

NORWEGIAN DELIVERY MODELS FOR OFFSHORE WIND
– MAPPING OF COMPETENCE OFFERS

Assessment of competence needs in Norwegian offshore wind industry

The Federation of Norwegian Industries

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Objective:

To support The Federation of Norwegian Industries in their project on 'Norwegian delivery models for offshore wind', workstream for 'Mapping of competence offers', DNV has performed an assessment of competence needs in the Norwegian offshore wind industry. The assessment is based on mapping of requests received from Norwegian players in offshore wind, categorized into e.g. customer type, service and project phase, and evaluation of the results in light of DNV's role in certification, advisory services and general experience from offshore wind projects globally

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1 EXECUTIVE SUMMARY

The Federation of Norwegian Industries is doing a project on 'Norwegian delivery models for offshore wind'. One of the workstreams of the project is 'Mapping of competence offers'. To support this workstream, DNV has performed an assessment of competence needs in the Norwegian offshore wind industry. The assessment is based on mapping of requests from the Norwegian offshore wind industry to DNV, categorized into e.g. customer type, service and project phase. The results of the mapping are evaluated in light of DNV's experiences from certification, advisory services and general offshore wind projects globally

The mapping is limited to the requests that DNV receives from offshore wind players in the Norwegian market.

DNV supports the offshore wind industry globally, and our global experience is used indirectly in our assessment of the mapping results.

The following general observations can be made from our mapping and assessment:

- The service requests from Norwegian players reflect that offshore wind is still a young industry in Norway
- Several players are in the process of finding their role and pathway and look for support within strategic business cases and technology concepts for offshore wind
- Players most frequently ask for support within anchoring, geotechnics, mooring, floating structure and turbine, followed by design basis/ metocean and power export system.
- The expertise that DNV in Norway most frequently sources from DNV offices in other countries are (i) Aerodynamics and turbine design, (ii) Power equipment and grid and (iii) Wind resource / energy production assessment.

2 INTRODUCTION

The Federation of Norwegian Industries is carrying out a project on 'Norwegian delivery models for offshore wind'. One of the workstreams of the project is 'Mapping of competence offers'. To support this workstream, DNV has performed an assessment of competence needs in the Norwegian offshore wind industry. The assessment is based on mapping of requests from the Norwegian offshore wind industry to DNV, categorized into e.g. customer type, service, and project phase. The outcome of the mapping is evaluated in light of DNV's experiences from certification, advisory services and general offshore wind projects globally

The mapping is limited to the requests that DNV receives from offshore wind players in the Norwegian market. DNV supports the offshore wind industry globally, and our global experience is used indirectly in our assessment of the mapping results.

This study focuses on competence needs and gaps in the Norwegian offshore wind market. Is it, however, relevant to mention as background, that DNV sees several requests from international players seeking support based on competence available in Norway. Further, DNV's centre of excellence for floating offshore wind is located in Norway.

3 BASIS FOR ASSESSMENT

DNV is an independent advisor and certification company that supports the offshore wind industry globally across supply- and value chains. DNV delivers services ranging from strategic advice and due diligence to advanced technical analysis, certification, operational support, and training. On this background, the idea behind this study is that the requests that DNV receives reflects the need for competence and support in the market. To support The Federation of Norwegian Industries in their work with offshore-wind relevant competence offers in Norway, DNV has performed a mapping of requests received from offshore wind players in the Norwegian market from January 2020 to Mai 2021. The outcome of the mapping is evaluated based on DNV's global experience with offshore wind.

The customer requests included in this study, were categorized into:

- Service: What type of service that was requested
 - Market, technology, and strategy: Studies and advice on markets, available technology, outlooks, benchmarking, etc as support to customers strategy work
 - Technical Due diligence: Supporting financing processes with technical knowledge
 - Business case development: Specific support on development of strategic direction
 - Application support: Support on rules and regulations, work process and technical aspects to apply for a licence
 - Standards and regulations: Support on interpretation and compliance
 - Technology qualification: Verification of technology with new or novel functions or application area
 - Third party review of concept: Independent assessment of technical viability of concept
 - Third party assurance: Verification of technology based on industry standards, customer defines scope
 - Certification: Verification of technology or wind farms based on DNV standards, DNV defines scope

- Owners engineer: Support integrated into customers project team
- Software: Sale of commercially available DNV software
- Training: Training courses
- Customer type: Description of customers role in supply chain
 - Developer: Wind farm developer
 - Designer: Designer of offshore wind technology
 - Product supplier: Supplier of sub-systems or components
 - Other
- Project location: Geographical location of the targeted offshore wind development
 - Norway
 - Specific location outside Norway
 - Global (not location specific)
- Project phase: Phase of targeted offshore wind development, based on Norwep's value chain definition /1/:
 - Development Phase
 - Project construction
 - Operations and lifetime extensions
 - Decommissioning
- Type of offshore wind concept
 - Offshore wind general
 - Bottom-fixed
 - Floating
- Technology: Technology areas where customers request specific support
 - Design basis / metocean
 - Installation
 - Anchors, mooring, geotechnics
 - Bottom fixed foundation and structure
 - Cables and export system
 - Floating structure
 - Turbine (coupled analysis, CFD, energy assessment, etc)

Further, DNV mapped for each request, whether the DNV project team would draw upon resources from DNV's global organisation (outside Norway), and for which competence area resources outside Norway were included. These competence areas were mapped into:



- Local requirements and regulations
- Wind resource and energy production assessment
- Aerodynamics and turbine design
- Turbine/floater/structure interaction and coupled analysis
- Power equipment and grid
- Wind farm design

4 RESULTS

The mapping of requests has been limited to players in the **Norwegian market**. From the mapping, we see that:

- Approximately 55% of enquiries are related to floating wind specifically
- Some 5% are related to bottom fixed specifically
- The remaining 40% relate to offshore wind in general (do not specify bottom-fixed or floating)

The key results are shown in Figure 4-1 through Figure 4-6 below. Discussion of the results is found in Chapter 5.

Figure 4-1 below shows percentage-wise distribution of type of service requested from DNV. Generally, early-phase services relating to strategic advice and technical concepts represent the majority, whilst in-service support and decommissioning are not represented.

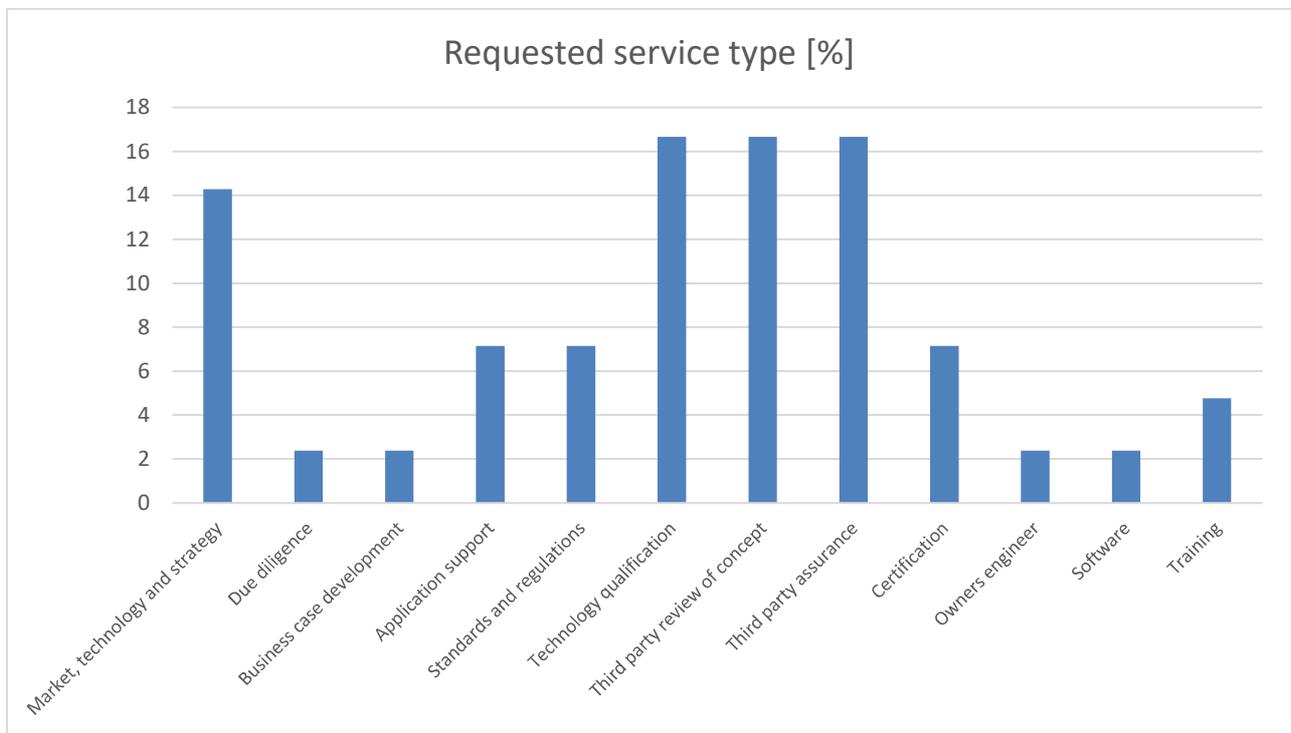


Figure 4-1 Service requests

Figure 4-2 below shows the type of customer the requests come from. Most requests come from offshore wind developers.

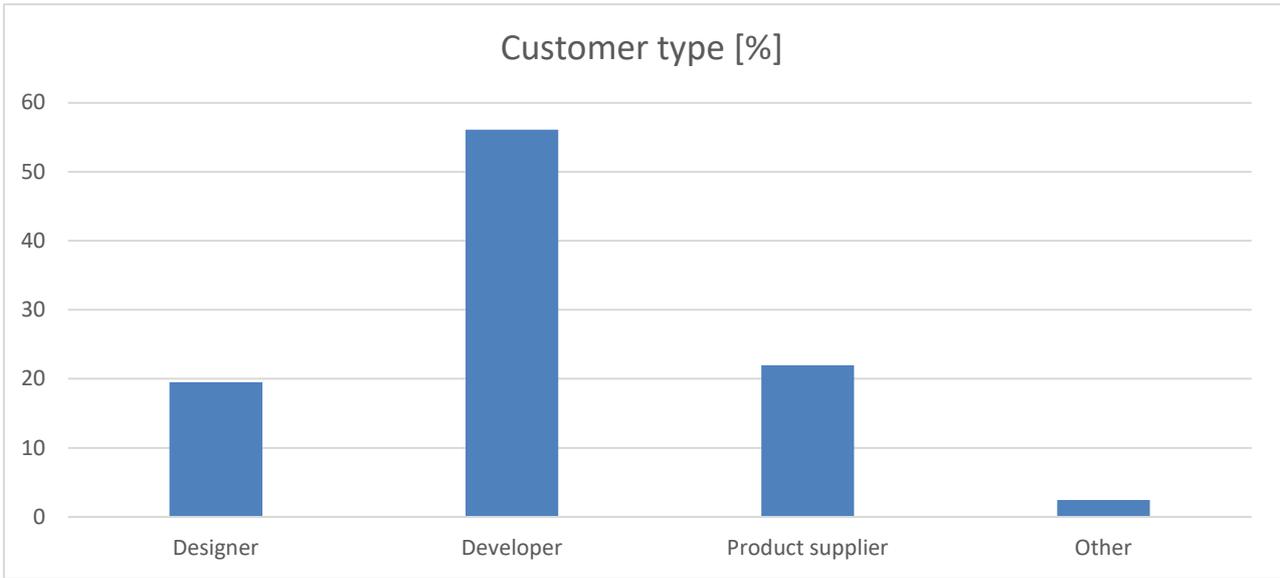


Figure 4-2 Customer type

Figure 4-3 below shows the geographical location of the targeted offshore wind development related to the customer requests. 'Global' means that no specific geographical location is related to the request. Most requests are related to offshore wind globally.

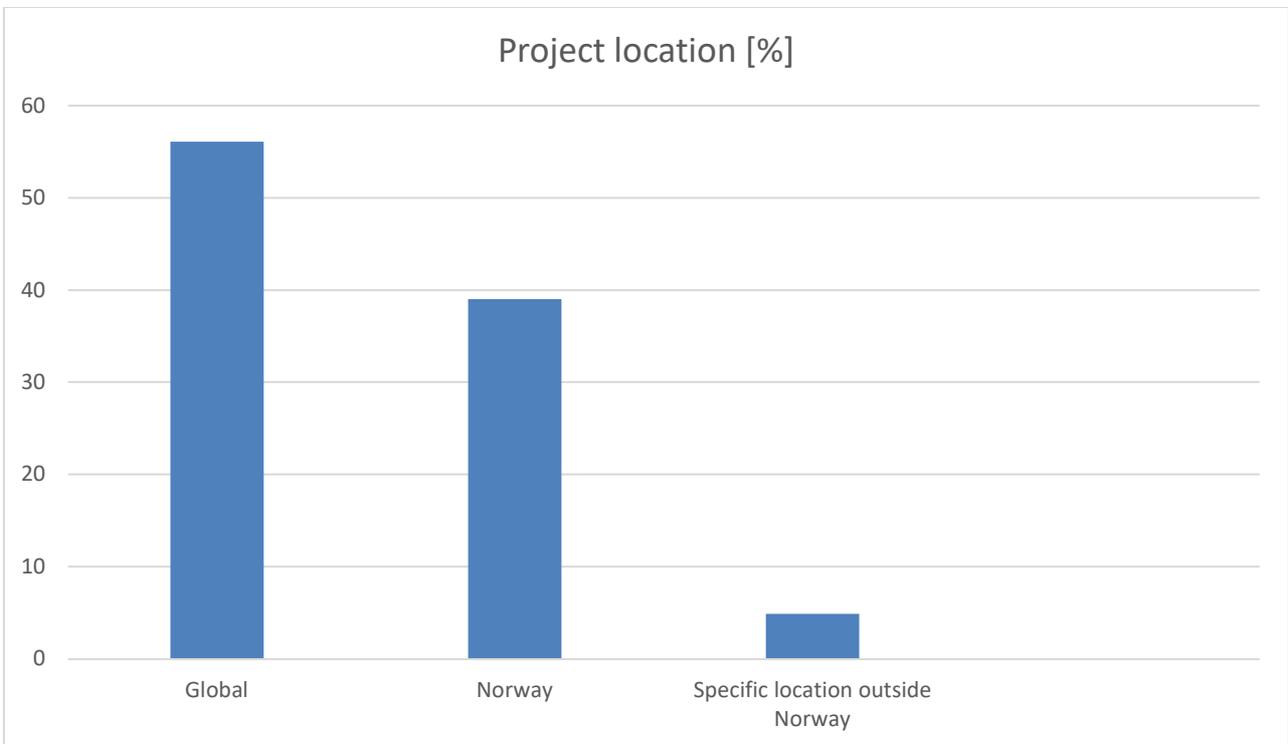


Figure 4-3 Project location

Figure 4-4 below shows the project phase related to the customer requests. 'Development Phase' will also include early phase studies and technology development that may not be limited to a specific offshore wind development project. The phases are based on Norwep's value chain model /1/.

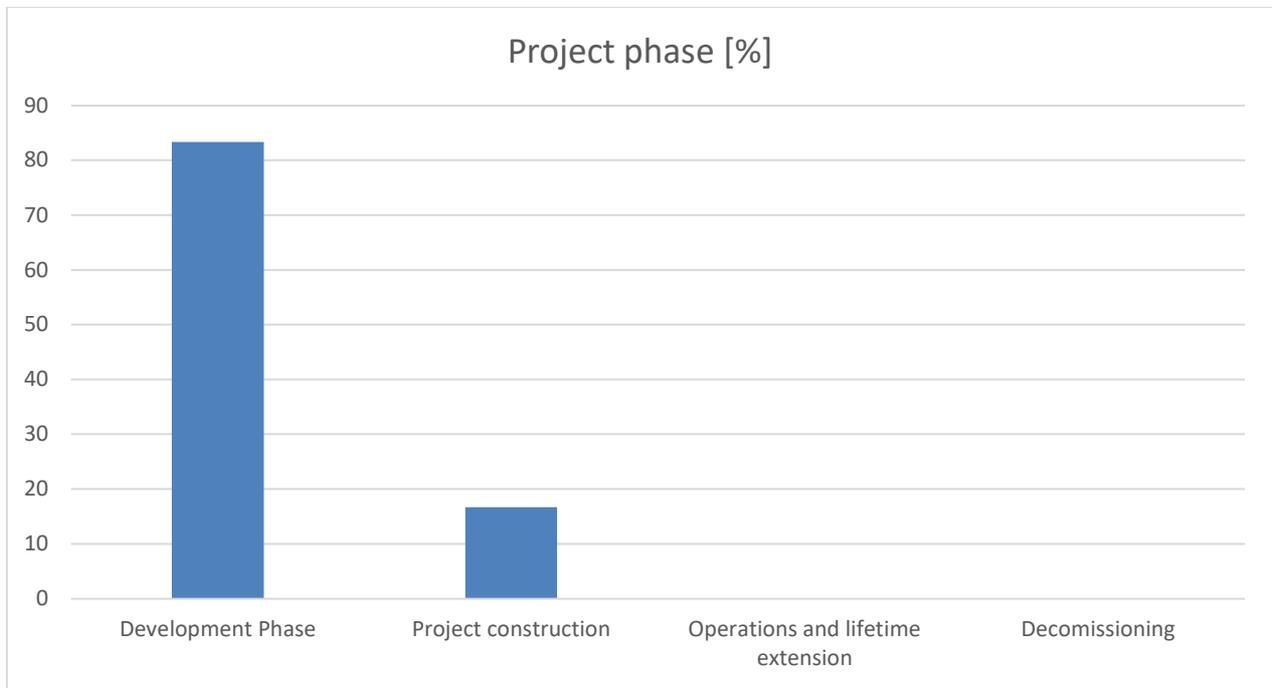


Figure 4-4 Project phases

It differs between customer requests whether the customer is after assistance within one or more specific technology area(s) or with offshore wind in general. For example, many of the requests for advice on market and strategy do not ask for specific technical details, but rather overall assessments and trends. For the requests where customers do ask for a specific technology area, the relative distribution is shown in Figure 4-5. One request may require support from DNV in one or more of these technology areas.

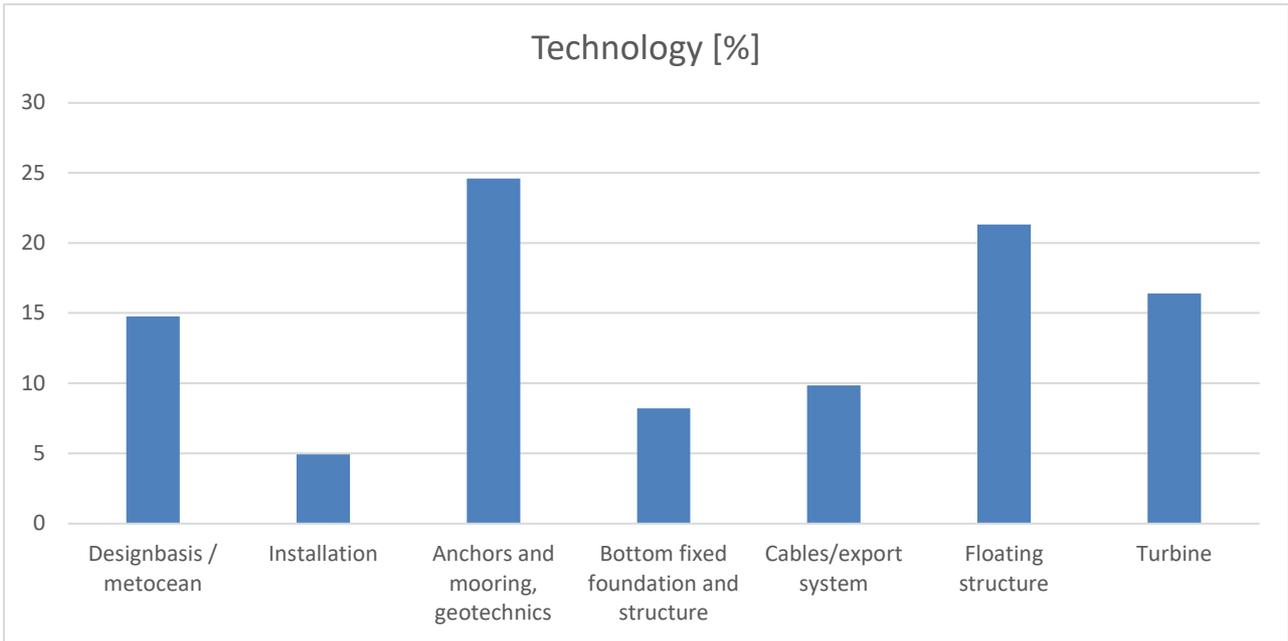


Figure 4-5 Technology

Figure 4-6 below shows the relative distribution of competence areas where resources from DNV's global organisation (outside Norway) was used. Requests delivered with only Norwegian resources, around 40%, are not a part of the data behind this specific chart. It should be noted that the way DNV deliver projects depends partly on which resources that have the relevant competence and partly on which resources that are available at the given time. Further, it should be noted that it is normal and encouraged in DNV to use global resources. These factors will influence the distribution shown below.

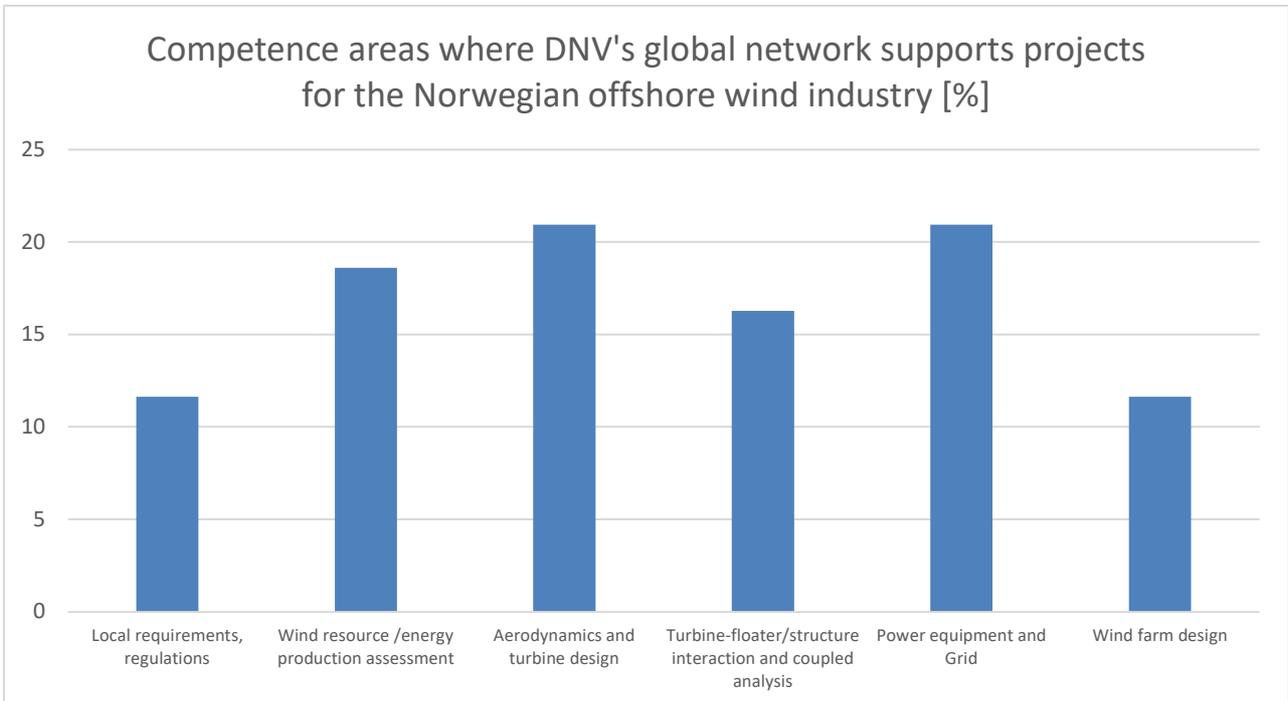


Figure 4-6 Competence sourced outside of Norway

5 DISCUSSION AND CONCLUSION

The distribution of requested services (Figure 4-1) shows a high representation of early phase services that relate to e.g. strategic options, business cases and investments, technology qualification and concepts. DNV sees this as a reflection of the status of offshore wind in Norway, where there is limited installed capacity and where the industry is focusing on understanding the opportunities and developing new technology. When the developments in Sørlige Nordsjø II and Utsira areas advances, we expect to see a shift towards services that typically support project execution, operations and even decommissioning. This is also reflected in the project phases (Figure 4-4) where more than 80% are in the development phase. More than half of DNV's offshore wind request in the Norwegian market stem from developers, but designers and product suppliers are also represented (Figure 4-2).

A large portion of the requests that DNV receives from the Norwegian Offshore Wind market is related to floating offshore wind. This can be due to floating being a more immature industry, where many support structure concepts are still being evaluated in order to reduce cost, increase applicability and scale. It can, however, also relate to the deep water potential in Norway, and that many players in Norway from the O&G and maritime sector see floating offshore wind as a global opportunity with good strategic fit.

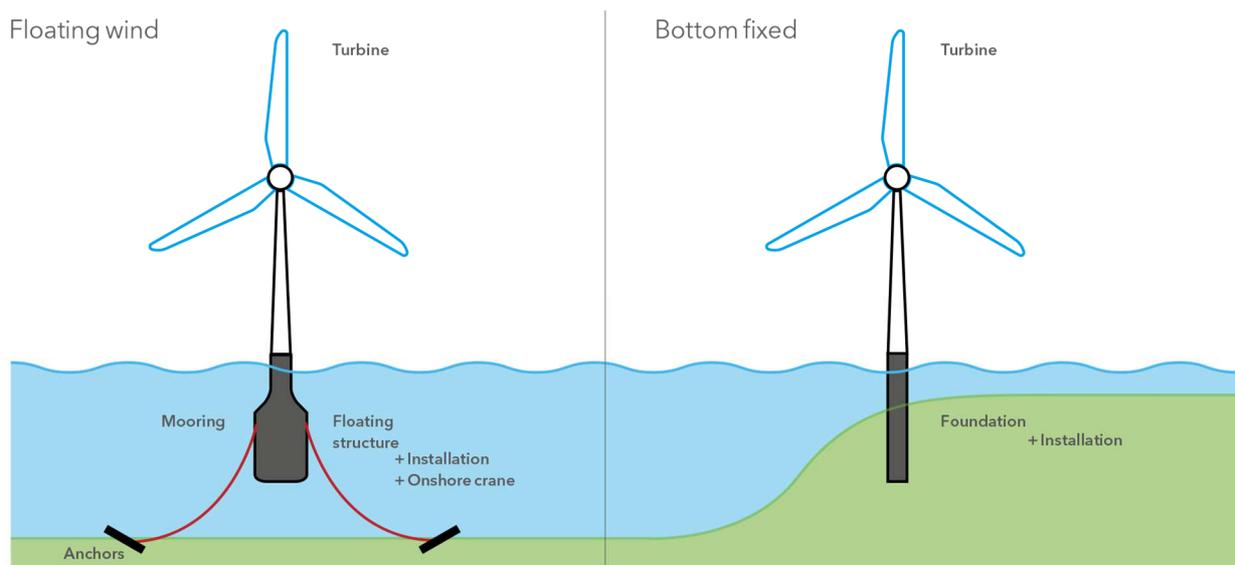


Figure 5-1 Simplified sketch showing the principles of floating and bottom-fixed wind. The export cables are not shown but pose an additional challenge to floating wind due to the dynamic behaviour of these systems.

Most of the requests that have been part of the mapping are of global relevance, meaning they do not link to any specific wind project development (Figure 4-3). For example, technology qualification and third-party review of concepts are services often requested by customers to de-risk and commercialize their concepts and technology for a global offshore wind industry.

Out of the requests where project location is specified, Norwegian project opportunities are dominating. Globally, DNV supports project developments in a large number of offshore wind markets and expect Norwegian players to increasingly position for opportunities abroad as well.

Some of the requests that DNV receive are related to offshore wind in the broader sense, while others target specific technical areas.

Where a technical area is specified, anchoring, mooring and geotechnics are most frequently asked for, followed by floating structure and turbine (Figure 4-5). As mentioned earlier, floating wind is of particular interest for Norwegian industry, and as a result of this, DNV is often requested to support on de-risking and commercializing technology originating from oil and gas that are intended to be used for floating wind. Turbine knowledge is also often requested, and often in combination with the other technology areas, as many of the players in the Norwegian industry has limited experience in this area.

As a global company, DNV has the benefit of using its global organization when building project teams to meet customer requests. This gives flexibility in capacity to deliver, and access to expertise. The expertise that DNV in Norway frequently sources from other parts of DNV are areas where competence has been built up as a result of a larger domestic offshore wind market such as “Aerodynamics and turbine design”, “Power equipment and offshore grid” and “Wind resource / energy production assessment” and “Wind farm design”. These are areas that are wind- and offshore power/grid-specific and where the Norwegian industry has less experience transfer to gain from the oil and gas industry. Another area that is frequently supported by experts from other countries is “turbine-floater/structure interaction and coupled analysis”. Experts in Norway have extensive experience with floater/structure coupled analysis applying software tools which origin from the O&G industry, but less experience with modelling of the turbine/controller. Experts from countries with more offshore (bottom-fixed) wind development have experience with turbine/structure coupled analysis which includes modelling of both turbine, controller and structure, and application of the design load cases (DLCs) required by industry standards (e.g. IEC, DNV). For the latter, the software tools often origin from onshore wind.

5.1 Conclusion

DNV has performed an assessment of competence needs in the Norwegian offshore wind industry. The assessment has been done by mapping requests received from Norwegian players in offshore wind. The requests have been categorized into e.g. customer type, service, and project phase. Evaluating the results based on DNV’s global experience from offshore wind projects, we draw the following main conclusions:

- The service requests from Norwegian players reflect that offshore wind is still a young industry in Norway
- Several players are in the process of finding their role and pathway and look for support within strategic business cases and technology concepts for offshore wind
- Players most frequently ask for support within anchoring, geotechnics, mooring, floating structure and turbine, followed by design basis/metocean and power export system.
- The expertise that DNV in Norway most frequently sources from other countries are (i) Aerodynamics and turbine design, (ii) Power equipment and grid and (iii) Wind resource / energy production assessment.



6 REFERENCES

/1/ Norwegian Energy Partners, Offshore Wind Value Chain, <https://www.norwep.com/Partners/Wind>



About DNV

DNV is the independent expert in risk management and assurance, operating in more than 100 countries. Through its broad experience and deep expertise DNV advances safety and sustainable performance, sets industry benchmarks, and inspires and invents solutions.

Whether assessing a new ship design, optimizing the performance of a wind farm, analyzing sensor data from a gas pipeline or certifying a food company's supply chain, DNV enables its customers and their stakeholders to make critical decisions with confidence.

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