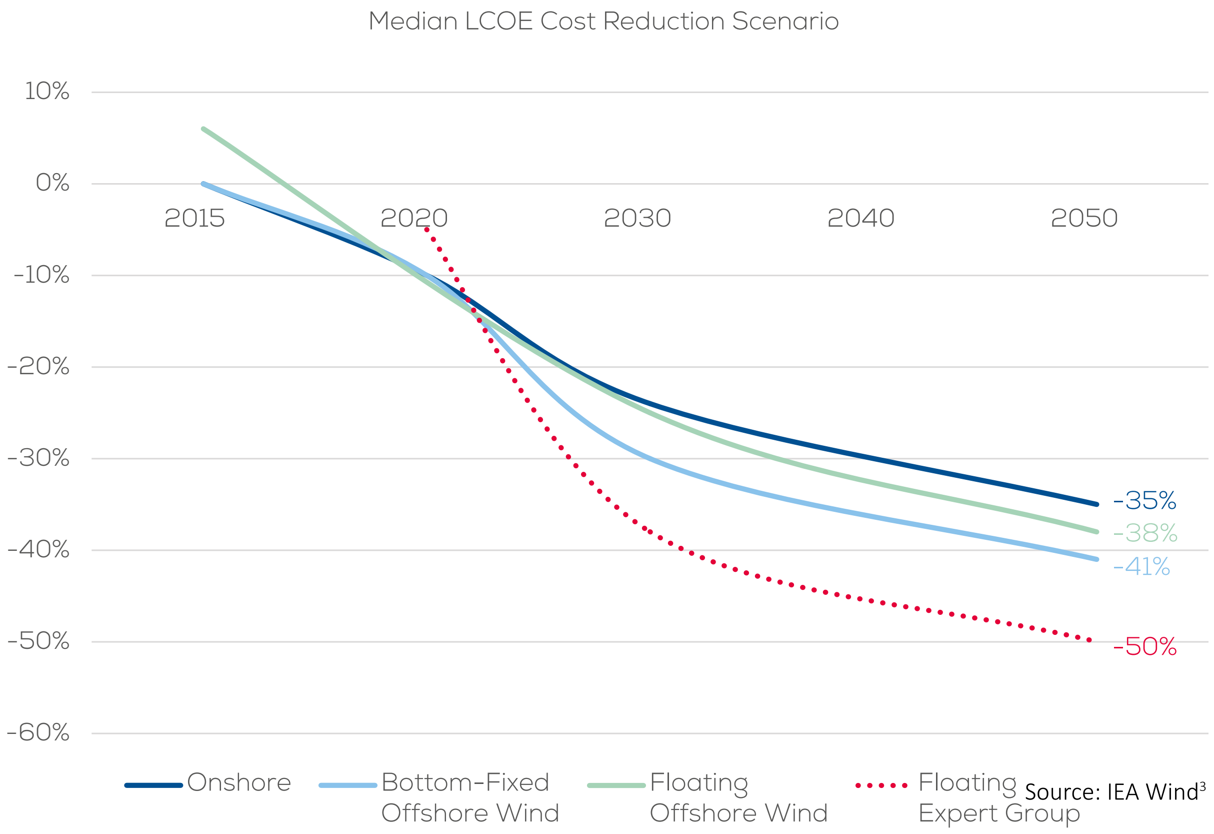
The significant increase in turbine sizes is another factor. Larger turbines are a good fit for FOW as they can withstand high wind-speeds and generate higher output per turbine.

Introducing floating offshore turbines will also reduce both costs and risks currently related to traditional BFOW construction, installation, operation and decommissioning. As turbines are located on floating structures, there will be fewer operations taking place below sea level, and installations and continuous maintenance of foundations will thus be less risky to conduct. In addition, most of the decommissioning activities will be carried out onshore, reducing costs, risks and environmental impacts.

Lastly, FOW will be able to benefit from economies of scale from the existing and well-developed BFOW sector. Several elements of the turbine design, structures and construction will overlap with BFOW. Thus, both sectors are equally to benefit from further development.

**FIGURE 2**

**Median LCOE Cost Reduction Scenario**




Source: IEA Wind[3]

3. www.ieawind.org/task_26_public/PDF/062316/lbnl-1005717.pdf

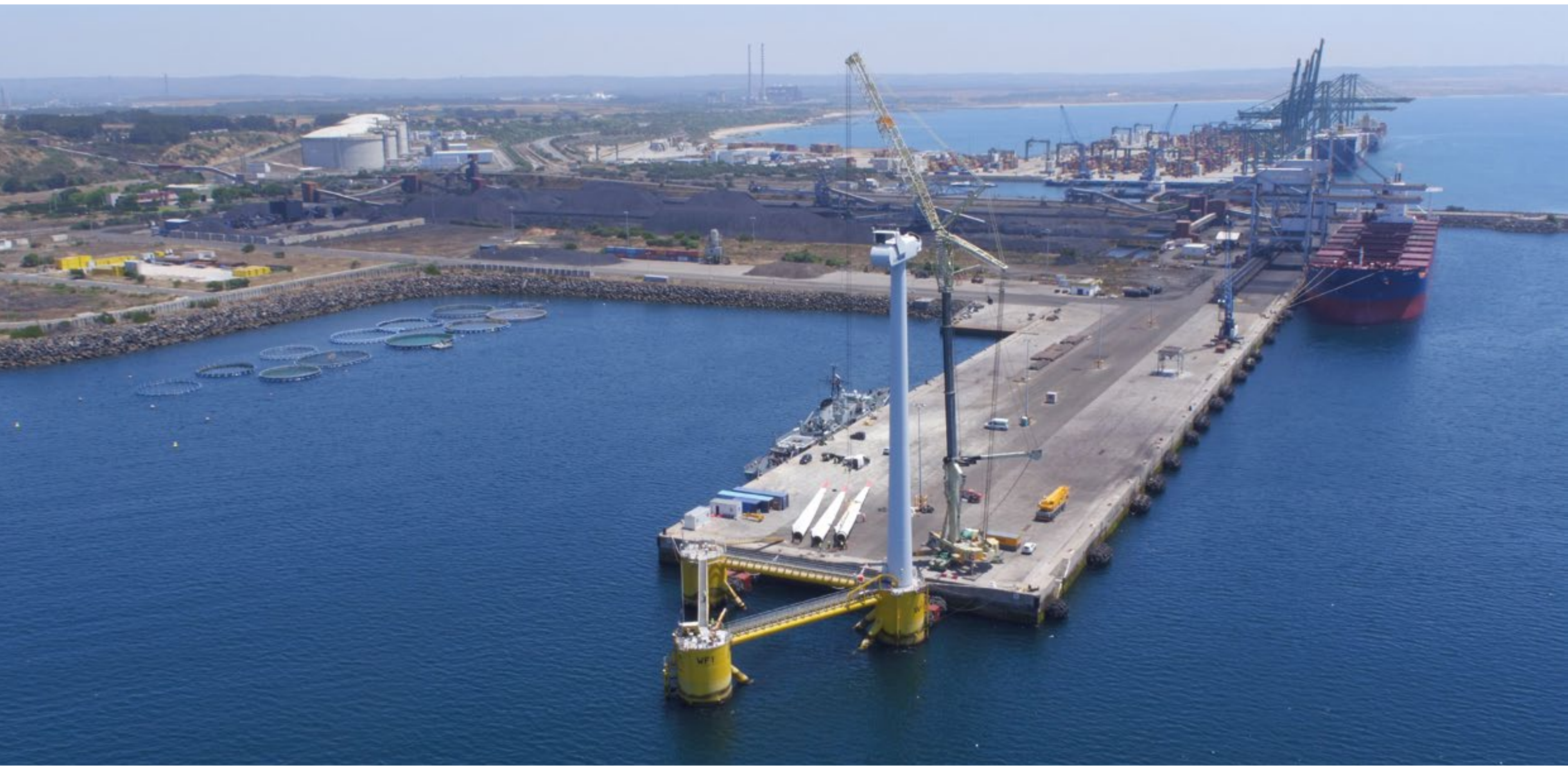


Photo: Principal Power

## 2.4 MAINTAINING GLOBAL LEADERSHIP IN OFFSHORE WIND

The European Commission has previously stressed the importance of maintaining our global leadership in renewable energy technologies. In the pursuit of this path it is important that we start to expand our focus towards FOW. With the EU having more than 50% of the potential global floating market, there are exceptional conditions for FOW development. This, together with a strong industry already leading the global BFOW industry, should allow Europe to maintain its position in the offshore wind industry.

The FOW industry therefore believes that a stronger commitment is needed to maintain our global competitive position. Both Japan and the US have technology and deployment pathways for FOW. Europe therefore needs to see a more defined European pipeline of projects in order to ensure continuous leadership in the offshore sector.

Within Europe, it is more likely that existing offshore wind markets will adopt FOW as opposed to new markets coming straight in with floating. The industry thus expects that markets such as Portugal, Spain, France, Ireland and Scotland are more likely to progress earlier with the development of FOW.

## 2.5 ECONOMIC BENEFITS

Not only is the continuous development of FOW important to maintaining Europe's global leadership in the offshore wind industry, the further expansion of an already strong industry will also further enhance economic conditions in countries, regions and communities embracing FOW. This will likely lead to more jobs in the wind turbine industry and in subindustries related to offshore (e.g. ports, shipyards, transportation, construction, O&M etc.).

With a broad and strong European commitment towards FOW, the sector will be able to develop at a faster pace. Such commitment will lead to increased stimulation of R&D to develop world-leading solutions which can be exported to global markets.

# 3. CONCLUDING REMARKS

Europe's leadership in offshore wind energy and in facilitating the energy transition can only be maintained by expanding the renewable energy focus to include floating offshore wind. Its potential is significant both in electricity generation and in industry development.

FOW is no longer a faraway technology confined to R&D. The technology has developed significantly in recent years, and FOW is now ready to be integrated into the energy market. Furthermore, it is also expected that costs will fall significantly in the years to come, benefitting from and following the downward trend already witnessed in onshore and BFOW.

With the technology now reaching a level closer to commercialisation, the industry is committed to developing further with the right policy conditions. Europe is the global leader in BFOW and it should be natural to remain as leader in FOW too.

However, this can only be realised if floating offshore wind receives a stronger commitment from policymakers throughout Europe. Developing a positive policy environment around floating offshore wind will improve the outlook of this technology and will attract the private investments needed for the industry to succeed in its commercial deployment.

## WINDEUROPE FLOATING WIND TASK FORCE

Cover photo: Hild Bjelland Vik - Statoil

WindEurope is the voice of the wind industry, actively promoting wind power in Europe and worldwide. It has over 450 members with headquarters in more than 40 countries, including the leading wind turbine manufacturers, component suppliers, research institutes, national wind energy associations, developers, contractors, electricity providers, financial institutions, insurance companies and consultants. This combined strength makes WindEurope Europe's largest and most powerful wind energy network.

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