

LEVERANSEMODELLER FOR HAVVIND

Regulators and legislation for offshore wind in selected countries

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Table of contents

1	INTRODUCTION AND SCOPE OF WORK.....	1
2	ABBREVIATIONS	2
3	REGULATORS AND LEGISLATIVE FRAMEWORK IN DENMARK, GERMANY, THE UK, AND NORWAY	3
3.1	Introduction to relevant framework	3
3.2	Offshore wind regulatory framework	4
3.3	Maritime regulatory framework	11
3.4	Country specific regulatory and legislative framework	13
4	SUMMARY	18
5	REFERENCES.....	21

1 INTRODUCTION AND SCOPE OF WORK

During 2020/2021, Norsk Industri conducts the project "Leveransemodeller for havvind" ("Delivery models for offshore wind"). This work includes a workflow called "Kartlegging av norske kompetansmiljøer innen havvind" ("Mapping of Norwegian competence within offshore wind").

DNV has been asked by Norsk Industri to create an overview of the regulators and legislation for offshore wind in the following countries: Denmark, Germany, the United Kingdom (UK) and Norway. This has been coarse mapping without thorough verification, and it should be seen in light of the constant development of the offshore renewable industry and especially the changes related to Brexit.

Offshore wind is new in Norway with limited development at the point in time for issuance of this report. However, it has been decided to develop a specific regulatory framework for offshore wind, which is now under development by Petroleum Safety Authority (PSA). It is noted that Equinor's Hywind Tampen floating wind farm, which will provide power to Snorre and Gullfaks platforms, are regulated under PSA's existing regulations for petroleum activities (/59/, /60/), but with adaptations related to use of offshore industry specific standards.

As the framework for offshore energy in Norway is under development, as an input to Norsk Industri, this regulatory mapping shows that regulations and competent authorities for offshore wind in Denmark and UK are similar for onshore and offshore wind except for maritime activities. In Germany, onshore wind is governed by the state building authority, while offshore wind is governed by Federal Maritime and Hydrographic agency of Germany (BSH). In this mapping, relevant onshore wind regulatory bodies in Norway have been identified and when relevant for offshore related aspects, framework for O&G has been mentioned. This report is based on internal DNV experience¹ and external sources as listed in section 5.

The following limitations apply to the study:

- The scope of work is restricted to acts and regulations in force in Denmark, the UK, Germany, and Norway.
- This report focuses on significant differences in the legal or conceptual basis behind such regulations, rather than providing an exhaustive list of national acts and regulations.
- Differences between Scotland, England, Northern Ireland and Wales have not been assessed in detail.
- Applicable industry standards, certification regimes and the relation between regulations and industry standards are not described in this report. This is covered in /16/ (publicly available in the link shown in /58/).
- The review does not consider any interface with aviation regulations.

For the purposes of this review, relevant acts and regulations for marine operations in offshore wind farms are those addressing:

- Marine coordination and emergency response
- Navigational safety and environmental impact
- Specific offshore construction and maintenance activities

¹ Especially the reports:

"Review of maritime and offshore regulations and standards for offshore wind", prepared by DNV on behalf of the Danish Maritime Authority (DMA) in 2015

"Overview of offshore wind standards and certification requirements in selected countries, prepared by DNV for Norsk Industri in 2020

2 ABBREVIATIONS

Table 2-1 Abbreviations

Abbreviation	Name	Country	Reference
BEIS	Department for Business, Energy and Industrial Strategy	UK	/39/
BG Verkehr	Berufsgenossenschaft für Transport und Verkehrswirtschaft	Germany	/36/
BMVI	Bundesministerium für Verkehr und digitale Infrastruktur	Germany	/37/
BSH	Bundesamt für Seeschifffahrt und Hydrographie	Germany	/38/
DEA	Danish Energy Agency	Denmark	/10/
DMA	Danish Maritime Authority	Denmark	/40/
DSB	Directorate for Civil Protection and Emergency Planning	Norway	/50/
EEZ	Exclusive economic zone	International	
G9	G9 Offshore Wind Health & Safety Association	International	/9/
HSE	Health and Safety Executives of Great Britain	UK	/66/
IALA	International Association of Marine Aids to Navigation and Lighthouse Authority	International	/33/
IEC	International Electrical Committee	International	/35/
IJUBOA	International Jack Up Barge Owners Association	International	/41/
IMCA	International Marine Contractors Association	International	/42/
IMO	International Maritime Organization	International	/5/
ITU	International Telecommunications Union	International	/43/
ISO	International Organization for Standardization	International	/44/
MCA	Maritime and Coastguard Agency	UK	/45/
MPE	Ministry of Petroleum and Energy	Norway	/46/
NMA	Norwegian Maritime Authority	Norway	/32/
NEA	Norwegian Environment Agency	Norway	/67/
NVE	The Norwegian Water Resources and Energy Directorate	Norway	/61/
NPRA	Norwegian Public Roads Administration	Norway	/34/
NWA	National Workboat Association	UK	/47/
Ofgem	Office of Gas and Electricity Markets	UK	/68/
PSA	Petroleum Safety Authority	Norway	/29/
RUK	RenewableUK	UK	/48/
WSV	Wasserstraßen- und Schifffahrtsverwaltung des Bundes	Germany	/49/

3 REGULATORS AND LEGISLATIVE FRAMEWORK IN DENMARK, GERMANY, THE UK, AND NORWAY

3.1 Introduction to relevant framework

In this section the current national regulatory and legislative framework relevant for offshore wind in Denmark, Germany, the UK and Norway are described. Frameworks for both offshore wind and maritime industry are included.

The information is based on publicly available information, in addition to the report “Review of maritime and offshore regulations and standards for offshore wind” prepared by DNV on behalf of Danish Maritime Authority (DMA) in 2015 /1/.

Legislative frameworks applying 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 exclusive economic zone (EEZ).

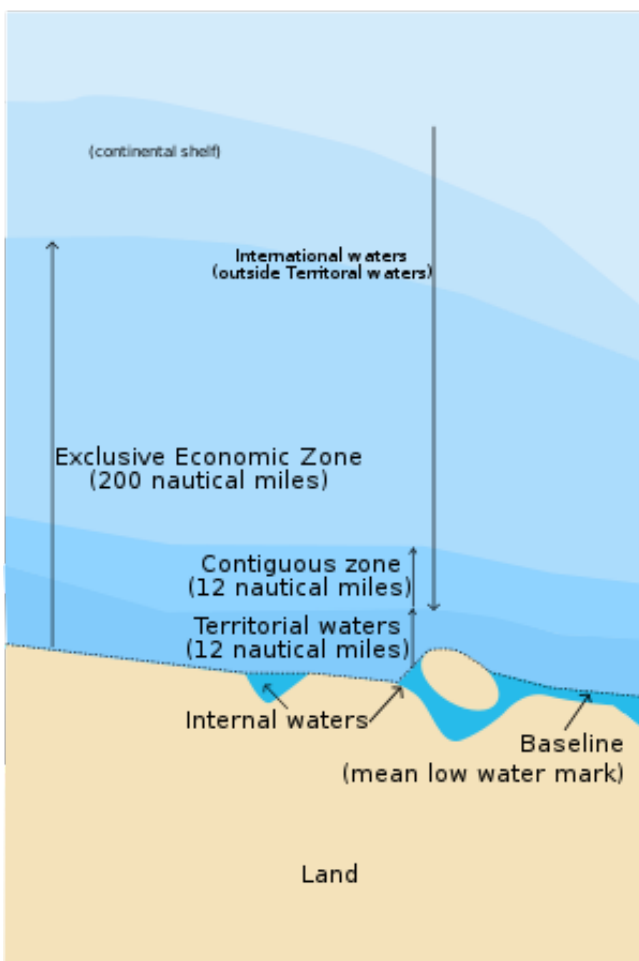


Figure 1 Exclusive economic zone (EEZ) as defined by United Nations Convention on the Law of the Sea (UNCLOS) (/2/, /3/)

Regulation falls into two categories;

- onshore legislation applied to offshore structures temporarily or permanently fixed to the continental shelf
- maritime legislation implemented into national regulations.

Activities in the EEZ are regulated both by national and international law. In the North Sea, all countries 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, regulatory responsibility and borders are defined by the following four roles:

- National state (regulating activities taking place onshore)
- Flag state (regulating vessels registered with the state and flying its flag)
- Coastal state (regulating activities taking place within the state's EEZ, i.e. use of the seabed, safety at sea)
- Port state (regulating vessels of another flag state operating within the port state's waters)

3.2 Offshore wind regulatory framework

The coastal state will exercise its functions through different competent authorities in different areas. For offshore wind, four main areas are of particular interest and investigated for the selected countries:

- Acts and regulations relevant for offshore wind
- Licensing and consent process
- Certification
- HSE regulations

These areas are described in more detail in the following subsections. It should be noted that for some of the countries, the regulatory framework relevant for offshore wind falls under the same acts as for onshore wind and regulatory bodies covers both offshore and onshore wind.

3.2.1.1 Acts and regulations relevant for offshore wind

Maturity of the different countries' strategic decisions for development of wind power, including offshore wind, differs, and so does the maturity of regulatory framework:

- Denmark is one of the pioneers in developing wind power and has installed wind turbines onshore since the 1970's. The "Promotion of Renewable Energy Act" was enforced from 2008.
- In Germany the political start of the offshore wind energy was in year 2000 with the implementation of the Renewable Energy Sources Act (EEG). In 2020 the "Offshore Wind Energy Act (/51/)" was amended.
- UK had its first offshore wind farm installed off Northumberland coast in 2000 /17/ and now their "Offshore wind Sector Deal" innovate and scale the offshore wind business largely /20/. UK government has also their governmental renewable energy roadmaps /21/.
- In Norway offshore wind was first on the political agenda in 2007 when the Stoltenberg II government issued the "Norwegian climate policy" that was approved by the Council of State. The Offshore Energy Act /24/ was enforced in 2020, but the regulatory framework is still under development and no offshore wind farms are installed on the continental shelf (except for the single Hywind demonstrator installed in 2009).

Table 3-1 gives an overview of acts specific for offshore wind (renewables) in the assessed countries. It should be noted that other acts may also regulate offshore wind and related topics like HSE or energy transmission security.

Table 3-1 Overview of acts specific for offshore wind (renewables)

Country	Act governing Offshore wind
Denmark	Promotion of Renewable Energy Act
Germany	Energy Industry Act (EnWG) Renewable Energy Sources Act (EEG) Offshore Wind Energy Act (WindSeeG 2017)
UK	Energy Act 2013 The Electricity Act 1989 (Requirement of Consent for Offshore Wind and Water Driven Generating Stations) (England and Wales) Order 2001
Norway	The Offshore Energy Act (Havenergilova)

This regulatory mapping has shown that Denmark and UK have similar regulations and competent authorities for onshore and offshore wind and less specific regulations for offshore wind except for the maritime part.

In Norway, PSA has developed HSE regulations applicable for offshore O&G activity, and together with Norwegian Environment Agency (NEA) and Norwegian Maritime Authority (NMA) are regulatory bodies for HSE for O&G. For onshore wind activities in Norway, HSE regulations and competence authority seems more diverse than for offshore O&G with more regulatory bodies e.g. The Norwegian Water Resources and Energy Directorate (NVE) Norwegian Labour Inspection Authority (Arbeidstilsynet), Directorate for Civil Protection and Emergency Planning (DSB), Municipal responsibility through "Planning and building acts". See chapter 3.2.1.2 for an excerpt of applicable relevant acts and regulations.

3.2.1.2 Licensing, subsidy, and consent process

An overall common practise for the assessed countries, is that they have done assessments of environmental consequence and sustainable development of offshore wind within their EEZ. These assessments support ministerial decisions on development of offshore energy licensing/leasing and relevant areas are opened in licensing rounds or auctions with varied frequency, for companies to announce their interest or bid.

Table 3-2 Relevant tendering, licensing and consent process

Country	Tendering, licensing, and consent process	Subsidy
Denmark	<p>1) Tendering process where Danish Energy Agency announces a site for a specific geographic area where applicants quote a kWh price to realise new offshore wind farms.</p> <p>2) Open door procedure: the project developer takes the initiative to establish an offshore wind farm. The project developer must submit an unsolicited application for a license to carry out preliminary investigations in the given area.</p> <p>Leases for offshore wind farms are awarded by the Danish Energy Agency, which is also responsible for issuing all required licences.</p>	<p>Owner of wind farm will have subsidy to cover the difference from market to quoted price.</p> <p>A feed in tariff mechanism guarantees tendered prices for 50,000 generating hours for up to 20 years.</p>
Germany	<p>WindSeeG update in 2020 has expanded with 20 GW towards 2030 and 40 GW towards 2040.</p> <p>The Federal Maritime and Hydrographic Agency (BSH) specifies the areas to be advertised and their respective times for tender in the area development plan (FEP) and carries out the preliminary investigation of the areas.</p> <p>Sites O-1.3, N-3.7 and N-3.8 are to be tendered in 2021 and commissioned in 2025.</p>	<p>In the tenders, the contract for the construction of an offshore wind project on a previously examined area is awarded to the bidder with the lowest bid value. If several bidders submit zero-cent bids on the same advertised space, the amended WindSeeG provides for a lottery procedure for the award of the contract. The lottery procedure is to be reviewed in 2022 for possible adjustments /52/.</p>
UK	<p>Leases for offshore wind farms are awarded by The Crown Estate. Consent is granted by Government ministers after examination by the Planning Inspectorate or Marine Scotland.</p>	<p>Subsidies are provided via a CfD which lasts for 15 years.</p> <p>Spring 2021 is a The Floating Offshore Wind (FOW) Demonstration Programme rolled out to with a competitive funding scheme to support the development of technologies and products for the floating offshore wind industry.</p>
Norway	<p>First opening of areas 01.01.2021. The consent process is not decided, and guideline document related to the application process from the ministry is expected spring 2021.</p>	<p>Not decided.</p>








3.2.1.1 Certification

Certification is commonly applied within the offshore wind industry, both of components e.g. Type certification of wind turbines and complete wind turbine structures or power plants including offshore substation and power cables i.e. Project Certification.



Project Certification is performed to attest that a wind power plant is fulfilling the defined requirements related mainly to structural integrity (applicable standards and state of the art knowledge) for the defined phases. Typically, the phases from development to construction and operations are included.

Table 3-3 shows the requirements related to certification from the authorities in the assessed countries. Reference is made to the DNV report made for Norsk Industri in 2020; “Overview of offshore wind standards and certification requirements in selected countries” (/16/, /58/) for further information about certification and industry standards.

Table 3-3 Overview of project certification requirements (Denmark: /22/, the other countries: /16/, /58/)

Country		Requirement for Project Certification	Main stakeholder and extent
Denmark			Responsible authority: Danish Energy Agency (DEA)/ Energistyrelsen (ENS) /10/ Requirement: The Executive Order BEK1773 /22/ requires that the mandatory modules for project certification laid down in the international procedure IECRE OD-502:2018 Project Certification Scheme and the referred ISO- and IEC-standards are covered. Alternative international scheme could be applicable, too.
Germany			Responsible authority: Federal Maritime and Hydrographic Agency (BSH) Requirement: Full project certification of the wind turbines and offshore substation, plus annual in-service certification of operating wind power plants according to BSH 7005:2015 standard.
Norway			Not yet decided (For petroleum installations, PSA requires sufficient third-party involvement organised by the operator.)
United Kingdom			Responsible authority: MCA/HSE Requirement: Health and Safety Legislation requires a company to prove that reasonable measures to ensure the safety of the structures are taken, in practice, certification of design basis and design phase are applied. Scotland: Marine Scotland requires third party certification or verification of floating wind turbines and their support structure incl. mooring. England & Wales: Not directly required by authorities, but common practice for design basis and design phase as described above.

Legend:

	requirement by laws/acts/orders
	indirect requirement e.g. by investors, insurance;
	currently no requirement



3.2.1.2 HSE regulations

HSE terminology is often referring to occupational health and safety, working environment issues and environmental aspects. Table 3-4 provides an excerpt of relevant laws and regulations relevant for HSE for offshore wind in the assessed countries. Here, the “S” also covers structural and electrical safety, construction, cyber and energy transmission security.

Table 3-4 Excerpt of relevant HSE regulations applicable to offshore wind

Country	Excerpt of Acts and Regulations applicable for wind (onshore and offshore) (HSE including personnel, structural and electrical safety, construction, cyber and energy transmission security)	Excerpt of regulations and guidelines specific for offshore wind
Denmark	<ul style="list-style-type: none"> • Consolidated Act No. 1084 of 19 September 2017 on working environment • Statutory Order on noise from wind turbines • Executive Order No. 1608 of 20 December 2017 on the safe operation of electrical plants • Executive Order No. 615 of 8 June 2010 on notification of work accidents to the Working Environment Authority • Executive Order No. 73 of 25 January 2013 on a technical certification scheme for wind turbines 	<ul style="list-style-type: none"> • Several regulations applicable for maritime operation, but no specific for offshore wind turbines
Germany	<ul style="list-style-type: none"> • Federal Immission Control Act (BImSchG) • Occupational Health and Safety Act (ArbSchG) • DGUV information sheet 203-007 previously: BGI 657 • DGUV Rule 113-004 Containers, Silos and Confined Spaces • DGUV Vorschrift 3 Accident prevention regulation • Guideline for wind turbines, effect and structural safety proof tests for the tower and foundation • Hazardous Substances Ordinance (GefStoffV) • Inspections of wind turbines according to DGUV regulation 3 • Operational Safety Ordinance (BetrSichV) • VDSI-Guideline 01/2013: Content of Work Safety Instructions and Training in the Wind Energy Sector (VDSI-Guideline) • Volume VII of the Social Insurance Code (SGB VII) 	<ul style="list-style-type: none"> • OSPAR Commission (2008). Guidance on Environmental Considerations for Offshore Wind Farm Development (Replaces agreements 2003-16, 2005-2, 2006-5, 2007-9). Reference number: 2008/-3. • OSPAR Commission (2004). Problems and Benefits Associated with the Development of Offshore Wind-Farms. ISBN 1-904426-48-4. • OSPAR Commission (2008). Assessment of the environmental impact of offshore windfarms. Reference number: 2008/-385. • OSPAR Commission (2006). Review of the Current State of Knowledge on the Environmental Impacts of the Location Operation and Removal/Disposal of Offshore Wind-Farms. Reference number: 2006/-278. • OffChEm – Chemical Emissions from Offshore Wind Farms • Several regulations applicable for maritime operation
UK	<ul style="list-style-type: none"> • Health and Safety at Work Act 1974 • Management of Health and Safety at Work Regulations 1999 • Design and Construction Management Regulations • Electricity at Work Regulations 1989 • Environmental Protection Act 1990 • Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013The • Climate Change Act 2008 • Planning Act 2008 • Security and Quality of Supply Standard (SQSS) • System Operator Transmission Owner Code (STC) • Statutory Instruments owned and enforced by HSE/local authorities (multiple) 	<ul style="list-style-type: none"> • <u>Regulatory expectations for emergency response 19.08.2019 (offshore wind) /55/</u> • Offshore Wind and Marine Energy Health and Safety Guidelines • Merchant Shipping Act 2019 • Marine and Coastal Access Act 2009 • Several regulations applicable for marine operation



Country	Excerpt of Acts and Regulations applicable for wind (onshore and offshore) (HSE including personnel, structural and electrical safety, construction, cyber and energy transmission security)	Excerpt of regulations and guidelines specific for offshore wind
Norway	<ul style="list-style-type: none"> • Pollution control act (Forurensningsloven) • Working Environment Act • The Planning and Building Act ("Plan- og bygningsloven") • Regulations on systematic health, safety and environmental work in enterprises (Internal Control Regulations) • Regulations on technical requirements for building works ("Byggteknisk forskrift - TEK10") • Regulations relating to building applications ("Byggesaksforskriften - SAK10") • Act on supervision of electrical installations and electrical equipment (Electricity Supervision Act) • Regulations on electrical supply systems (FEF) • Regulations on low-voltage electrical systems (FEL) • Regulations on electrical equipment (FEU) • Regulations on safety when working in and operating electrical systems with guidance (FSE) • Regulations on safety and emergency preparedness in the power supply (the emergency preparedness regulations) 	<ul style="list-style-type: none"> • HSE regulations specific for offshore wind turbine is under development • Several regulations applicable for marine operations exists

3.3 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.

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) (4/) and/or other national requirements.

The International Maritime Organization (IMO) (5/) is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. The two international conventions of most relevance to design and construction standards are the International Convention for the Safety of Life at Sea (SOLAS) (6/) and the International Convention on Load Lines (Load Line) (7/). 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.

3.3.1.1 Consent process for marine operations

The consent process impact on marine operations in a wind farm 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) (8/).

The EIA process ensures that environmental consequences of projects such as offshore wind farms are identified and assessed before authorisation is given. Potential environmental impacts and socioeconomic 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 considered 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 Search and Rescue (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 3rd 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 a SEA Statement.

3.3.1.2 Marine coordination in marine operations

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 coordination'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 coordination is supported by the G+ /9/.

3.4 Country specific regulatory and legislative framework

3.4.1.1 Denmark

Energistyrelsen (ENS, /10/) or the Danish Energy Agency (DEA) is the competent authority for Danish onshore and offshore wind 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 cooperation with the following other agencies:

- Miljøstyrelsen (/11/) or the Danish Environmental Protection Agency (DEPA)
- Søfartsstyrelsen (/12/) or the Danish Maritime Authority (DMA)
- Arbejdstilsynet (/13/) or the Danish Working Environment Authority (DWEA)
- Sikkerhedsstyrelsen (/26/) or the Danish Safety Technology Authority (DSTA)
- Beredskabsstyrelsen (/54/) or the Danish Emergency Management Agency (DEMA)

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 – Kystdirektoratet (/14/) or the Danish Coastal Authority (DCA)
- Vessel transfers from shore to offshore wind farm sites, including access to installation – the DMA
- Offshore wind farm sites – the DEA and the wind farm 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. The emergency preparedness is divided into two parts, the municipal emergency service and the Danish Emergency Management Agency. The Danish Emergency Management Agency is a governmental agency under the Ministry of Defence.

Den Maritime Havarikommission or the Danish Maritime Accident Investigation Board has responsibilities for investigation of accidents within Danish waters.

In 1995, a spatial planning committee for offshore wind was established and it still exists /65/. The committee is led by the DEA and consists of government authorities responsible for the natural environment, safety at sea and navigation, offshore resources extraction, visual interests and grid transmission conditions. Furthermore, the committee comprises expertise within the technical fields of wind power as well as turbine, foundation and grid technologies. Emphasis is also put on ensuring a planned and coordinated development of offshore wind farms and the associated transmission grid.

3.4.1.2 Germany

For offshore wind power plants, the Gesetz zur Entwicklung und Förderung der Windenergie auf See (Windenergie-auf-See-Gesetz - WindSeeG), § 47 Planfeststellungsverfahren, Sec, 1, item 5 applies. The Gesetz zur Entwicklung und Förderung der Windenergie auf See is published by the Bundesministerium für Wirtschaft und Energie.

The Bundesamt für Seeschifffahrt und Hydrographie (BSH or Federal Maritime and Hydrographic Agency) /15/ is a higher federal authority within the portfolio of the Bundesministerium für Verkehr und digitale Infrastruktur (BMVI or

Federal Ministry of Transport and Digital Infrastructure). It is the public institution for maritime tasks and the competent authority for maritime issues together with the Wasserstraßen- und Schifffahrtsverwaltung des Bundes (WSV or Federal Waterways and Shipping Administration). BSH is responsible for tasks such as averting dangers at sea, issuing official nautical charts and surveying tasks in the North Sea and Baltic Sea, as well as forecasting tides, water levels and storm surges. In addition, the BSH is responsible for the surveying of ships, flag law, the testing and approval of navigation and radio equipment and the issue of certificates for seafarers. With regard to construction projects in the North and Baltic Seas, the BSH is responsible for spatial planning and for the testing and approval of power generation systems (offshore wind turbines and offshore substations), cables and other systems within the scope of federal responsibility. The WSV examines wind farm projects for hazards related to navigation.

Federal Agency for Nature Conservation (BfN) is the competent nature conservation authority for the EEZ.

BSH and 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 carrier of statutory accident insurance for companies in the private sector, are responsible for preventing occupational health hazards and accidents.

The BSH 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 installed. 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, SeeAufgG), implemented by the Maritime Facilities Act (Seeanlagengesetz, SeeAnlG /57/). 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 (EIA) according to the standard outlined by the BSH. The BSH, in cooperation with experts, has also developed minimum requirements for mandatory geological/geophysical and geotechnical site investigation at planned wind farm sites. 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.

On January 1st, 2003 the Central Command for Maritime Emergencies (CCME) (Havariekommando) commenced operations /63/. The CCME is a joint institution of the German Federal Government and the Federal Coastal States. It was established to set up and carry out a mutual maritime emergency management in the North Sea and in the Baltic Sea. It is based in Cuxhaven (Northwest Germany). The Central Command for Maritime Emergencies is headed by a federal official. During daily work routine the CCME consists of about 40 employees, working in five different sections.

The Bundesnetzagentur and the regulatory authorities of the federal states are responsible for regulation of the gas and electricity networks. The legal framework for the Bundesnetzagentur's activities is the Energy Act (EnWG), the Renewables Energy Act (EEG) and Grid Expansion Acceleration Act (NABEG).

3.4.1.3 United Kingdom

In this section, the differences between Scotland, England, Northern Ireland and Wales have not been assessed in detail, but some difference between England and Scotland have described. It is noted that the regulatory aspect related to Brexit are complex and have not been assessed in detail. The below is excerpt of the situation in the UK.

The Department for Department for Business, Energy & Industrial Strategy (BEIS) has the overall responsibility for offshore energy projects in the UK, though in England and Wales some responsibilities are delegated to the Marine Management Organisation (MMO) and in Scotland to the Scottish Executive. It should be noted that Department of Energy and Climate Change (DECC) and Department for Business, Innovation and Skills (BIS) became part of BEIS in July 2016.

In England, the Marine Management Organisation (MMO) is responsible for preparing marine plans. Leases for offshore wind farms are awarded by The Crown Estate.

In Scotland, in 2010 the Marine Act introduced a new era for the management of Scotland's seas and the resulting National Marine Plan (2015) sets the wider context for planning within Scotland, including what should be considered when creating local, regional marine plans. In October 2020, a sectoral marine plan for offshore wind energy in Scotland was published /62/. The Plan will provide the strategic framework for the first cycle of seabed leasing for commercial-scale offshore wind by Crown Estate Scotland (the 'ScotWind' leasing round). In November 2017, Crown Estate Scotland (CES) announced its intention to run a further leasing round for commercial-scale offshore wind energy projects in Scottish waters. This Plan provides the spatial framework for this leasing round, by identifying which areas of seabed can be made available for leasing by CES. This is the first cycle of seabed leasing to be administered wholly within Scotland, with previous rounds being administered by The Crown Estate.

The Maritime and Coastguard Agency (MCA), an executive agency of the Department for Transport and the Health and Safety Executives of Great Britain (HSE) and Northern Ireland (HSENI), holds 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.

Floating structures are regulated by the MCA, while structures fixed to the seabed 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 coordination 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.

In Scotland, Marine Scotland under the Marine Act 2010 and the Marine and Coastal Access Act 2009, grants marine licenses. Marine Scotland requires that the Licensee of a floating wind farm provides evidence on third party certification/verification for all WTGs, mooring systems and WTG platform structures. The Licensee of a floating wind farm must complete an Emergency Response Cooperation Plan (ERCoP) for the construction and operation phases in cooperation with the MCA.

The HSE /66/ is a statutory body in Great Britain, whose main function is to secure 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 onshore and offshore accidents.

To ensure effective coordination 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” (/27/).

3.4.1.4 Norway

“Havenergiloven” (the “Offshore Energy Act” /24/), sets the framework for the utilization of renewable energy resources at sea. The Act became operational in 2010 with the aim to facilitate the utilization of the offshore renewable resources on the Norwegian Continental Shelf (NCS).

The Ministry of Petroleum and Energy (MPE, /46/) is awarded the responsibility for the regulations under the act. Further, the purpose of the Act is to ensure that utilization of resources and deployment of technology offshore is made in accordance to societal needs and ambitions, accounting for environmental aspects, energy distribution needs and competing business interests in the larger scheme of the framework. The Act applies to Norwegian sea territory outside the base line (“grunnlinjen”) and on the Norwegian Continental Shelf (NCS). The law stipulates that production facilities cannot be built, owned, or operated without a license from the Ministry of Petroleum and Energy (MPE). Before the opening of an area, an impact assessment shall be prepared. The impact assessments shall include assessments of environmental and societal consequences of renewable energy production, such as consequences for other business interests.

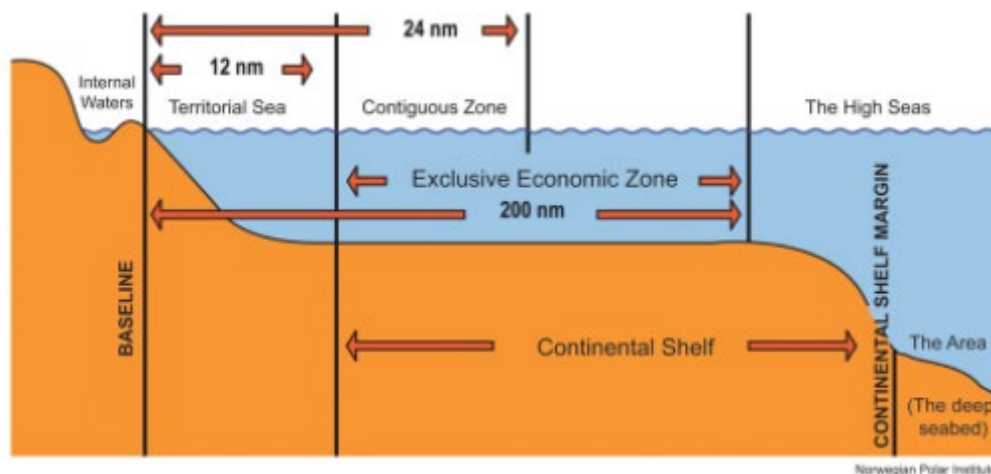


Figure 2 Norwegian sea territory (/28/)

“Havenergiforskriften” (“the Marine Energy Regulations”) were adopted on 12 June 2020 and enter into force on 1st of January 2021 /46/. The regulation is largely based on the proposed regulation that were sent for consultation in 2019. In the consultation memorandum to the regulations, the MPE expressed a desire to have similarities with the licensing process on land. A main difference between offshore and onshore wind farms, is that there is no private property right at sea, and the state will decide who has the right to use the different areas.

From 1st of January 2021, the areas Utsira Nord and Sørilige Nordsjø II were opened for offshore renewables /56/. MPE has the licensing authority for offshore wind. MPE will also be the receiver of the «meldinger²» and applications. NVE will support MPE with technical advices in the licensing process and have the authority to approve the detailed plans /61/.

² It is required to submit «Melding med forslag til utredningsprogram».

MPE has established a project for establishing regulatory framework for offshore wind farms. The purpose of the project is to consider and assess a framework allowing offshore wind resources to be developed for the benefit of the society. MPE will consider offshore wind farm projects when the overarching framework for offshore wind is further clarified.

The 17th of August 2020, it was announced that the Petroleum Safety Authority (PSA) has been given the responsibility for safety, working environment and emergency response in accordance with "Havenergiloven" (/24/) § 5.1 of renewable energy generation on the Norwegian Continental Shelf (NCS) (/29/).

A dedicated regulatory regime covering HSE in the offshore wind sector will be developed by PSA. The timeline for this regulatory regime is not yet clear, but it is expected that PSA will present the regulatory scope within next workshop of "Regulatory Forum" held before summer 2021. Insight from the ongoing process is that the regulation will be risk- and functional based with guidelines referring international standards.

Onshore wind industry in Norway is regulated by the following bodies:

- The Norwegian Water Resources and Energy Directorate (NVE) is the regulatory body for The Energy Act (Energiloven) which regulates projects inside of "grunnlinjen" and being connected to the Norwegian power system. NVE is also managing the licensing process for onshore wind. All plants with more than 5 wind turbines and a total installed capacity of more than 1 MW are subject to a license. NVE are also regulatory body auditing the energy transmission security and environmental issues addressed in the consent.
- The Norwegian Labour Inspection Authority (Arbeidstilsynet) is following up on the Working Environment Act and the Regulations on systematic health, safety and environmental work in enterprises (Internal Control Regulations).
- Directorate for Civil Protection and Emergency Planning (DSB) is following up on supervision of electrical installations and electrical equipment (Electricity Supervision Act) and is auditing the industry against this.
- The Norwegian Environment Agency (Miljødirektoratet) is following up on the Environmental act
- According to Regulations relating to building applications ("Byggesaksforskriften - SAK10"), an independent control of wind turbine constructions is required.

The Norwegian Coastal Administration (NCA) has been awarded the responsibility for safety zones and marking and this is regulated by "Forskrift om merking av og etablering av sikkerhetssoner tilknyttet innretning for fornybar energiproduksjon" (/30/). The NCA is a national agency for coastal management, maritime safety and preparedness against acute pollution (/31/). The NCA is under the Ministry of Transport and Communications.

The Norwegian Maritime Authority (NMA) ("Sjøfartsdirektoratet") is the administrative and supervisory authority in matters related to safety of life, health, material values and the environment on vessels flying the Norwegian flag and foreign ships in Norwegian waters (/32/). The NMA is also responsible for ensuring the legal protection of Norwegian-registered ships and registered rights in those ships. The NMA is subordinate to the Ministry of Trade, Industry and Fisheries and the Ministry of Climate and Environment. Their activities are governed by national and international legislation, agreements and political decisions.

For offshore O&G the operators are responsible for ensuring sufficient resources for search and rescue. The Joint Rescue Coordination Centres (Hovedredningsentralene) have the operational responsibility for coordinating available resources appropriate for search and rescue between government agencies, voluntary organizations and private companies. The Norwegian Coastal Administration is authority if acute pollution. The Norwegian Coastal Administration is responsible for coordinating state, municipal and private emergency preparedness in a national emergency preparedness system.

When it comes to responsibility towards reporting and investigation of accidents there is a spilt scenario; O&G is under the authority of Petroleum Safety Authority Norway (PSA) while maritime incidents are under the authority of Norwegian Maritime Authority (NMA).

4 SUMMARY

Table 4-1 gives an overview of the national and competent authorities for offshore wind in the assessed countries. As mentioned, in Norway the framework is not yet fully in place so regulator for both onshore wind and offshore wind are shown. If relevant, framework for O&G is mentioned in addition for offshore related aspect not relevant for onshore wind.

Table 4-2 gives an overview of required risk analysis and practices to reduce risk for the assessed countries. Also, here, there are uncertainties related to how this will be regulated in Norway. For the areas where the framework is not yet in place, the regulator for onshore wind and O&G are shown. If relevant, framework for O&G is mentioned in addition for offshore related aspect not relevant for onshore wind.

Table 4-1 National administrations and competent authorities for offshore wind (/1/)

Regulator	Denmark	Germany	UK	Norway
National state	Danish Energy Agency (DEA)	Federal Maritime and Hydrographic Agency of Germany (BSH)	Department for Business, Energy and Industrial Strategy (BEIS) Office of Gas and Electricity Markets (Ofgem)	Offshore wind: Ministry for Petroleum and Energy (MPE) / The Norwegian Water Resources and Energy Directorate (NVE) Onshore wind: The Norwegian Water Resources and Energy Directorate (NVE)
Coastal state	Danish Coastal Authority (DCA)	Federal Waterways and Shipping Administration (WSV*)	Marine Management Organization, (MMO**)	The Norwegian Coastal Administration (NCA)
Flag/port state	Danish Maritime Authority (DMA)	Federal Maritime and Hydrographic Agency (BSH) German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication (BG Verkehr)	Maritime and Coastguard Agency (MCA)	Norwegian Maritime Authority (NMA)
Spatial planning	Danish Energy Agency (DEA) + government authorities/ministries	Federal Maritime and Hydrographic Agency of Germany (BSH)	Crown Estate / Marine Management Organisation (MMO) (England) Crown Estate Scotland (CES)	Ministry for Petroleum and Energy (MPE) / The Norwegian Water Resources and Energy Directorate (NVE)
Electricity safety	Danish Safety Technology Authority (DSTA)	Federal Maritime and Hydrographic Agency (BSH)	Health and Safety Executive (HSE)	Offshore wind: Petroleum Safety Authority Norway (PSA)*** Onshore wind: Directorate for Civil Protection and Emergency Planning (DSB)
Construction safety	Danish Safety Technology Authority (DSTA)	Federal Maritime and Hydrographic Agency (BSH)	Health and Safety Executive (HSE)	Offshore wind: Petroleum Safety Authority Norway (PSA)*** Onshore wind: Municipal responsibility through "plan and building department"

Regulator	Denmark	Germany	UK	Norway
Energy transmission security	Danish Energy Agency (DEA)	Bundesnetzagentur	Office of Gas and Electricity Markets (Ofgem)	Both offshore and onshore wind: The Norwegian Water Resources and Energy Directorate (NVE)
Workplace safety	Danish Working Environment Authority (DWEA)	Responsibility of respective federal state authority.	Health and Safety Executive (HSE)	Offshore wind: Petroleum Safety Authority Norway (PSA) ^{***} Onshore wind: The Norwegian Labour Inspection Authority (Arbeidstilsynet)
Environmental regulator	Danish Environmental Protection Agency (DEPA)	Federal Agency for Nature Conservation (BfN)	Environment Agency (EA)	Both onshore and offshore wind: Norwegian Environment Agency (NEA)
Emergency preparedness	The Danish Emergency Management Agency (DEMA)	Central Command for Maritime Emergencies (CCME)	Maritime and Coastguard Agency (MCA)	Offshore wind: Petroleum Safety Authority Norway (PSA) ^{***} Offshore O&G and maritime: The Norwegian Coastal Administration (NCA) is authority if acute pollution Onshore wind: Municipal responsibility through Emergency services

* Within 12nm of the coast, state agencies have the jurisdiction responsibility, although the BSH have the overall responsibility for offshore wind.

** Some responsibilities are devolved in Scotland

*** Although PSA has been appointed as regulator, the specific regulations for offshore wind are under development and are not yet published.

Table 4-2 Overview of National requirements of required risk analysis and practices to reduce risk (/1/)

Analysis/practice	Denmark	Germany	UK	Norway
Requirements for safety and emergency studies	No national guidance specific to wind farms	Studies shall be performed to produce the required protection and safety concept	Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)	Onshore wind: Internal Control Regulations requires identification and analyses of risks. Offshore O&G: PSA requires safety studies
National requirements for environmental studies	Guidance document on Environmental Impact assessment by the DEA	Standards for the Environmental Impact Assessment issued by the BSH	Reference made to Guidelines of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)	Onshore wind: Internal Control Regulations requires identification and analyses of risks Offshore O&G: Norwegian Environment Agency (NEA) requires safety studies. EIA is often part of the consent process.
Navigational risk analysis	Required, evaluated by DMA.	Required, evaluation by BSH and operator.	Performed by authorities as part of the process to open an area for development.	Part of the Environmental Impact Assessment (EIA)
Safety zone during construction	500m	500m	500m	The Norwegian Coastal Administration (NCA) has been awarded the responsibility for safety zones and marking and this is regulated by "Forskrift om merking av

Analysis/practice	Denmark	Germany	UK	Norway
				og etablering av sikkerhetssoner tilknyttet innretning for fornybar energiproduksjon" (/30/).
Safety zone during operation	None	Normally 500m and the area are closed for passaging.	Normally none but may apply for 50m.	May be up to 500m, ref. NCA
Required distance to shipping lanes	None, but some projects have applied 2 times largest ship length (based on ship traffic analysis)	500m safety zone, plus buffer zone to large ships of 2 nautical miles	Evaluation of ship traffic per project. Guidelines for recommended distance are available.	Within the safety zone, restrictions may be imposed on traffic and other use of the waters, for example a ban on specific groups of vessels, anchoring, fishing or such like /30/.
Marking of wind farms	IALA O-139	IALA O-139	IALA O-139	NCA and /30/: Owner is responsible for marking such that facility is visible for seafarers. The requirements refer to the manual published by NPRA or recommendations or guidelines by IALA. Reference is also made to IMO, ITU and IEC.

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