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**December 2015**

**Summary report on  
North Sea regulation  
and standards**

**REVIEW OF MARITIME  
AND OFFSHORE REGULATIONS  
AND STANDARDS FOR OFFSHORE WIND**

REVIEW OF MARITIME AND OFFSHORE REGULATIONS AND  
STANDARDS FOR OFFSHORE WIND

# Summary report on North Sea regulation and standards

Søfartsstyrelsen / Danish Maritime Authority



**DANISH MARITIME AUTHORITY**

**Report No.:** 2015-0886, Rev. 1

**Document No.:** 1SMV3FB-12

**Date:** 2015-11-25



Project name: Review of maritime and offshore regulations and standards for offshore wind DNV GL AS  
 Safety, Risk & Reliability

Report title: Summary report on North Sea regulation and standards Veritasveien 1  
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Date of issue: 2015-11-25

Project No.: PP136810

Organisation unit: Safety, Risk and Reliability

Report No.: 2015-0886, Rev. 1

Document No.: 1SMV3FB-12

Applicable contract(s) governing the provision of this Report:

Consultancy Agreement between the Danish Maritime Authority and DNV GL AS dated 2015-06-11.

Objective:

Present a review of current maritime and offshore regulations and standards addressing maritime activities in the offshore wind sectors of Denmark, the United Kingdom, Germany and the Netherlands. Areas of substantial difference are identified as possible focus areas for collaboration and harmonisation between regulatory authorities.

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Keywords:

Offshore wind  
 Regulation  
 Industry standards  
 North Sea

Rev. No.	Date	Reason for Issue	Prepared by	Verified by	Approved by
0	2015-10-08	First issue	Simon Mockler	Stephen Bligh	Peter Hoffmann
1	2015-11-25	Incorporating DMA and MCA comments	Simon Mockler	Stephen Bligh	Peter Hoffmann



## FOREWORD

This report has been prepared based on publically available legislation and information at the time of issuance of this document, in addition to consultation with selected authorities, industry bodies and associations. The principal authorities referred to in this document have been invited to validate the findings during the final preparation of this report. DNV GL and the Danish Maritime Authority have made every reasonable attempt to ensure that the information presented here is an accurate representation of regulations and standards applying in the offshore wind industry.

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## EXECUTIVE SUMMARY

This report presents an overview of some of the key regulations and standards affecting the offshore wind industry in the North Sea. It focuses on maritime and offshore regulations and standards as applied in Denmark, the United Kingdom, Germany and the Netherlands. It has been prepared by DNV GL AS (DNV GL) on behalf of the Danish Maritime Authority (DMA).

The approach taken by maritime regulators to the design and construction of vessel types particularly important to the offshore wind sector (windfarm maintenance vessels, self-elevating units and offshore service craft) is examined. The most fundamental differences are associated with the national implementation and application of various international conventions and codes, in particular the Special Purpose Ships Code (SPS Code). While there are similarities and themes between one or more flag states, there are important differences in terms of what vessel types the SPS Code may be applied to (and how personnel onboard solely in connection with offshore construction and maintenance activities are treated). A larger disparity may be found in the regulation of offshore service craft, where until recently designs have been predominantly of non-convention size and governed solely by domestic legislation. As larger designs seeking the capacity to carry greater than 12 technicians or contractors have been developed, national administrations are developing new solutions from within the existing regulatory framework.

The report reviews the various regulatory bodies with responsibility for the offshore wind sector and summarises their requirements for controls relating to the safety of navigation within or in the vicinity of offshore wind farms, in addition to environmental restrictions on some marine operations activities. With the exception of these two topics, industry standards have the larger impact on the day-to-day conduct of marine operations in offshore wind, though it is important to also note the role played by 'non-maritime' safety regulators in offshore activities (and the corresponding shift in the legislative basis of regulation). The application of existing industry standards does not necessarily properly reflect the risk profile of operations in offshore wind and there is a need to both focus more closely on the risks of high frequency operations and recognise the reduced consequence of many higher risk activities when compared to oil & gas.

The most significant differences in competence and training requirements for the sector are highlighted, both for marine crew and industrial technicians or contractors working on windfarm projects. Particular attention is drawn to the issues surrounding the definition of 'industrial personnel' who are neither members of a vessel's crew nor passengers in the traditional sense and are not addressed by the international definition of 'special personnel'. While progress continues at IMO to resolve this issue, different solutions have been adopted by European flag states. The established maritime standards for marine crew competence are interpreted differently in the offshore service craft sector and there are some significant variations between jurisdictions.

The review finds a maturing industry that sits alongside more established offshore activities and shares the uneasy compromise of regulatory input from various maritime and offshore bodies. This leads to a tendency to adopt existing oil & gas regulatory expectations or industry standards, which may not be warranted by the actual risks associated with the offshore wind industry. From its outset the industry has been based on a fragmented value chain, with both suppliers and principals coming from a range of industry backgrounds with their own predispositions and prejudices. While much is being done to improve engagement and cooperation within and between parts of the supply chain, the need to also adapt to shifts in regulatory requirements when moving between the various sectors of the north sea only increases the segregation that the industry sees.



# 1 INTRODUCTION

DNV GL AS (DNV GL) has been engaged by the Danish Maritime Authority (DMA) to prepare a report describing and mapping the different national regulations and industrial standards applicable to maritime operations in the North Sea offshore sector.

## 1.1 Purpose

The purpose of this report is to review the various national regulations and standards which vessel owners, vessels and their crews must comply with in connection with offshore wind operations within the jurisdictions of Denmark, the United Kingdom, Germany and the Netherlands.

The report is intended to provide an overview of differences in legislative approach with regard to the requirements for the construction, operation, safety and crew competence of vessels. The review includes reference to relevant industry standards, which constitute an important element of the offshore industry.

The ultimate objective is to identify areas for harmonisation across the North Sea that may address operational and regulatory challenges facing the offshore industry.

## 1.2 Background

The Plan for Growth in Blue Denmark has identified a growth potential for maritime activities in the offshore sector, including the growing offshore wind industry.

In general, the Government of Denmark wants to promote the possibilities of growth and employment in the offshore sector, and the conditions for this include competitive technical and manning requirements for Danish vessels.

The G9 Offshore Wind Health & Safety Association (G9) and other national industry associations have mapped individual areas and issued general guidelines addressed at the industry, but it is assessed that, at present, a broad overview is not available of the scope and contents of national regulations and standards affecting the various vessel types, owners and crewmembers when operating in the North Sea.

In the offshore industries, operations often take place within the limits of territorial waters and a state's exclusive economic zone (EEZ). Thus, the regulation is covered by national legislation and typically involves both the maritime authorities and shore-based authorities. The vessels are also designed according to national or international regulations – depending on their size and type. The many authorities and various national and international sets of regulations to which vessel owners and operators must relate make cross-border operations difficult.

## 1.3 Scope

The scope of this review is restricted to regulations in force and standards in use in Denmark, the United Kingdom, Germany and the Netherlands.

This review does not provide a summary of all aspects of national regulation and industry standards relating to the following areas, but instead focuses on significant differences in the legal or conceptual basis behind such regulations and standards.

### 1.3.1 Vessel design and construction

For the purposes of this review, relevant regulations and standards for vessel design and construction are considered to be those addressing:

- General arrangement and concept of the vessel
- Structure and equipment
- Machinery and systems
- Control and monitoring systems
- Electrical systems
- Cargo handling arrangement and systems
- Stability
- Watertight and weathertight integrity
- Fire safety
- Lifesaving appliances
- Navigation and radio equipment
- Number and status of persons onboard
- Other activity specific safety requirements

The review focuses on which international instruments (if any) are applied in different jurisdictions and where interpretations of these vary.

### 1.3.2 Marine operations

For the purposes of this review, relevant regulations and standards for marine operations are considered to be those addressing:

- Marine coordination and emergency response (in offshore wind farms)
- Navigational safety and environmental impact (of offshore wind farms)
- Specific offshore construction and maintenance activities

The review does not consider any interface with aviation regulations and standards.

### 1.3.3 Competence and training

For the purposes of this review, relevant national regulations and industry standards for competence and training are considered to be those addressing:

- Competence and training of a vessel's marine crew.
- Competence and training of technicians and contractors engaged in marine operations or carrying out work within an offshore wind farm.

## 1.4 Methodology

The principal basis for DNV GL's review has been published legislation, statutory regulations and industry standards, cross-checked against DNV GL's own experience and authorisations as a third party certifying authority. This has been supplemented by publically available information from Authorities and Industry Associations (websites, published guidance etc.) and other recent studies. When considering industry standards, international rather than national bodies have been focused on.

Finally, consultation with maritime authorities was carried out to clarify areas of uncertainty and selected industry stakeholders were invited to offer input regarding the areas of existing regulations and standards that present the greatest challenges to industry.

## 2 OFFSHORE WIND REGULATION

Legislative frameworks that apply to offshore wind farms are dependent on the coastal state in whose waters they are installed. All states apply national regulation to activities on their EEZ. Regulation will fall into two categories, land based legislation applied to offshore structures temporarily or permanently fixed to the continental shelf and maritime legislation implemented into national regulations. Activities in the EEZ are regulated both by national and international law. In the North Sea, countries all claim up to 12 nautical miles from the coastline as territorial waters, with the EEZ largely divided by the median line (which forms the boundary of the territorial sea for each state).

For the purposes of this review, a state is considered to be acting in one or more of the following three roles:

- Flag state (regulating vessels registered with the state and flying its flag).
- Coastal state (regulating activities taking place within the state's EEZ).
- Port state (regulating vessels of another flag state operating within the port state's waters).

### 2.1 Maritime regulatory framework

The established maritime regulatory framework derives from international conventions implemented into national law by maritime administrations as flag, coastal or port states and by demonstrating compliance with internationally agreed standards enjoy the privileges of those conventions.

Flag states have the authority and responsibility for enforcement of appropriate international memoranda, conventions and protocols that the state has ratified, adopted or acceded to through national regulation. The flag state may also agree dispensations from certain requirements of regulations through either the demonstration of equivalency or issuance of an exemption.

In addition, to Flag state responsibilities, Port states around the North Sea are responsible for enforcement under the requirements of the directive for Port State Control (Paris MOU) and/or other national requirements.

#### 2.1.1 IMO conventions

The term 'convention' vessel is used to refer to a vessel which by virtue of its size, service or trade is subject to the requirements of international maritime conventions. The requirements of these conventions will be reflected in the national regulations of the flag state. The two international conventions of most relevance to design and construction standards are the International Convention for the Safety of Life at Sea (SOLAS) and the International Convention on Load Lines (Load Line). Further reference to these conventions includes reference to their associated protocols and most recent amendments unless otherwise stated. The term "non-convention" is used to refer to a vessel which is regulated solely or partially by national regulation and is not subject to the requirements of the major international conventions. Both SOLAS and Load Line apply only to vessels trading internationally but will in general be recognised by administrations for ships on non-international voyages. SOLAS applies to commercial vessels with a gross tonnage of 500GT or more (or carrying more than 12 passengers), while Load Line applies to commercial vessels with a Load Line length of 24m or more.

- **Non-convention**  
Vessel not trading internationally, less than 24m in Load Line length and less than 500GT.
- **Convention**  
A cargo vessel engaged on international voyages and > 24m GT (subject to Load Line) and/or > 500 GT (subject to SOLAS) and/or carrying more than 12 passengers (passenger vessel).



SOLAS also establishes a clear distinction between Cargo and Passenger vessels, with a vessel of any size carrying more than 12 passengers and trading internationally defined as a Passenger vessel. This distinction is reflected for vessels not trading internationally through national regulations implementing EU Directive 2009/45/EC.

Other IMO conventions with an impact on design and construction standards are the International Convention for the Prevention of Pollution from Ships (MARPOL) and the Maritime Labour Convention, 2006 (MLC)<sup>1</sup>. These are not considered further in this review.

Common recognition and enforcement of ratified international requirements for convention vessels is assured through the principle of “no more favourable treatment”, by which a vessel may be held to compliance with the requirements of the coastal state in whose waters a vessel is operating (and who may inspect the vessel under their authority as port state). Port states are not required to automatically accept equivalences or exemptions granted by other flag states and may apply their interpretation of international requirements. Vessels engaged in cabotage trades (i.e. operating solely within the waters of a coastal state other than their flag state) may be required to obtain a Certificate of Equivalence or otherwise demonstrate compliance with the requirements of the coastal state.

The final major IMO convention relevant to this review is the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). This prescribes minimum standards relating to training, certification and watchkeeping for seafarers which states are obliged to meet or exceed in their requirements for the manning of vessels.

### 2.1.2 IMO codes and guidelines

A series of international codes have been developed by the IMO which provide equivalent arrangements for convention vessels of special design, construction or service and for which the requirements of the conventions are not considered to provide a sufficient international standard. These equivalent arrangements include alternative design and construction standards in addition to operational controls. The three codes of most relevance to design and construction standards in the offshore wind sector are listed below. Further reference to these codes is to their latest editions and amendments unless otherwise stated:

- **International Code of Safety for High-Speed Craft (HSC Code)**  
Mandatory code for application to high-speed craft which are capable of operating at planing speeds (and are generally of generally light construction relative to conventional vessels). Provision is made for both cargo and passenger craft.
- **Code for the Construction and Equipment of Mobile Offshore Drilling Units (MODU Code)**  
Recommended code for application to mobile offshore drilling units, including self-elevating (jack-up) and column-stabilized (semi-submersible) units.
- **Code of Safety for Special Purpose Ships (SPS Code)**  
Recommended code for application to vessels of unusual design and operational characteristics carrying *special personnel* who are neither members of the marine crew nor passengers and are carried on board in connection with the special purpose of that ship or because of special work being carried out aboard that ship.

Other significant IMO guidance documents for the offshore sector include:

- **Guidelines for the design and construction of offshore supply vessels (OSV Guidelines) /1/**  
These are intended for application to supply vessels of ‘conventional’ offshore industry design, primarily engaged in the transport of stores, materials and equipment to offshore installations.

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<sup>1</sup> This is an International Labour Organization (ILO) convention rather than an IMO convention and includes provisions for seafarer’s conditions of employment, health protection, medical care, welfare and social security protection in addition to design and construction requirements for accommodation and recreational facilities.

The code specifically excludes provision for the carriage of more than 12 industrial personnel [see section 5.2.1] and is not intended for vessels operating as special purpose ships. While vessels designed and constructed in accordance with this code may fulfil certain logistics or construction support functions in the offshore wind industry it excludes the more specialised functions that are the feature of the industry.

- **Code of safe practice for the carriage of cargoes and persons by Offshore Supply Vessels (OSV Code)**

Relates to safety management system provisions for both operator and charterer, to avoid or reduce to a minimum the hazards which affect offshore supply vessels in their daily operation of carrying cargoes and persons to, from and between offshore installations.

- **Recommendations for the training and certification of personnel on mobile offshore units (Recommendations for MOU training)**

Recommends training standards and competence requirements for personnel onboard mobile offshore units (MOUs) in addition to the requirements of STCW. The recommendations include the definition of expected crew roles specific to MOUs.

## 2.2 Offshore regulatory framework

The second legislative framework relevant to offshore wind is offshore regulations governing activities within the territorial waters and EEZ of a particular coastal state. Coastal state offshore regulations are not governed by international law but may be influenced by regional agreements or harmonisation of industry practices. The Coastal state will exercise its functions through different competent authorities in different areas: e.g. responsibility for licensing and consent of activities in the EEZ will often fall under a different competent authority than the responsibility for regulating safety.

### 2.2.1 Denmark

Energistyrelsen or the Danish Energy Agency (DEA) is the competent authority for Danish offshore wind power projects. Besides calls for tenders and the approval of new projects, continuous work is carried out on environmental impacts and future locations.

The offshore wind farm installation sites are regulated by the DEA in co-operation with the following other agencies:

- Miljøstyrelsen or the Danish Environmental Protection Agency (DEPA)
- Søfartsstyrelsen or the Danish Maritime Authority (DMA)
- Arbejdstilsynet or the Danish Working Environment Authority (DWEA)

For marine access to offshore wind farms in Danish National waters the responsibility for development and enforcement of regulations the responsibility is divided into three main areas.

- Port Facility – Kystdirktoratet or the Danish Coastal Authority (DCA)
- Vessel transfers from shore to Offshore wind farm site, including access to installation - the (DMA)
- Offshore wind farm site – the DEA and windfarm operator

Port facilities and operations for loading and unloading, security parameters and safety measures are maintained by the DCA which regulates loading operations and port security and the DWEA which regulates shore based working safety measures. Vessel transfers from shore to offshore wind farm site location are maintained and regulated by the DMA for sea transport.

The surveillance of Danish waters and of civilian shipping, sovereignty enforcement, pollution prevention, environmental surveillance, ice-breaking, etc. are the responsibility of the Ministry of Defence. Den Maritime Havarikommission or the Danish Maritime Accident Investigation Board has responsibilities for accidents within Danish waters.

## 2.2.2 United Kingdom

The Department for Energy & Climate Change (DECC) has overall responsibility for offshore energy projects, though some responsibilities in England and Wales are delegated to the Marine Management Organisation (MMO) and powers are devolved to the Scottish Executive for Scottish projects.

The Maritime and Coastguard Agency (MCA) as an executive agency of the Department for Transport and the Health and Safety Executives of Great Britain and Northern Ireland (HSE & HSENI) hold the main responsibilities for health and safety regulation in the UK's offshore wind industry. The Maritime Accident Investigation Branch (MAIB) also has responsibilities when accidents occur within the marine environment.

Generally speaking, floating structures are regulated by the MCA, structures fixed to the seabed (on the UK continental shelf) it is regulated by the HSE. The MCA's main functions are to develop, promote and enforce high standards of marine safety, to minimise loss of life amongst seafarers and coastal users, and to minimise pollution from ships of the sea and coastline. It is also responsible for the initiation and co-ordination of all maritime Search and Rescue (SAR) within the UK Maritime Search and Rescue Region.

The MCA is responsible for enforcing all merchant shipping regulations in respect of occupational health and safety, the safety of vessels, safe navigation and operation. Merchant shipping health and safety regulations extend to all those working on the ship, and all shipboard activities carried out by the crew under the control of the ship's master.

The HSE is a statutory body in Great Britain (i.e. England, Scotland and Wales but not Northern Ireland), whose main function is to make arrangements to secure the health, safety and welfare of people at work and to protect the public from dangers arising from work activities. HSE inspectors have, for example, power of entry to all workplaces, including docks and offshore installations, to inspect health and safety conditions and also to investigate accidents to dock workers working in a port or while loading or unloading a ship. In general HSE investigates land based and offshore accidents.

To ensure effective co-ordination between those organisations where their duties for health and safety enforcement and accident investigation overlap at the water margin, offshore and on inland waterways a memorandum of understanding has been made between the HSE, MCA and MAIB. The memorandum is publicly available and is entitled: "*Memorandum of Understanding between the Health and Safety Executive, the Maritime and Coastguard Agency and the Marine Accident Investigation Branch for health and safety enforcement activities etc. at the water margin and offshore*".

## 2.2.3 Germany

For Maritime issues in Germany, the competent authorities are the Bundesamt für Seeschifffahrt und Hydrographie (BSH) or Federal Maritime and Hydrographic Agency and the Wasser- und Schifffahrtsverwaltung des Bundes (WSV) or Federal Waterways and Shipping Administration, an executive agency within the Bundesministerium für Verkehr und digitale Infrastruktur (BMVI) or Federal Ministry of Transport and Digital Infrastructure. The WSV examines wind farm projects for hazards to navigation.

BSH and the Ship Safety Division of the Berufsgenossenschaft für Transport und Verkehrswirtschaft (BG Verkehr) or Professional Association for Transport and Transport Economics, operating under the jurisdiction of the BMVI are the main federal authorities with responsibility for maritime safety, protection of the marine environment and maritime security. The Ship Safety Division of BG Verkehr acts



as flag and port state. Maritime accidents are investigated by Bundesstelle für Seeunfalluntersuchung (BSU) or the Federal Bureau for Maritime Casualty Investigation.

Additionally, the Berufsgenossenschaft (or Professional Trade Associations), the carriers of statutory accident insurance for companies in the private sector, are responsible for preventing occupational health hazards and accidents.

## 2.2.4 Netherlands

The competent offshore authority for the sea bed in the Netherlands is the Rijkswaterstaat (RWS) or Directorate-General for Public Works and Water Management. Examination, inspection and investigations related to offshore safety fall under the remit of Staatstoezicht op Mijnen or State Supervision of Mines (SSM).

The Netherlands Shipping Inspectorate (NSI) as a sub-department of Inspectie Leefomgeving en Transport (or Transport and Water Management Inspectorate) has responsibility for flag state and port state inspections, certification of seafarers and ship registration. The NSI has responsibility for enforcement investigation of maritime accidents, in addition to the safety investigation responsibilities of de Onderzoeksraad or the Dutch Safety Board.

## 2.3 Consent process

The consent process impacts on marine operations in a wind farm due through requirements for marine/navigational safety and environmental assessments. According to EU law, offshore wind farm development must satisfy two assessment processes: Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA).

The EIA process ensures that environmental consequences of projects such as offshore wind are identified and assessed before authorisation is given. Potential environmental impacts and socio-economic consequences associated with the development of offshore wind-farms are; change of food species availability, bird collision, stress and reduction of biological fitness, habitat loss as fish may leave area etc. The purpose of the EIA process is to ensure that all the likely effects of a development are fully understood and taken into account before a development is permitted to go ahead.

Thus, all countries within EU need to undertake the EIA and report this in an Environmental Statement (ES), which is submitted with the application for development. The only difference between countries is eventually the national guidance, which is meant to assist developers and regulators in the assessment. The national guidance is non-mandatory. However, failure to comply with the principles of the guidance may result in delaying the application process.

The marine/navigational safety assessment (or sometimes referred to as only collision risk analysis) are normally carried out as part of the EIA. The assessment focuses on the likelihood and consequences of ship impact on the offshore wind farm. The major hazards are commercial ships deviating from normal routes (tankers, bulkers, containers, etc.), vessels sailing through wind farms, provision of SAR in, over and through wind farms and recreational or fishing vessels sailing close to the wind farm or entering shipping routes in order to avoid proposed sites.

Traffic control can also be a statutory safety zone, in which the regulating authority has the right to intervene in 3<sup>rd</sup> party activities in an area, restricting activities or access to the area. Traffic control can also be guidelines for traffic overview, advising and coordinating the vessels working in the wind farm.

The Strategic Environmental Assessment (SEA) is a process of evaluation of environmental effects during the preparation of policies, plans, programmes and legislation (including executive regulations). The applicants need to prepare an Environmental Report, integrate environmental considerations into the Plan or Programme and provide an SEA Statement.

**Table 2-1 National requirements for marine/navigational safety and emergency studies**

Denmark	United Kingdom	Germany	Netherlands
No national guidance specific to wind farms	Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)	Studies must be performed in order to produce the required protection and safety concept	Assessment Framework for Defining Safe Distances between Shipping Lanes and Offshore Wind Farms

**Table 2-2 National requirements for environmental studies**

Denmark	United Kingdom	Germany	Netherlands
Guidance document on Environmental Impact assessment by the DEA	Reference made to Guidelines of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)	Standards for the Environmental Impact Assessment issued by the BSH	To be performed by the state

### 2.3.1 Denmark

Consent to perform wind energy projects in Danish waters is awarded to projects on the basis of the Act of Electricity Supply, either by tender or the 'open door principle'. The areas issued to tender by the DEA are determined by a spatial planning committee. The committee is tasked with finding appropriate sites for offshore wind farms.

The committee consists of:

- The DEA with regard for the Federal sovereignty jurisdiction over territorial waters and of the EEZ as concerns the exploitation of wind energy. Thus the Authority is the planning authority and is responsible for approving offshore wind turbines.
- Energinet.dk with responsibility for planning and construction of the electricity transmission grid and for ensuring open and equal access to all the players in the energy market.
- Risø with its specialist knowledge of wind power and the establishment for criteria for wind power test areas.
- The DMA with responsibility for navigational safety and safety at sea.
- The Naturstyrelsen or Danish Nature Agency with responsibility for seascape, nature conservation and raw material extraction.

The applicants are required to carry out an environmental impact assessment (EIA) **/3/**. A developer will perform preliminary investigations before obtaining a license from preliminary investigations. At this point, the in-depth environmental assessment is undertaken.

The results of the environmental assessment determine which mitigation measures will be necessary. In severe cases, the DEA can require environmental monitoring during the environmental phase.

### 2.3.2 United Kingdom

The Crown Estate (CE) owns the seabed up to 12 nm. Companies must apply to CE for licenses. For projects beyond the territorial waters, the 2004 Energy Act was established, extending CE's jurisdiction to the UK EEZ. In planning, the local authorities have only a consultative role.



Consent procedures vary according to the size of wind farm and the process applied by the wind farm developer, but for English waters (and Welsh offshore waters) the consenting body will be either the Marine Management Organisation (MMO) or DECC on the advice of the Planning Inspectorate (which investigates Nationally Significant Projects of 100MW or more). In Scottish waters the authority is devolved to Marine Scotland, in Northern Irish waters the Department of Environment Northern Ireland and for Welsh inshore waters Natural Resources Wales.

Developers must perform an Environmental Impact Assessment (EIA) and a navigational/marine safety and emergency response assessment.

The MCA has issued a guidance note **/4/** for the navigational/marine safety and emergency response assessment. The recommendations set out by the guidance should be taken into account when conducting the EIA and preparing for the ES.

The guidance highlights issues that need to be taken into consideration when assessing the impact on navigational safety and SAR from offshore renewable energy developments, proposed for United Kingdom (UK) internal waters, territorial sea or Renewable Energy Zones.

### 2.3.3 Germany

The BSH is the agency that approves offshore wind farm development projects in the North Sea and Baltic Sea. BSH conducts the application procedure for wind farms in the German EEZ, which is where most German offshore wind farms are planned. Within German territorial waters, the approval of offshore wind farms lies with the regional authorities. For projects in the German EEZ the laying of shore export cables must be approved by the relevant regional authority.

The legal basis of this approval procedure for the German EEZ lies in the United Nations Convention on the Law of the Sea of 10 December 1982 and the German Federal Maritime Responsibilities Act (Seeaufgabengesetz), implemented by the Marine Facilities Ordinance (Seeanlagenverordnung). Approval granted by the BSH for installation in the EEZ however is not legally binding for approval involving installations on land or in territorial waters.

The approval procedure for installation on the EEZ requires the wind farm project to ensure it does not impair the safety and efficiency of navigations and is not detrimental to the marine environment. It is mandatory to carry out an environmental impact assessment according to the standard outlined by the BSH **/5/**. The BSH, in co-operation with experts, has also developed minimum requirements for mandatory geological/geophysical and geotechnical site investigation at planned wind farm sites **/6/**.

The approval of a wind farm lasts for 25 years, after which the operator must apply for an approval extension. Construction must commence a minimum of 2.5 years after the approval.

### 2.3.4 Netherlands

The Dutch system of approval for wind farms has been recently changed, with the new system including more significant involvement on behalf of the Dutch government than in other countries. In September 2013, the Energy agreement for sustainable growth was published as a coalition agreement between the current government and industrial organizations. The agreement sets ambitions for renewable energy use with a goal of 16% renewable energy use by 2023. To enable the fulfilment of these goals, the Offshore Wind Energy Act was passed in March 2015. The Dutch Ministries of Economic Affairs and of Infrastructure and the Environment are responsible for the execution of the Offshore Wind Energy Law.

Under the Offshore Wind Energy Act three designated areas will be developed sequentially for offshore wind: off the coast of Zeeland, North Holland and South Holland. The government will take responsibility for deciding which sites or plots can be developed within the designated development areas. The plot decision specifies where a wind farm may be built in the area and under which conditions, i.e. which techniques to use. The Ministries of Economic Affairs of Infrastructure and the Environment will make the site decisions. The Netherlands Enterprise Agency will collect all the relevant data and make the data available on its website.

Project developers shall be required to obtain a permit for the realisation of an offshore wind project that is specified in a plot determined by the government. Project developers also apply for a subsidy to develop the plot. It is expected that the winner of the subsidy will ultimately win the permit to develop the plot. The decision process to award a permit is limited to a test on the financial and technical feasibility of the project.

In the process of determining the plots, the government will assess the environmental and ecological effects of the plots, drawing up an Environmental Impact Assessment for each plot. The soil, the wind speeds and the water data for the plots will be accounted for in the environmental impact assessment.

The project developers can use this information in their bid during the tender procedure. This assessment is performed by the Directorate-General for public work and water management (Rijkswaterstaat - RWS), is the Dutch Ministry of Infrastructure and Environment's executive agency responsible for managing the Dutch sea bed. The government shall further specify the precise location of the wind projects in the plot decisions and indicate under which provisions a wind project can be constructed in order to avoid conflicts with mining, fishing, shipping, and other offshore activities; and avoid damage to the environment.

When choosing areas for offshore development and their sites, the Dutch government applies a navigational safety framework **/7/** developed by the Director of Maritime Affairs at the Ministry of Infrastructure and the Environment. The Framework is based on relevant international provisions and regulations: International Regulations for Preventing Collisions at Sea (COLREGs), General Provisions on Ships' Routing and United Nations Convention on the Law of the Sea (UNCLOS). Development areas and sites are chosen based in part on current shipping lanes and their safety zones are determined according to the Assessment Framework.

The siting of a development site and its associated safety zone is based on allowing sufficient space for a round turn of the largest vessel using existing shipping lanes.

An environmental impact report and an appropriate assessment will also be required.

## 2.4 Summary of regulating authorities and industry bodies

**Table 2-3 National Administrations and Competent Authorities (for Offshore Wind)**

<b>Regulator</b>	<b>Denmark</b>	<b>United Kingdom</b>	<b>Germany</b>	<b>Netherlands</b>
Flag/Port State	DMA	MCA	BG Verkehr	NSI
Coastal State	DEA	DECC/MMO*	BSH/WSV†	RWS
Safety regulator	DWEA	HSE	BSH/BG Verkehr	SSM

\* Some responsibilities are devolved in Scotland

† Within 12nm of the coast, state agencies have de jure responsibility, though de facto the direction of offshore wind policy is set by BSH.



Significant industry associations with an interest in the North Sea offshore wind sector include:

- International Marine Contractors Association (IMCA)
- International Jack Up Barge Owners Association (IJUBOA)
- Danmarks Rederiforening / Danish Shipowners' Association
- UK Chamber of Shipping
- National Workboat Association (NWA)
- Verband Deutscher Reeder / German Shipowners' Association
- Koninklijke Vereniging van Nederlandse Reders / Royal Dutch Shipowners' Association
- G9 Offshore Wind Health & Safety Association (G9)
- European Wind Energy Association
- Vindmølleindustri / Danish Wind Industry Association
- RenewableUK (RUK)
- Bundesverband WindEnergie / German Wind Energy Association
- Nederlandse Wind Energie Associatie / Netherlands Wind Energy Association

Industry bodies producing guidelines and standards relevant to the scope of this review are:

- Classification Societies<sup>2</sup>
- RUK
- International Organization for Standardization (ISO)
- IMCA
- IJUBOA
- G9
- NWA

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<sup>2</sup> The Classification Societies most active with respect to vessel types or other activities in the offshore wind sector are: American Bureau of Shipping (ABS), Bureau Veritas (BV), DNV GL and Lloyd's Register (LR). Other members of the International Association of Classification Societies (IACS) are: China Classification Society (CCS), Croatian Register of Shipping (CRS), Indian Register of Shipping (IRS), Korean Register of Shipping (KR), Nippon Kaiji Kyokai (Class NK), Polish Register of Shipping (PRS), RINA and Russian Maritime Register of Shipping (RS).

## 3 VESSEL DESIGN AND CONSTRUCTION

For the majority of convention-sized vessels issued with certification under international frameworks there are few significant differences between the North Sea jurisdictions under consideration as regards requirements for conventional cargo and passenger vessels.

Offshore industry vessels however fall into more specialised categories not well aligned with the requirements of conventional deep-sea shipping and thus the interpretation and application of international frameworks varies between flag states.

### 3.1 Vessels used in the offshore wind industry

There is a broad mix of vessel types used in the offshore wind industry, spanning a range of designs and activities. While there are significant similarities with vessels used in other offshore industries and many vessels may work interchangeably between sectors, the specific demands of offshore wind have seen innovations in both vessel design and operation, some of which remain unique to the sector.

Some of the typical activities and marine operations which vessels working in offshore wind may be required to perform are listed below:

- Crew/personnel transfer (both by 'step-over' and 'walk to work' methods)
- Foundation and turbine installation
- Heavy lift installations
- Turbine maintenance
- Diving support
- Cable laying
- Rock dumping
- Accommodation of personnel
- Guard duties
- Geotechnical, geophysical and environmental survey
- Fauna observation
- Construction/maintenance support

These various roles require the use of a wide range of vessel types, including both convention and non-convention vessels. The vessel types on which this report focuses (and where the offshore wind industry has introduced new demands and requirements) are:

- **Windfarm maintenance vessels**  
Convention-sized vessels similar in design to those employed in other offshore industries in support and supply roles.
- **Self-elevating units**  
Jack-ups, including specialised wind turbine installation vessels. Self-elevating units may be unmanned or permanently manned and self-propelled or not propelled by mechanical means.
- **Small service craft**  
Typically non-convention vessels < 24m in Load Line length and carrying no more than 12 passengers, of either high speed or conventional design. Recent designs have begun to exceed both of these thresholds.

## 3.2 Wind farm maintenance vessels

Various also known as service and maintenance vessels, wind service operation vessels or simply as offshore service vessels (as used in other offshore industries), this vessel type is a relatively recent addition to the offshore wind industry that has been introduced as larger wind farms are constructed further from shore-based logistics. A 'typical' design and specification has yet to emerge, however special characteristics may include:

- Accommodation for industrial personnel
- Facilities for the carriage, launch & recovery of daughter craft (other than fast rescue craft)
- Offshore gangway for personnel transfer
- Boat landings for transfer of personnel to or from small service craft
- Onboard workshop and turbine spares facilities
- Crane capacity for in-field parts and equipment transfer
- Dynamic positioning system (capable of relatively high in-field transit speeds)

These vessels must be distinguished from offshore supply vessels (OSVs) used in the oil & gas industry, as they are not primarily engaged in the transfer of supplies to an offshore installation. This distinction aside the type does have similarities with other offshore service vessels. The more specialised nature of their work will generally require the carriage of persons in addition to the marine crew.

An important subset of this vessel type are 'Walk-to-Work' vessels intended to accommodate technicians or contractors in-field and transfer them to offshore installations by means of a gangway.

A summary of the regulatory basis applied by different flag states is shown in Table 3-1.

**Table 3-1 National requirements for wind farm maintenance vessel design and construction**

Type	Denmark	United Kingdom	Germany	Netherlands
'Typical'	Convention or SPS Code on case-by-case assessment.	Convention or SPS Code <b>/8/</b>	Convention or SPS Code	Convention or SPS Code
Walk-to-work	SPS Code	SPS Code or Passenger (Convention)	SPS Code or OSV Guidelines will be accepted, subject to risk assessment	SPS Code

## 3.3 Self-elevating units

Self-elevating units (or jack-ups) are used for a variety of development, construction and maintenance activities in offshore wind. The vessels used will vary from small, units of less than 24 m in Load Line length used for inshore roles to large offshore designs operating in more than 40 m of water depth. Broadly speaking, units may be divided into three categories:

- Unmanned units which are non-self-propelled and carry no permanent crew accommodated on board, is not fitted with certified accommodation and on which crew and project workers are routinely transported to and from the unit on completion of each shift.
- Permanently manned units which are non-self-propelled but are permanently manned by a crew (and project workers if applicable), in which some or all personnel are accommodated on board and are not routinely transported to and from the unit at shift changes.
- Self-propelled units which are provided with a mechanical means of propulsion and are permanently manned. A distinction should be made between units which are capable of unassisted independent navigation and units which are only provided with position-keeping ability.

While both unmanned and permanently manned non-self-propelled self-elevating units are employed in a wide range of roles in offshore wind, one of the vessel types most closely identified with the sector are Wind Turbine Installation Vessels. These are in general self-propelled, permanently manned self-elevating units capable of comparatively high transit speeds which are designed to carry wind turbine and foundation components from a marshalling port and then conduct construction and installation activities while jacked-up.

Both permanently manned and self-propelled units will frequently carry special personnel in addition to the marine crew due to the nature of their work.

A summary of the regulatory basis applied by different flag states is shown in Table 3-2.

**Table 3-2 National requirements for self-elevating unit design and construction**

Unit	Denmark	United Kingdom	Germany	Netherlands
Unmanned	Convention/ <b>9/</b>	Convention	National safety certificate and MODU Code/ <b>10/</b>	National safety certificate/ <b>11/</b>
Manned	Convention <b>/9/</b>	Convention or MODU Code (case-by-case) <b>/12/</b>	National safety certificate and MODU Code/ <b>10/</b>	National safety certificate or SPS Code (for > 12 special personnel)
Self-propelled	Convention and SPS Code (case-by-case)*	Convention (and SPS Code for > 12 special personnel) <b>/8/</b> and additional MODU Code requirements <b>/12/</b>	Convention (and SPS Code for > 12 special personnel) and additional MODU Code requirements	Convention or SPS Code†

\* Further application of MODU Code is optional, either by issue of MODU Safety Certificate or a Statement of Compliance

† MODU Code may be applied if required by operator's risk assessment, but is not mandatory

The application of the Conventions to non-self-propelled self-elevating units varies, but in general:

- For unmanned units the requirements of the Load Line convention are applied (except for provisions for protection of personnel and some reduced stability requirements) and a Load Line or Load Line Exemption Certificate will be issued (or national equivalent).
- Permanently manned units will additionally require SOLAS safety equipment and radio certification, though the MODU Code may be applied where it is accepted by the flag State for application to non-drilling units.

Additionally, the actual certificates issued will vary; with for example BG Verkehr issuing SPS and MODU Code certificates in place of SOLAS safety certificates, while the DMA and the NSI will issue SOLAS certificates in addition.

Non-convention self-elevating units of less than 24 m in Load Line length are in general issued with a national safety certificate under national regulations.

### 3.4 Offshore service craft

Small service craft (of less than 24 m in Load Line length) are not subject to the majority of international conventions. In general they are engaged on domestic voyages as commercially operating cargo vessels and therefore are certificated under national legislation. It is increasingly common for service craft certificated under national legislation of one flag State to operate within the jurisdiction of a different port and/or coastal State.

As small service craft have increased in size, two principal challenges have presented themselves:

- The development of designs  $\geq 24$ m Load Line length which would become subject to the Load Line Convention.
- The development of designs intended to carry more than 12 industrial personnel (see section 5.2.1).

For high speed service craft exceeding either of these thresholds the response from flag States has been to apply the provisions of the HSC Code, either by treating the vessels as Passenger HSCs or, more recently by developing new guidance based on Cargo HSC requirements and implementing a definition of industrial personnel.

A summary of the regulatory basis applied by different flag states is shown in Table 3-3.

The HSC Code was developed for vessels trading internationally on a fixed route, so there are some barriers to its application to small service craft; however these are typically overcome by a rewording of the Permit to Operate (or Trading Permit) to cover an area of operation rather than a defined route.

**Table 3-3 National requirements for offshore service craft design and construction**

Basis	Denmark	United Kingdom	Germany	Netherlands
Small service craft	Small commercial vessel /13/ <sup>3</sup> or DNV GL HSLC Rules, Small Service Craft <sup>4</sup>	Small workboat/14/ <sup>5</sup>	Small Special Service Craft/15/ (applies to craft < 100 GT)	Small cargo vessel /11/
HSC Code	Category A Passenger Craft	Interim standards for High Speed Offshore Service Craft based on exemption from Cargo Craft requirements – currently available individually	Offshore Service Craft – based on exemption from Cargo Craft requirements /16/ carrying 'offshore service personnel'	Category A Passenger Craft

### 3.4.1 Small service craft standards

A brief comparison of the design and construction standards for small service craft has been made to highlight similarities and differences between the national requirements. For the sake of simplicity and to focus on the requirements relevant to the majority of the service craft market this comparison only considers the requirements for small service craft of less than 24m in Load Line length (i.e. not subject to Load Line). For Denmark, the UK and the Netherlands this restriction is explicit in the national requirements, while in the case of the German standard circular the size restriction for applying the standard is based on gross tonnage. However in practice there are very few vessels exceeding 24m in Load Line length which are also less than 100 GT. Additionally, this comparison does not consider vessels of less than 15 m in length (which would not be subject to the supplementary regulations of the Danish Notice F) or which would not meet the UK's area category 2 service restriction (operation up to 60 miles from a safe haven).

All jurisdictions will accept the rules of a recognised Class Society for hull construction standards, though the UK may also accept equivalent standards or first principles calculations. The Netherlands regulations additionally delegate standards for other naval architectural aspects (i.e. watertight subdivision and stability) to the rules of a recognised Class Society.

<sup>3</sup> Maximum vessel length stated for small commercial vessel is 15 m, however for cargo vessels between 15 m and 24 m in Load Line length, Notice F may be applied in place of Notice B, applying additional rules in Annex 3.

<sup>4</sup> With additional national requirements

<sup>5</sup> Previously MGN 280 – Small vessels in commercial use for sport, pleasure, workboats and pilot boats – alternative construction standards

Requirements for watertight subdivision include collision and machinery space bulkheads, with the German regulations also expecting a double bottom arrangement as far as practicable and compatible with the design. UK vessels designed to operate greater than 60 nm from a safe haven will also be required to meet damage stability criteria. A separate set of stability criteria are provided for vessels such as catamaran service craft with a low waterplane area but large intact freeboards.

Significant fire safety and life-saving appliance requirements from the different regulations are summarised in Table 3-4.

**Table 3-4 Comparison of national safety requirements for small service craft.**

Area	Denmark	United Kingdom	Germany	Netherlands
Fire safety	A-30 machinery space structural fire protection	Machinery space structural fire protection*	Flame resistant machinery space insulation	Machinery space fixed-fire extinguishing system
	B-15 galley fire protection	Machinery space fixed fire-extinguishing system	Machinery space fixed fire-extinguishing system	Fire pump
Life-saving appliances	Machinery space fixed-fire extinguishing system	Fire pump (outside of machinery space)	2 fire pumps	
	2 fire pumps			
Life-saving appliances	Immersion suits	Immersion suits	Immersion suits	200% SOLAS liferaft capacity (split port and starboard)
	200% SOLAS liferaft capacity (split port and starboard)	100% total ISO 9650 liferaft capacity†	100% total SOLAS liferaft capacity	

\* Special test procedure according to Appendix 9 of the Workboat Code or MGN 407 required for fibre reinforced plastic (FRP) construction. Aluminium construction should have an equivalent level of protection to FRP. A-15 standard may be accepted in lieu of test procedure. Steel construction requires no mandatory protection but it should be considered in way of accommodation spaces.

† UK vessels operating more than 150 nm from a safe haven require SOLAS approved liferafts such that 100% capacity is available following the loss of any one liferaft.

## 4 MARINE OPERATIONS

### 4.1 Marine coordination

Marine coordination in offshore wind involves the planning and oversight of marine operations to be undertaken within a wind farm, in addition to cooperation with national authorities in providing effective incident response. While it has been used in other offshore (especially construction) activities, the large numbers of people and vessels that may be associated with offshore wind marine operations has led to an expansion of the function. Marine co-ordination's responsibilities may include continuous monitoring of wind farm (and non-wind farm) marine traffic, navigational advice to vessel Masters and project staff (in planning and during operations) and authorisation for specific marine operations (such as personnel transfer). This proactive role for marine co-ordination is supported by the G9 **/17/**.

#### 4.1.1 Denmark

There are no mandatory requirements for continuous, remote marine coordination and traffic monitoring in Danish wind farms. While the practice is adopted for larger sites, smaller wind farms frequently sub-divide and combine functions of the role with other roles, for example a vessel master within the wind farm may be appointed 'marine coordinator', while much of the logistical and control of work tasks have been planned in advance by a shore-based Company representative or quartermaster.

Some operators are investigating consolidating traffic monitoring and remote coordination functions for a number of small sites in a single shore facility to provide the support in a cost effective manner.

#### 4.1.2 United Kingdom

Safety measures are expected to be implemented for UK wind farms appropriate to the level of risk determined from the EIA in consultation with the MCA. MGN 371 gives examples of such measures including:

- Continuous, multi-channel VHF watch.
- Monitoring by radar, AIS, closed circuit television (CCTV) or other agreed means.
- Creation of an Emergency Response Cooperation Plan (ERCoP) with the relevant Maritime Rescue Coordination Centre.

#### 4.1.3 Germany

BMVI have established requirements for monitoring of offshore wind farms, based on the results of the mandatory environmental risk assessment (i.e. EIA). If the park is an area under the responsibility of the WSV, the monitoring of only the park areas is required. In other words, in the areas under WSV responsibility, the safety requirements are equivalent to the requirements given in the authorisation from the BMVI.

In areas which are not under the responsibility of the WSV, and for which no other risk mitigation measures are identified during the approval process, marine coordination must be implemented in an area of at least 12 Nm is to be carried out by nautical professionals **/18/**.

A traffic monitoring system should be automated with a work screen tracking vessel activity. Type and intensity of monitoring is to be determined depending on the sea area, traffic frequency and risk assessment of wind farms on an individual basis by the General Directorate of the Waterways and

Shipping Administration (GDWS). Marine coordination is carried on the basis of AIS and communication via VHF marine radio and should comply with IALA Vessel Traffic Services (VTS) guidelines.

Other specifications in the BMVI’s instructions for marine coordination include:

- Spatial design and action measures
- Functional requirements:
  - Detection and communication – AIS and VHF radio specifications
  - Type and intensity of sea spatial observation/surveillance – to be determined on a case-by-case basis by the GDWS
  - Automatic monitoring of traffic – A work screen with automatic traffic data must be in place
  - Hydmet-System – specifies environmental data to be extracted
  - Ensuring maritime radio services – requires radio equipment complies with relevant standards and guidelines
- Marine coordination centre – requires separate work place and screen for monitoring

Qualifications required for nautical marine coordination will depend on the risk level of the area and will be determined by the GDWS.

#### 4.1.4 Netherlands

Arrangements for the monitoring of wind farms are listed as mitigation measures to be taken into account when determining the safety zones, but they are not explicitly required.

## 4.2 Statutory safety zones

UNCLOS allows a coastal state to establish a safety zone of up to 500 m around an offshore installation or structure within its EEZ.

It is common practice in the North Sea to establish such a safety zone around a wind farm in construction, or around major maintenance activity to act as a control on third party traffic. An example definition of major maintenance is an activity involving a large vessel (self-elevating unit, floating barge, heavy lift vessel, DP/anchorage cable lay barge, etc.).

**Table 4-1 National requirements for safety zones**

Phase	Denmark	United Kingdom	Germany	Netherlands
Construction	500 m will normally apply	500 m will normally apply	500 m will normally apply	500 m will normally apply
Operations	No mandatory safety zones.	<i>No mandatory safety zones. A wind farm can apply for a 50 m nominal safety zone around each structure.</i>	German wind farms are closed as a rule.	Based on assessment framework, 500 m is common practice.

### 4.2.1 Denmark

Danish wind farms follow the practice of establishing 500 m safety zones around wind farm installations and activities during construction, but do not typically extend these into operation.

## 4.2.2 United Kingdom

During construction, major maintenance, possible extension and decommissioning a temporary safety zone of 500 m around each structure will normally apply. The temporary safety zones may be established upon successful application to DECC. A safety zone may also be imposed by DECC in consultation with the MCA.

In order to minimize disruption to mariners and other users of the sea, the zones will be established on a 'rolling' basis, covering only those areas of the total site in which such activities are actually taking place at a given time. Once that activity has been completed in that specific location, the safety zone will then 'roll on' to cover the next specific location within the site in which such activity is taking place/20/.

Operational (or permanent safety zones) are not expected to be established around entire wind farm arrays, as compelling risk-assessed arguments would be required for their establishment. However, applications for the establishment of safety zones around single installations or several installations making up an array will be considered on a case by case basis by DECC and the MCA, taking site specific conditions into account/21/. The nominal safety zone around an operational wind turbine is expected to have a 50 m radius. In practice, very few applicants have to date sought such operational safety zones/20/.

## 4.2.3 Germany

In Germany, the wind farms are always closed to outside activity. BSH applies a 500 m safety zone around the entire windfarm during the construction and operations phases. However, small craft less than 24 m in length are in general exempted from the requirements of the safety zone, subject to good weather conditions and a restricted top speed.

## 4.2.4 Netherlands

Current wind farms in the Netherlands apply a 500m safety zone around the site and this practice is expected to continue. The EIA for the Borssele Wind Farm Zone proposes safety zones for high voltage cables and pipelines of 500 m, telecom cables have a safety zone of 750 m and a general safety zone around the wind farm site of 500 m.

## 4.3 In-field operations

A wealth of industry standards have been developed for different marine operations in the offshore industry such as diving, cable-laying, lifting or other construction, installation and maintenance activities required by offshore industry. IMCA in particular produces a wide range of guidelines for various marine operations; in addition to competence frameworks (see section 5.1.4), lessons learned and guidance on equipment design and specifications. This review has focused on areas currently seen as more contentious or uncertain in the offshore wind industry.

Marine operations will be designed, planned and operationally controlled as appropriate to the scale, complexity and risk level. The extent of these measures will vary significantly between different types of operation, but widely used guidance documents<sup>6</sup> relevant to offshore wind for the planning of (generic) operations are:

- DNV-OS-H101 Marine Operations

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<sup>6</sup> Many contractors or marine assurance and advisory service providers apply their own internal guidelines or processes; however the majority are consistent with the principles in the documents listed here.

- 0001/ND General Guidelines for Marine Projects
- 0035/ND Guidelines for Offshore Wind Farm Infrastructure Installation

There is also the recently published ISO 29400 Offshore wind energy – Port and marine operations, however this document has not been widely adopted by the industry to-date.

Numerous other guidance documents and codes of practice exist for individual operations, but these are not explicitly considered in the scope of this review. It is perhaps useful to note that the majority of these operation specific guidance documents have originally been developed for the oil & gas industry, though many of the standards bodies and associations involved are now either developing dedicated offshore wind guidance or revising existing guidance to reflect practices in the wind industry.

Lifting operations are one area of offshore activities where the offshore legal framework is better defined, drawing on the European framework set out by the EU Machinery Directive and Use of Work Equipment Directive. These are variously implemented by national legislation in EU member states and are overseen in the offshore industries by the relevant competent authorities. While different legislative frameworks exist and there are a number of recognised guidance documents and codes of practice, one of the most significant issues currently noted in the industry is related to the correct classification of a lift and application of the appropriate process (i.e. lifts may be treated as 'routine' when guidance would in fact suggest additional design or operational precautions).

Many marine operations require the use of dynamically positioned (DP) vessels. There is at present a lack of clarity in the industry when determining the appropriate class of DP vessel for certain activities, particularly as many of the existing considerations around the use of DP vessels relates to operations within the safety zones of oil & gas installations.

In contrast to the offshore oil & gas industry where personnel transfers (generally) are limited in number, take place according to a defined schedule and to a limited number of installations associated with high potential risks; personnel transfer in the offshore wind industry involves much more frequent transfers to a large number of installations, with a limited amount of time onboard and a lower potential risk associated with the installation(s). This is representative of a general feature of the risks involved in offshore wind operations, where the highest consequence hazards are of a lower severity than those seen in oil & gas, while the frequency of exposure to hazards with less severe consequences has increased.

Current industry guidance relating to personnel transfers in the wind industry includes:

- **IMCA SEL 025 / M 202 – Guidance on the transfer of personnel to and from offshore structures**  
Provides general guidance on risk assessment, responsibilities and communications for personnel transfer operations, in addition to more specific guidance for different types of transfer: crew boat (or 'step-over'), basket/lifting or gangway.
- **G9 Good Practice Guideline for the safe management of small service vessels used in the offshore wind industry**  
High level process and responsibilities for personnel and marine crew involved in 'step-over' transfers from a crew boat or service craft.
- **DNV GL Gangway Access to Offshore Facilities – Walk-to-Work (W2W) Industry Guidance**  
Output from a Joint Industry Project covering the selection of a walk-to-work arrangement (including facility and vessel considerations), implementation and delivery of the solution and operational considerations.

The use of walk-to-work systems and appropriate procedures for 'step-over' personnel transfers is currently generating significant debate in the industry and with regulators.

## 4.4 National environmental regulation

However, special environmental concerns related to offshore wind turbines are covered by relevant environmental regulations for each country.

The noise caused by during construction and how it can affect animals is an environmental concern which is tackled in various ways. Several mitigation measures are used in the relevant countries/**22**/:

- Soft-start implies slowing ramping up the piling power
- Employing marine mammal observers and delaying piling if mammals are spotted
- Acoustic deterrent devices, emit a sound to initially scare away animals during noisy operations
- Seasonal restrictions on piling, for example, restrictions on piling during fish larval seasons
- Restrictions on developing wind parks in Natura 2000 sites (Natura 2000 is an EU-wide network of nature protection areas.)
- Noise thresholds
- Restriction on parallel piling

The legislation that drives marine mammal protection is the EC Habitats Directive, but the individual countries apply the above techniques in different ways in order to fulfil the Directive's requirements.

### 4.4.1 Denmark

In Denmark, the environmental impact assessment is used to determine the environmental permit requirements. The environmental regulatory requirements for the construction phase at Horns Rev and Nysted respectively, differed considerably since the two areas differ to a great extent and feature different sensitivity issues. In general, the following points were addressed during the construction phase at both wind farms but in varying orders of priority/**23**/:

- Sediment spill monitoring
- Incidents, accidents and oil spill
- Waste handling
- Precautions regarding pile driving/vibration of sheet piles/monopiles
- Sediment depositing
- Marine archaeology
- Registration of navigation in the area

The requirements for noise mitigation are also dependent on the environmental impact assessment, as well as the experience from previous wind turbines. There are no required noise mitigation procedures. Soft-start is required, but depends on the permit. No marine mammal observers are required and there are no seasonal restrictions on piling. In recent projects, seal scarers have been employed but they are not mandatory. Development of wind parks in Natura 2000 sites is not strictly forbidden.

### 4.4.2 United Kingdom

The UK has the most extensive requirements for noise mitigation. Soft-start is required. Marine mammal observers are also required, although their extent and method of employment is site specific. Marine mammal observers must follow the UK's Joint Nature Conservation Committee's guidelines/**24**/ . Some passive acoustic monitoring must also be employed. Seasonal restrictions on piling to prevent disturbances to fish populations are site-specific, but have been employed in many projects.

The UK does not employ noise thresholds, but consent includes requirements for noise monitoring so that the biological assumptions employed in the original environmental impact assessment can be verified /**22**/ .



### 4.4.3 Germany

Developers in German waters are obliged to employ some form of noise mitigation during piling. Soft-start is required. Developers are required to submit a noise mitigation plan to the BSH as well as daily reporting to the authorities regarding the environmental impacts of construction activities. Depending on the project, pingers or seal scarers may be used and piling may be restricted during certain seasons. There is also a noise threshold for construction activities **/22/**.

Concepts for meeting noise thresholds include the use of bubble curtains around the site during piling, but this is not a requirement.

Since the establishment of the requirements for Marine Spatial planning, no offshore wind farms have been established in Natura 2000 sites.

### 4.4.4 Netherlands

Noise mitigation requirements in the Netherlands include soft-start during piling, as well as seasonal restrictions on fish larvae, as the noise is thought to disturb feeding and reproduction cycles. Piling is not permitted between January 1<sup>st</sup> and July 1<sup>st</sup> for any site **/22/**.

## 5 COMPETENCE AND TRAINING

### 5.1 Marine crew competence

Certification requirements for marine crew on convention vessels are governed by the STCW Convention. Flag states are required to implement Certificates of Competency (CoC) for the following roles (numbering denotes the relevant regulation of the STCW convention)<sup>7</sup>:

- **II/1** – Officer in Charge of a Navigational Watch (OOW), vessel > 500 GT.
- **II/2** – Master/Chief mate, vessel > 500 GT.
- **II/3** – Master/Officer in Charge of a Navigational Watch, vessel < 500 GT restricted to near coastal voyages.
- **III/1** – Officer in Charge of an Engineering Watch (EOOW).
- **III/2** – Chief Engineer/2<sup>nd</sup> Engineer, vessel with > 3 000 kW propulsion power.
- **III/3** – Chief Engineer/2<sup>nd</sup> Engineer, vessel with 750-3 000 kW propulsion power.

Flag states have introduced additional sub-categorisations of these certificates (for example to introduce restriction categories for OOW and EOOW), but generally for convention sized vessels the requirements align well.

Mutual recognition of STCW certificates is also relatively well established, with a flag state able to issue a recognition certificate for holders of a CoC issued by another flag state whose training institutions are STCW approved and covered by a bilateral agreement with the flag state.

One significant difference between European flags (and especially relevant to the offshore industry) is the definition of “near-coastal voyage”. A summary of current requirements (also relevant for design criteria for small service craft) most relevant to the offshore sector is provided in Table 5-1.

**Table 5-1 Area restrictions applied for ‘Near-Coastal’ voyages**

Denmark	United Kingdom	Germany	Netherlands
Trade areas for small commercial vessels: <b>F5</b> – trade in the North Sea east of 4° westerly longitude, south of 62° northerly latitude and south of 56° northerly latitude in the Baltic. <b>F6</b> – trade as for F5, in addition to all sea areas within 100 nm of the nearest land.	Areas of operation for small workboats: <b>Area Category 2</b> – up to 60 nm from a safe haven <b>Area Category 1</b> – up to 150 nm from a safe haven* <b>Area Category 0</b> – Unrestricted service.	Coastal shipping range: <i>An international journey between Germany, Denmark, Poland or the European parts of the Netherlands.</i> <i>Small special craft (&lt;100 GT) are limited to 10 nm from shore (may be extended if built to Class rules).</i>	Near coastal: <i>A trading area that extends to a maximum of 30 nm from the coast, with the understanding that the vessel is no more than a 12-hour voyage away from a base port specifically referred to in the certificate of seaworthiness, and never more than six-hour voyage away from a sheltered harbour.</i>

\* In practice, the relevant area of operation restriction applied to CoC by the UK is 150 miles from a safe haven.

#### 5.1.1 Offshore service craft

Since they are generally non-convention vessels engaged on near coastal voyages, the competence requirements for crews of offshore service craft are covered by the most restricted categories of STCW certification. Flag states have therefore developed a range of sub-categories of certificate and requirements for the manning of these vessels and the competence of their crew, specific to the interests and requirements of their national maritime industries (summary provided in Table 5-2).

<sup>7</sup> Only STCW regulations relevant to deck and engine watchkeeping officers and command roles are listed, the Convention further defines requirements for ratings and specialised electro-technical roles.

**Table 5-2 National (minimum) requirements for service craft manning (craft < 500 GT)**

Jurisdiction	Master	Mate/Crew
<b>Denmark</b>	Master Home Trade	Mate 4 <sup>th</sup> class Second hand (< 200 GT) Certificate of proficiency in sailing (<100 GT)
<b>United Kingdom</b>	Master workboat Master code vessel (< 200 GT) RYA/MCA Yachtmaster Ocean Master code vessel (< 200 GT, 150 nm) RYA/MCA Yachtmaster Offshore (150 nm)	RYA/MCA Yachtmaster Coastal (150 nm) Second person deemed competent by owner/managing agent (60 nm)
<b>Germany</b>	Master Coastal (Coastal) Skipper small craft (<100 GT)	Bridge Watchkeeper
<b>Netherlands</b>	Master small ships Skipper-engineer (near coastal)	Chief mate small ships First maritime officer small ships

**Notes**

- This table assumes a minimum safe manning of two persons, for vessels < 24 m in Load Line length. With increasing vessel size the administration may require a larger number of crew (and this is increasingly becoming an industry standard).
- Alternative minimum certificates are shown, including additional vessel size or trade area restrictions as applicable.

Officers of service craft regulated under a HSC Code framework will be required to also hold a type rating certificate specific to the type and model of craft.

### 5.1.2 Self-elevating units

Self-elevating units present another challenge to the STCW framework, both for non-self-propelled and self-propelled units. The unique roles associated with the operation of mobile offshore units in general and self-elevating units in particular are not adequately addressed by STCW competencies, nor are STCW competences required for unmanned (or all non-self-propelled) units.

IMO Recommendations for MOU training/**2/** (includes column-stabilized, surface, submersible and self-elevating MOUs) provide expected competences and STCW requirements for the following roles relevant to self-elevating units:

- **Offshore Installation Manager (OIM)**  
Competent person, appointed to manage the offshore activities of the MOU.
- **Barge Supervisor [or Bargemaster/Jacking engineer]**  
Person who may provide support to the OIM in essential marine matters.
- **Maintenance Supervisor [or Chief Engineer]**  
Person assigned responsibility for the inspection, maintenance and testing of all machinery and equipment.

These functions are in addition to marine roles including that of the Master, however it should be noted that industry practice may combine some of these roles (i.e. the Master may also act as OIM and/or Bargemaster), depending on the size and function of the self-elevating unit.

The IMO Recommendations for MOU training/**2/** include the following guidance for STCW certification of self-elevating unit roles:

- OIM to hold CoC as Master or Chief Mate (with additional self-elevating unit specific stability training).
- Barge supervisor to hold CoC as Master, Chief Mate or Officer in Charge of a Navigational Watch (with additional self-elevating unit specific stability training)
- Maintenance supervisor to hold CoC as Chief Engineer, Second Engineer or Officer in Charge of an Engineering Watch.



Partly because the recommendations are targeted at MOUs in general and are neither specific to self-elevating units nor account for self-propelled self-elevating units, vessel operators experience difficulty in obtaining Certificates of Competency for the crews of self-elevating units. To address this, work is being undertaken by IJUBOA to develop a competence framework and clearer recommendations specifically for the roles of OIM, Bargemaster/Jacking Engineer and Maintenance Supervisor working on self-elevating units.

### 5.1.3 Dynamic positioning operator (DPO) certification

There are no STCW requirements for certification of DPOs on offshore vessels, however the industry has developed a well-established scheme of certification and competence assessment and this has been recognised by the IMO/**25/**, which invites Administrations to promote IMCA's guidance on the topic/**26/**.

The most widely recognised certification scheme is managed by the Nautical Institute<sup>8</sup>, awarding certification subject to:

- Any restrictions on the holders Certificate of Competency (vessel size, area of operation)
- The DP Class of the vessel

Operators of self-elevating wind turbine installation vessels find that fulfilling the requirements of the DPO Certification scheme (where experience is measured by time spent in DP mode) is a challenge for crew on these vessel types, where multiple, short duration DP operations are the typical mode of operation.

### 5.1.4 Industry guidelines

Offshore industry guidelines for marine crew competence have developed over a number of years, bridging the gap between generic STCW requirements and the more activity and vessel type specific needs of the industry. A selection of the most relevant guidelines are summarised below, also noting IJUBOA's development work referenced in section 5.1.2.

The UK National Workboat Association has developed guidance/**27/** on competency training for Masters and Crew of Offshore Energy Service Vessels (offshore service craft), including a requirement to be assessed as competent in (amongst other aspects):

- Vessel handling and manoeuvring (restricted to the propulsion type in use)
- Safe operation in wind farm service
- Emergency response procedures
- Knowledge of the vessel and its equipment

The scope of the NWA guidance is small, however it establishes an important framework for application by the association's members and is targeted at a vessel sector which until recently has had little published industry guidance of this type. Its development has been contemporary with that of the UK's Master Workboat CoC which references UK's National Occupational Standards (NOS) Maritime suite, expanding on many competence elements relevant to service craft crew in greater detail.

IMCA maintains a competence assurance and assessment framework for the offshore industries, including guidance for marine roles /**28/**. IMCA's framework is based around specifying the expected

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<sup>8</sup> An alternative certification scheme in use in the offshore industries is based on DNVGL-ST-0023 Competence of dynamic positioning operators. Certificates based from training centres complying with standard (along with other DNV GL competence standards) are recognised by the Norwegian Maritime Authority.



knowledge and demonstrable skills for different roles in both 'core' competences generic to all job functions and 'key' competences which are activity specific.

In the Marine Division guidance, activity specific competence requirements are defined for:

- DP Operations
- Anchoring
- Heavy lift
- Diving
- Survey/ROV

The marine crew roles covered by the Marine Division guidance include both STCW roles and non-STCW roles specific to the offshore industry:

- Master
- Chief Mate
- Bridge Watchkeeper
- Dynamic Positioning Operator (see also **/26/**)
- Ballast Control Operator
- Chief Engineer
- Engineer in Charge of a Watch
- Radio Operator
- Able Seafarer
- Electrotechnical Officer
- Electrician
- Rigger Foreman
- Rigger
- Crane Operator
- Heavy Lift Crane Operator

In addition to the main marine division guidance, IMCA has developed small workboat marine role guidance **/29/** intended for application to any vessel less than 200 GT. The guidance has been developed in response to a perceived need from the offshore wind industry.

- Master
- Deckhand/Able Seafarer
- Support Engineer
- Marine Co-ordinator

Activity specific competence requirements are defined for:

- Personnel Transfer
- Fuel Transfer
- Towage
- Anchor Handling
- Vessel-specific Crane Operations
- Diving Operations
- DP Operations

In the area of marine crew competence, the IMCA competency frameworks are probably the dominant additions to STCW requirements, representing a well-established and internationally recognised offshore industry standard for the activities concerned. In comparison to the more recently developed NWA guidelines they cover a broader range of competence elements and expand on the expected knowledge, abilities and means of demonstrating this in greater detail.

## 5.2 Technicians and contractors

Industry (in implementing national safety regulations) requires Technicians and contractors working within an offshore windfarm to have safety training appropriate to the hazards of their work and be provided with suitable personal protective equipment (PPE).



The dominant wind industry specific basic safety training standard **/30/** has been developed by the Global Wind Organisation (GWO), addressing:

- First aid
- Manual handling
- Fire awareness
- Working at height

For the offshore wind industry, an add-on sea survival module has also been developed.

Application of the GWO standard is increasing and mutual recognition has been agreed for other existing standards developed by the Bildungszentrum für Erneuerbare Energien (BZEE) or Training Centre for Renewable Energy **/31/** and RUK **/32/** with only minor deviations. However, it is important to note that national occupational health & safety regulations may impose (or be interpreted as imposing) additional requirements in excess of the GWO standard.

While much of the safety requirements are specific to work activities undertaken on an offshore installation, there are significant interfaces with maritime regulations standards, most notably regarding the status of technicians or contractors while embarked on a vessel and the compatibility of wind industry training standards with maritime requirements.

### 5.2.1 Industrial personnel

Existing maritime legislation makes a clear distinction between a vessel's crew and passengers not employed or engaged in any capacity on board a vessel on the business of that vessel. There are in addition to this distinction three other terms used in IMO documents:

- Special personnel
- Visitors
- Industrial personnel

Special personnel are expected to have received a defined course of instruction and practical experience in ship operations similar to STCW Basic Safety requirements. However, the definition of special personnel in the SPS Code specifically excludes persons onboard for transport or accommodation and applies only to work carried out onboard a vessel in connection with its special purpose.

The IMO Recommendations for MOU training **/2/** define three categories of offshore personnel (other than the marine crew):

- Category A: Visitors and special personnel not regularly assigned who are on board for a limited period of time, in general not exceeding three days, and who have no tasks in relation to the normal operations of the MOU.
- Category B: Other special personnel without designated responsibility for the safety, security and survival of others.
- Category C: Regularly assigned special personnel with designated responsibility for the safety, security and survival of others.

Category A offshore personnel are expected to receive a safety induction covering basic safety information and emergency response, while other categories of personnel are expected to receive more detailed familiarisation training and to have been provided with offshore safety training similar to STCW Basic Safety.

The term Industrial Personnel is also used in the SPS Code and the OSV Code, but no clear definition is provided. In both usages it is intended to exclude the application of the relevant code to industrial personnel who are transported or accommodated onboard for the purposes of offshore industrial activities.

The discrepancies arising from a lack of a definition for Industrial Personnel and the perceived need for such a definition to address changing needs of offshore industries have been recognised by various Flag States. The following agenda item was raised at the second session of the sub-committee on ship design and construction:

- **Guidelines addressing the carriage of more than 12 industrial personnel on board vessels engaged in international voyages (SDC 2/8)**

A draft definition of industrial personnel (as distinct from passengers, crew, special personnel or offshore personnel) including training and certification requirements was drafted and presented to the 95<sup>th</sup> session of the maritime safety committee (MSC 95) but not adopted.

This issue has been included in the 2016-17 biennial agendas for MSC and SDC with the target of completing “mandatory instrument and/or provisions addressing safety standards for the carriage of more than 12 industrial personnel on board vessels engaged on international voyages”. The existing draft definition for Industrial Personnel proposes that they should have received basic safety training according to relevant industry standards and can meet appropriate medical standards, in addition to having received a safety induction for the vessel which is transporting or accommodating them.

**Table 5-3 IMO Definitions – Persons on board/33/**

IMO Instrument	Definitions of persons on board and where they are used and defined									
	Passenger		Crew		Special Personnel		Visitor		Industrial Personnel	
	Used	Defined	Used	Defined	Used	Defined	Used	Defined	Used	Defined
SOLAS	Yes	Yes	Yes	No	-	-	-	-	-	-
SPS Code	Yes	No	Yes	Yes	Yes	Yes	-	-	Yes	No
OSV Code	-	-	-	-	Yes	No	-	-	Yes	No
MODU Code	-	-	Yes	No	-	-	Yes	Yes	-	-
MOU training /2/	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	-	-
<b>Definitions (Typical)</b>										
Passenger	Every person other than the Master and the members of the crew, or other persons employed or engaged in any capacity on board a ship in the business of the ship.									
Crew	All persons carried on board the ships to provide maintenance and navigation of the ship, its machinery, systems and arrangements essential for propulsion and safety of navigation or to provide services for other persons on board.									
Special Personnel	Persons who are not passengers or members of the crew and who are carried in connection with the special purpose of that ship or because of the special work being carried out on that ship. [Specifically <i>excludes</i> persons on board only for accommodation or transport]									
Visitor	Personnel not regularly assigned to a [mobile offshore drilling] unit.									
Industrial Personnel	[Not defined]									

The German Flag has effectively implemented the draft definition of industrial personnel in the Code for Offshore Service Craft (as “Offshore Service Personnel”). The United Kingdom’s application of the SPS Code treats industrial personnel as synonymous with special personnel and has extended the definition of the latter to specifically include wind turbine technicians among other offshore personnel.

## 5.2.2 Maritime standards for offshore roles

Although the scope of much offshore basic safety training is similar to that required by STCW, there are significant functional differences reflecting the differences in roles between the crew of a vessel and staff of an offshore installation and in general the offshore industry has tended to develop its own standards rather than accept STCW qualifications for offshore personnel.

This is particularly true for medical standards, where fitness assessment (as opposed to identification of underlying health conditions) forms a more significant part of the scope of offshore medicals. The types

of work undertaken in offshore wind (in particular the significant amount of working at height) increase the importance of this. The most widely applied medical standards in the offshore wind industry are:

- Hardanger agreement (mutual recognition of Oil & Gas UK, Norsk olje & gass and Nederlandse Olie en Gas Exploratie en Productie Associate approved medicals)
- Danish offshore medical (valid for Denmark only and based on Maersk, Hess and DONG Company standards)
- G41 (German statutory requirement for persons working at height)

Both the Danish and UK Flag states have stated that seafarer’s medicals are not suitable for workers in offshore wind and the suitability of existing offshore medicals for turbine technicians in particular should be questioned (see RUK’s Guidelines/**34/**). For other, vessel based non-marine crew roles however; both offshore and seafarer’s medicals may be accepted depending on Company policy and the nature of the work.

An area where maritime standards have been applied is sea survival training, where 3 different standards are in common use:

- OPITO Basic Offshore Safety Induction & Emergency Training (BOSIET)/**35/**
- GWO Basic Safety/**30/**
- STCW Personal Survival Techniques/**36/**

Each standard understandably focuses on the sea survival techniques seen as most critical to the industry for which the standard is developed. All however include practical demonstration donning of personal lifesaving appliances, basic individual and group in-water survival techniques and entry to a liferaft from the water (including immediate actions on boarding).

**Table 5-4 Main differences between sea survival standard practical demonstrations**

<b>OPITO BOSIET</b>	<b>GWO Basic Safety</b>	<b>STCW Personal Survival Techniques</b>
<ul style="list-style-type: none"> <li>• No entry to water at height requirement</li> <li>• No requirement to right a capsized liferaft</li> </ul>	<ul style="list-style-type: none"> <li>• No mustered entry to liferaft</li> <li>• Includes emergency descent from height</li> <li>• Includes marine transfer training</li> </ul>	<ul style="list-style-type: none"> <li>• No helicopter rescue techniques</li> </ul>

There is now a general industry trend towards wider application of the GWO standard, with recognition of the value of industry and activity specific training as opposed to the use of STCW.

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