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Jurisdictional Scan of Suitable Area Definition for Offshore Wind Development

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Executive Summary

Offshore wind power is a rapidly growing industry around the world, with numerous countries developing their respective offshore wind generation capacities. Global leaders include the United Kingdom, Germany, Belgium and China. In jurisdictions with established offshore wind sectors, governments have typically taken on roles that comprise regulating development activities, forming Marine Spatial Plans (MSPs), defining offshore wind leasing areas, conducting stakeholder engagement and disseminating relevant information to the public.

While Canada has not yet developed any offshore wind infrastructure, the adoption of the *Canadian Energy Regulator Act* (CERA) in 2019 provides the new Canadian Energy Regulator (CER) with jurisdiction over offshore renewable energy projects. In Canada, Atlantic Canada Offshore Developments and Northland Power are the most active Canadian developers in the offshore wind industry.

CanmetENERGY-Ottawa (CE-O) has been engaged by the Renewable and Electrical Energy Division (REED) within Natural Resources Canada (NRCan) to conduct preliminary research and analysis to support future decision making regarding offshore wind in Canada. This study examines approaches taken in other jurisdictions to characterize the various technical, environmental and socio-economic considerations deemed relevant to offshore wind, and to document steps taken within the jurisdictions to establish offshore wind leasing areas, if applicable. This information is expected to be valuable should an exercise be undertaken in the future to evaluate appropriate areas for offshore wind in Canada.

Upon reviewing the offshore wind industries of the United Kingdom (UK), Germany, Belgium, Denmark, the Netherlands and the United States (US), broad similarities were observed between jurisdictions. Several countries including the UK, the US and the Netherlands have administered processes to formally define offshore wind leasing areas, and have then held competitive auctions to transfer development rights to the successful bidder. In addition, many countries have undertaken MSP processes covering large geographic areas to manage interactions between various ocean activities, one of which is offshore renewable energy development. These jurisdictions have typically employed a permitting process whereby applications for offshore wind projects within the MSP area are evaluated on a case-by-case basis.

Most jurisdictions use a combination of exclusions and restrictions to categorize various ocean use considerations and to assist in identifying appropriate areas for offshore wind development. In this report, exclusions are generally defined as areas where no further development or activity is permissible, whereas restrictions, also termed priority considerations in some cases, do not necessarily prohibit further activity, but may have certain constraints or conditions attached. Common exclusions identified amongst jurisdictions include:

- Shipping lanes
- Existing offshore wind zones
- Pipelines
- Environmental protected areas
- Oil and gas extraction
- Military activity
- Unexploded ordnance

- Material disposal sites
- Submarine cables

Common restrictions include:

- Fisheries
- Aquaculture
- Leisure and tourism
- Heritage
- Scientific research

The table below presents a summary of approaches taken by other jurisdictions to characterize ocean use considerations with respect to offshore wind.

Consideration	DE[1]	BE[2]	NL[3]	DK[4]	US[5]	UK[6]
Shipping	●	●	●	◒	●	●
Existing offshore wind zones	●	●	●	◒		●
Pipelines	●	◒	●	◒	●	●
Environmental protected areas	●	◒	●	◒	●	◒
Oil and gas extraction	◒		●	◒	●	●
Military activities	◒	◒	●	◒	●	◒
Material extraction / dredging	◒	◒		◒	●	●
Submarine cables	◒	◒	◒	◒		●
Heritage		◒	◒		◒	●
Material disposal					●	◒
Unexploded ordnance					●	
Fisheries	◒	◒	◒	◒	◒	◒
Leisure and tourism	◒		◒	◒		
Aquaculture		◒	◒	◒		◒
Scientific research / interest	◒	◒				
Other[7]					◒	◒

MSP process

Leasing area definition process

[1] Germany MSP
[2] Belgium MSP
[3] Netherlands MSP
[4] Denmark MSP
[5] Rhode Island SAMP
[6] UK Round 4 Lease
[7] e.g. ports, airports, anchorage, offshore tidal, CO_2 storage, mineral evaporites

● Exclusion

◒ Restriction or identified priority

This report is intended to provide an overall snapshot of different approaches that may be useful for consideration should a similar exercise of offshore wind lease area designation occur within Canada. It is not intended to provide an overall assessment of the MSP framework in a given jurisdiction, nor does it thoroughly examine stakeholder dialogue and consultation processes or strategies for conflict resolution.

Table of Contents

Glossary

ADP	Areas Designated for Preservation
APC	Area of Particular Concern
BOEM	Bureau of Ocean Energy Management
BPNS	Belgian Portion of the North Sea
BSH	Federal Maritime and Hydrographic Agency
CE-O	CanmetENERGY-Ottawa
CER	Canadian Energy Regulator
CERA	Canadian Energy Regulator Act
CREG	Belgian Federal Energy Regulator
DFO	Department of Fisheries and Oceans
DMA	Danish Maritime Authority
DOI	Department of the Interior
EBA	Ecosystem-Based Approach
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
GSC	Geological Survey of Canada
LOMA	Large Ocean Management Areas
MaPP	Marine Plan Partnership for the Canadian Pacific North Coast
MSP	Marine Spatial Plan
MUMM	Management Unit of the North Sea Mathematical Models
NEA	Netherlands Enterprise Agency
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
NRCan	Natural Resources Canada
NREL	National Renewable Energy Laboratory
NYSERDA	New York State Energy Research and Development Authority
O&G	Oil and Gas
OREC	Offshore Wind Renewable Energy Certificate
OSW	Offshore Wind
PNCIMA	The Pacific North Coast Integrated Management Area
PPA	Power Purchase Agreement
PPP	Power Production Potential
REED	Renewable and Electrical Energy Division
REZ	Renewable Energy Zone
RFP	Request for Proposals
SAMP	Special Area Management Plan
SDE+	Stimulation of Sustainable Energy Production
SEA	Strategic Environmental Assessment
SMZ	Special Management Zone
SPA	Special Protected Areas
TDI	Technology Development Index
TSO	Transmission System Operator
UK	United Kingdom
UN	United Nations

Tables and Figures

1. Introduction

1.1 Context

While Canada has not yet developed any offshore wind infrastructure, the adoption of the *Canadian Energy Regulator Act* (CERA) in 2019 provides the new Canadian Energy Regulator (CER) with jurisdiction over offshore renewable energy projects. Furthermore, the Renewable and Electrical Energy Division (REED) within Natural Resources Canada (NRCan) has begun efforts to establish the regulatory framework for future offshore wind energy projects. These legislative and regulatory efforts correspond with offshore wind developers proposing projects and identifying areas of interest in Canadian coastal areas.

One aspect of work required to support these efforts involves characterizing existing offshore conditions so that areas approved for possible development are environmentally safe and well-defined with respect to other ocean space users. This characterization work supports a variety of possible future activities, including Strategic Environmental Assessments (SEAs), wind resource and geotechnical assessment campaigns, and the designation of offshore wind leasing areas.

This report summarizes the approaches taken in other jurisdictions to define potential offshore wind lease areas and identifies important considerations necessary for conducting a similar analysis in Canada. Canada has an opportunity to learn from other governments and regulatory bodies who have examined environmental and socio-economic issues associated with proposed plans or policies that allow offshore wind development, who have engaged in marine spatial planning (MSP) initiatives [1] and who have allocated designated leasing areas for offshore wind.

This report is intended to provide an overall snapshot of different approaches that may be useful for consideration should a similar exercise of designating offshore wind lease areas occur within Canada. It is not intended to provide an overall assessment of the MSP framework in a given jurisdiction, nor does it thoroughly examine stakeholder dialogue and consultation processes or strategies for conflict resolution.

1.2 Report Outline

This report is organized as follows: Section 1 provides an overview of the global status of offshore wind. Section 2 specifies the approach taken to complete the study, including the type of literature reviewed. Section 3 contains a review of marine spatial analysis and offshore wind area definitions undertaken by various jurisdictions as a precursor to offshore wind development. Section 4 presents a summary of the jurisdictional scan with some key takeaways, and Section 5 provides considerations for a Canadian context along with recommendations for future work.

1.3 Global Offshore Wind Status

Total cumulative offshore wind capacity reached over 29 GW in 2019, which represents roughly 4.7 percent of total global wind capacity [2]. A breakdown of installed capacity by country is shown in

Table 1. While about 80% of offshore wind capacity is currently located in Europe, significant growth is expected in Asia and North America over the next decade. Global offshore wind capacity is expected to grow to between 154 and 193 GW by 2030 [3].

The cost of offshore wind continues to decline. European offshore wind auction and power purchase agreement (PPA) data demonstrates a price decline from about CAD 275/MWh for projects that reached commercial operation between 2017 and 2019, to about CAD 100/MWh for projects that will reach commercial operation between 2024 to 2025[1] [3]. Recent projects approved in New York state, for example, demonstrated average all-in development cost projections in their bids of CAD 113/MWh[2] [4].

Offshore wind turbine manufacturers continue to innovate to produce larger, more efficient turbines, with individual nameplate capacity likely reaching 12 to 15 MW in this decade [3]. Developers are also beginning to use high-voltage cables to lower electrical infrastructure costs.

While almost all existing commercial offshore wind farms use fixed-bottom foundations, as offshore wind farm development is being considered for deeper waters and farther from shore, floating wind turbine technology is expected to gain prominence going forward [5]. There are currently five floating offshore wind turbines installed in Scotland and four in Japan, representing 46 MW overall, with another 14 projects representing 200 MW under construction and 4,888 MW in the global pipeline [3].

Table 1: Global Offshore Wind Installed Capacity [2]

	New installed capacity 2019 (MW)	Total installed capacity (MW)
Total offshore	**6,145**	**29,136**
Europe	3,627	21,903
United Kingdom	1,764	9,723
Germany	1,111	7,493
Belgium	370	1,556
Denmark	374	1,703
Netherlands	0	1,118
Other Europe	8	310
Asia-Pacific	2,518	7,204
China	2,395	6,838
South Korea	0	73
Other Asia	123	292
Americas	0	30
USA	0	30

[1] Prices converted from USD 200/MWh and USD 75/MWh, respectively, using Bank of Canada conversion factors.

[2] USD 83.36/MWh, USD 25.14/MWh, and USD 0.73/month, respectively. Converted with Bank of Canada rates.

2. Methodology

2.1 Focus Areas and Rationale

This study aims to better understand how different jurisdictions have balanced marine uses such as shipping, environmental conservation, military, fisheries, resource extraction, cables and pipelines, and tourism, with the ocean area use requirements of offshore wind farms. Specifically, this study aims to identify:

- The process undertaken by various jurisdictions to designate offshore wind lease areas
- How different jurisdictions have characterized the spatial needs of offshore wind farms, including wind conditions, seabed suitability, the presence of existing infrastructure such as cables and pipelines, requirements for new underwater electric cables, the presence of wrecks and other archaeological remains, and proximity to port facilities, onshore transmission interconnection points, and onshore maintenance facilities
- Considerations recognized by other jurisdictions in designating offshore wind lease areas in relation to fisheries, ecologically and biologically significant areas and critical habitats
- Considerations recognized by other jurisdictions with respect to the social impacts of offshore wind farms such as horizon visibility, and offshore area use for leisure, travel, and tourism activities

2.2 Key Reports Reviewed

Generally, reports reviewed for this study include those that were produced by, or produced for use by, national governments to inform the designation of maritime areas within their territorial waters as suitable for, or restricted from, development of offshore wind. Other useful reports tended to be detailed reviews of government policy or offshore wind development processes that were produced by non-governmental organizations (NGOs) such as industry associations. In general, the European MSP platform[3] is an effective repository for MSP activities in Europe. The Intergovernmental Oceanographic Commission's website is also generally useful for information on a given country's MSP practices[4]. Table 2 contains key reports that were of particular value for this study. A full list of references is available in Section 6.

[3] https://www.msp-platform.eu/msp-practice/countries
[4] http://msp.ioc-unesco.org/world-applications/overview/

Table 2: Selection of Key Reports Reviewed for this Study

Jurisdiction	Report Title	Organization	Reference
United Kingdom	*Resource and Constraints Assessment for Offshore Wind: Methodology Report*	The Crown Estate	[8]
Germany	*WWEA Policy Paper Series - Germany*	World Wind Energy Association (NGO)	[10]
Belgium	*Maritime Spatial Planning Country Information - Belgium*	European MSP Platform (NGO)	[13]
Denmark	*Danish Experiences from Offshore Wind Development*	Danish Energy Agency	[18]
Netherlands	*Policy Document on the North Sea 2016-2021*	The Dutch Ministry of Infrasture and the Environment The Dutch Ministry of Economic Affairs	[22]
United States	*Rhode Island Ocean Special Area Management Plan – Chapter 8: Renewable Energy and Other Offshore Development*	Rhode Island Coastal Resources Management Council	[27]

3. Jurisdictional Scan

3.1 United Kingdom

3.1.1 Industry Summary

As of the end of 2019, the United Kingdom holds 33% of global offshore wind (OSW) capacity [2]. The UK MSP is split into four different areas managed by England, Northern Ireland, Scotland and Wales, respectively. A Maritime Policy Statement was prepared in 2011 by the UK, Scottish, Irish and Welsh governments following the *Marine and Coastal Act* in 2009 and the *Scottish Marine Act* in 2010 [6]. In the UK, MSPs are prepared by the regulatory bodies listed in Table 3 [6]. As of the *2004 Energy Act*[5], the UK's Exclusive Economic Zone (EEZ) (Figure 4 in the Appendix) was defined for potential wind and wave power, with exploitation rights in this area belonging to the crown [7]. The Crown Estate's activities defining OSW leasing areas ultimately feed into the designated wind areas recognized in the UK's various MSPs [8].

Table 3: The UK Jurisdictions' MSP Authorities [6]

UK Jurisdiction	MSP Authority
England	Marine Management Organisation (responsible for MSP preparation) The Department for Environment, Food & Rural Affairs (statutory body for MSP)
Scotland	Marine Scotland
Wales	The Welsh Government
Northern Ireland	The Department of Agriculture, Environment and Rural Affairs

3.1.2 Development Process

The most recent area delineation activity undertaken by the Crown Estate was the Offshore Wind Leasing Round 4, which aimed to characterize potential offshore wind leasing areas on the English, Welsh and Northern Irish seabeds [8]. In this activity, four processes were employed to refine the leasing areas as described below and in Figure 1:

1. A technical resource model defined desirable areas for development based on water depths ranging from 5 to 60 m, geological considerations and accessibility due to wave exceedance over 2.5 m.
2. An exclusions model (hard constraints) removed areas with constraints that preclude further development, such as existing infrastructure or areas that are unfeasible for development due to health, safety, policy or other concerns.
3. A restrictions model (soft constraints) identified and characterized all other criteria considered based on the constraints each would impose on new offshore wind development, while not necessarily prohibiting development.

[5] http://www.legislation.gov.uk/ukpga/2004/20/notes

4. The characterization areas were defined by combining the previous three stages and identifying the 50% of potential areas that were least constrained by each feature, breaking these down into the resultant characterization areas for further review [8].

Figure 1: High Level Stages of Resource and Constraints Models Demonstrating Subsequently Decreasing Footprints [9]

The finalization of the characterization areas employs the resource, exclusions and restrictions models to optimize leasing areas [8]. While the exclusions model comprises areas precluded from development, the restrictions model is particularly focused on the review of areas which may restrict OSW development [8]:

- Environmental impacts
- Visibility from land and distance to coast
- Avian activity outside of special protected areas (SPAs)[6]
- Military use
- Fishing
- Oil and gas helicopter platforms
- Existing MSPs
- Other key resource usages

Once the leasing areas are defined, the Crown Estate makes their analysis of the areas available for review, helping to inform potential bidders [9]. The leasing approval process then proceeds according to the following steps [9]:

1. Prequalification Questionnaire – Determines eligible bidders by assessing bidders' economic, technical, and legal compliance.

[6] SPAs are defined as part of the European Union's (EU) network of protected "Natura 2000" sites. In particular, SPAs are sites defined under The Birds Directive with the aim of protecting the ~500 bird species found in the EU. https://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm

2. Invitation to Tender Stage 1 – Assesses technical and financial robustness of projects submitted by eligible bidders.
3. Invitation to Tender Stage 2 – A multi-cycle bidding process based on option fees of eligible bidders that awards contracts until a specific amount of OSW capacity is met (7 GW in the case of the Round 4 lease).
4. Plan-Level Habitats Regulations Assessment (HRA) – The Crown Estate performs an HRA to assess potential impacts to relevant nature conservation sites.
5. Agreement for Lease – The Crown Estate enters into a Wind Farm Agreement for Lease with successful bidders.

3.1.3 Spatial Priorities

The English MSP is separated into 11 distinct sections that are further defined by their location relative to the mainland (North, South, East and/or West, Inshore or Offshore) [6]. Inshore and Offshore essentially comprise the areas bounded by the limits of the territorial sea (12 nm) and exclusive economic zone, respectively [6]. England is aiming to have MSPs in place for each of these offshore areas. Currently, MSPs have been completed for the Eastern (Inshore and Offshore) and Southern (Inshore and Offshore) maritime areas, while the remaining areas are expected to be completed by 2021 [6]. The Eastern Inshore and Offshore MSPs are provided in Appendix B – United Kingdom.

The Eastern MSPs are governed by 11 high-level objectives related to the sustainable development of England's maritime area, along with policy statements on the following areas:

- Economic
- Social and cultural
- Environment
- Climate change
- Governance
- Defence
- Oil and gas
- Offshore wind
- Tourism and recreation
- Tidal stream and wave power
- Carbon capture and storage
- Ports and shipping
- Dredging and disposal
- Aggregate
- Subsea cabling
- Fisheries
- Aquaculture

The Southern MSPs were similarly developed according to 12 objectives and the policies, as opposed to being specific to different aspects of marine development, are cross-cutting and apply to various maritime areas on topics required by legislation [6].

Scotland currently has two MSPs, one at the national level, and the other specific to the Shetland Islands. Scotland's National MSP chapters cover the following topics [6]:

- Sea fisheries
- Aquaculture
- Wild salmon and diadromous fish
- Oil and gas
- Carbon capture and storage
- Offshore wind and marine renewable energy
- Recreation and tourism
- Shipping, ports, harbours and ferries
- Submarine cables
- Defence
- Aggregate

The Shetland Islands' MSP considers the following sectors [6]:

- Commercial fishing
- Aquaculture planning framework
- Seaweed cultivation
- Oil and gas exploration and decommissioning
- Renewable energy
- Marine aggregate extraction
- Tourism
- Shore access and moorings
- Cables and pipelines
- Commercial moorings for weather and radar masts
- Marine transport
- Future ferry/harbour developments
- Dredging and disposal

The Welsh and Northern Ireland MSPs are currently being prepared, following a public consultation phase [8].

3.2 Germany

3.2.1 Industry Summary

As of the end of 2019, Germany holds 26% of global offshore wind capacity and has the second-largest offshore wind capacity in the world, after the UK [2]. The coastal states in Germany, Schleswig-Holstein and Mecklenburg-Vorpommern, for the North and Baltic Territorial Seas, respectively, are responsible for the German territorial sea, which is defined as the area within 12 nm, roughly 22.2 km, of the shoreline [10]. The state's responsibility in this zone involves granting permissions to offshore projects and the administration of grid connection [10]. The basis for project approval within 12 nm is provided by the *Federal Pollution Control Act* [10]. Projects in this area are desirable due to shallow waters, however they are rarely approved due to higher impacts on the environment and landscape. There are currently only two projects within the 12 nm zone: one each in the North Sea and the Baltic Sea [10]. Developments in Germany's offshore wind industry lie primarily in the exclusive economic zone (EEZ), which lies beyond

the 12 nm zone and is shown in Figure 4, Section 7.1 [10]. Germany's North Sea MSP is provided in Appendix B – Germany.

3.2.2 Development Process

Project development in the EEZ falls under the jurisdiction of federal law, and the approval process can be broken down into five stages:

1. Comments are requested from competent authorities such as the Federal Agency for Nature Conservation.
2. Other stakeholders get involved, including the public—this phase also includes an application conference meeting whereby the project is presented.
3. The applicant prepares an Environmental Impact Assessment (EIA) and risk analysis based on environmental studies.
4. The standard investigation concept considers the most important requirements for a project's approval by reviewing the construction phase, operating phase, deconstruction phase, environmental protection and grid connection.
5. The Federal Maritime and Hydrographic Agency (BSH) reviews requirements for approval of a project and subsequently notifies the proponent if the project is approved [10].

Wind farm site selection in Germany is typically based on an exclusion approach whereby areas are excluded from consideration based on various sensitive factors. Among the highest priority considered are: average wind speed, construction restrictions (existing infrastursture, shipping lanes, etc.) and buffer zones around sensitive areas [11]. After the initial exclusion exercise, remaining areas are evaluated on a site-by-site basis. The environmental impact assessment is required under German law, and guidelines for environmental protection are defined primarily by Germany's *Federal Nature Conservation Act* [11].

3.2.3 Spatial Priorities

The MSPs for the German EEZs (Figure 4, Appendix A) identify six priority areas for OSW energy: four in the North Sea and two in the Baltic Sea. The areas of the MSP are broken down into priority and reservation areas for relevant area uses. Priority areas for a given area prohibit other activities unless they are compatible with the existing priority use. Reservation areas are otherwise particularly important, but not strictly prohibitive to development in the same area. The German EEZ MSP has designated priority areas for shipping and offshore wind development, and reservation areas designated for shipping, pipeline and scientific research. Additional considerations include existing natural resources, submerged cables, military and leisure [11].

3.3 Belgium

3.3.1 Industry Summary

As of the end of 2019, Belgium holds approximately 5% of global offshore wind capacity [2]. Belgium's offshore potential lies in the North Sea, which is sub-divided into its territorial sea (within 12 nm from the shore) and its EEZ which covers approximately 2,000 km^2. The Belgian MSP process has been ongoing since 2003, when the government initiated a 'Master Plan' to allocate marine areas to specific uses [12]. The original driver for this plan was demand for offshore wind farms and requirements to

safeguard European protected areas (Natura 2000 sites[7]) [12]. Belgium has an MSP in place which was developed by the Belgian Minister for the North Sea and is expected to be updated to reflect Belgium's plans for 2020–2026 [13]. The current MSP is provided in Appendix B – Belgium. One significant addition to the updated MSP will be a new OSW-designated area [14].

3.3.2 Development Process

Historically, the Belgian OSW project approval process has required a project proponent to acquire three types of permits before beginning construction, as outlined in Table 4 [15]. Payments for the projects are then carried out by the issuance of Green Certificates from the Belgian federal energy regulator (CREG) for every MWh of power fed into Belgium's power grid by a given OSW farm [14]. The Federal Government defines minimum sale prices for these certificates to be sold to Elia, the transmission system operator (TSO) [15]. On April 4, 2019, however, the Belgian government adopted a law aiming to establish principles to move towards a competitive bidding process for energy concessions with the goal of ultimately reducing subsidies paid by the government but still supporting offshore renewable industries [14]. This updated method of operation is expected to be employed for Belgium's new OSW designated area, which is expected to be reflected in an updated MSP [14].

Table 4: Belgian Project Approval Requirements [15]

Permit	Process
Domain concession	Based on the quality and location of a proposed project, the Federal Minister of Energy grants rights to the proponent for the construction and operation of an OSW farm within a designated marine area.
Marine Protection Permit	1. The proponent submits an environmental impact study to the Management Unit of the North Sea Mathematical Models (MUMM). 2. MUMM performs an environmental impact assessment and other studies relating to the acceptability of the project. 3. A public enquiry period is held, and the MUMM conducts a further review of the project. 4. The Minister makes a decision on granting the permit.
Cable permits	The Federal Minister of Energy grants permits to lay submarine cables, generally stipulating that they be laid in such a way so as to disrupt the sea floor as little as possible (i.e., along previous installations where possible).

3.3.3 Spatial Priorities

The GAUFRE[8] Project was carried out between 2003 and 2005 with the aim to provide marine spatial data and guide the MSP creation process [16]. This project involved data collection activities to generate maps of offshore technical considerations (i.e., water depth, soil conditions, water currents, etc.)

[7] "Natura 2000 is a network of protected areas covering Europe's most valuable threatened species habitats: https://www.eea.europa.eu/themes/biodiversity/natura-2000/the-natura-2000-protected-areas-network

[8] GAUFRE is not an acronym, but stands for "Towards a Spatial Structure Plan for Sustainable Management of the Sea."[16]

along with existing area definitions and uses (i.e., Natura 2000 sites, existing uses including planned wind farms, shipping lanes, etc.) [16]. The GAUFRE report was produced to provide information on all activities in the Belgian portion of the North Sea (BPNS), and in the chapter specific to wind, it described the following constraints [16]:

- Recognized shipping lanes preclude OSW farms.
- Dredging, fishing (beam trawling and lobster), and military activities were considered incompatible with OSW farms.
- Coastline visibility and noise impacts were seen as restrictive, but not necessarily preclusive to OSW farms.
- Tourism, aquaculture, and recreational fishing were expected to be compatible shared uses with OSW.
- Clay and clayey sand were considered the most desirable subsoils.
- Stony soil, mixed strata or fine sand were considered the least desirable subsoils.
- Level subsoil was to be preferred.
- Water depths should be less than 30 m.[9]
- It was found that optimal wind speeds occur at distances greater than 20 km from shore.
- There were no technical limitations to maximum distance, but the recommendation was less than 40 km from shore to be economically profitable.

Belgium's current MSP considers the following uses [13]:

- Shipping
- Ports
- Mineral extraction
- Offshore renewable energy production
- Fishing
- Aquaculture
- Tourism
- Marine cultural heritage
- Nature protection
- Military
- Scientific research
- Cables and pipelines

3.4 Denmark

3.4.1 Industry Summary

As of the end of 2019, Denmark holds approximately 6% of global offshore wind capacity [2]. Danish sea activities are governed by a number of sectoral acts such as the *Marine Environment Protection Act* and the *Raw Materials Act*. The MSP process was introduced within the *Act on Maritime Spatial Planning* [17]. The Danish MSP for the North and Baltic Seas is expected to take full effect in March 2021 and is being developed by the Danish Maritime Authority (DMA) along with a working group comprised of 12 Danish maritime authorities [17]. Of particular interest to the DMA is discerning what activities create conflicts with one another and which ones may provide synergies as part of a broader maritime

[9] Note that OSW technology has advanced considerably since the GAUFRE report, and this would likely not apply today.

development approach [17]. The layout of the Danish offshore sectors is provided in Appendix B – Denmark. The final Danish MSP is expected to be laid out as delineating Danish waters into two supertypes of zones: general use zones and reserved development zones, as defined in Table 5 [17].

Table 5: General Use vs. Reserved Development Zones [17]

General Use	Reserved Development
Default state of Danish waters	Areas defined for a specific use
No identified need for developing infrastructure	Typically involve fixed infrastructure or more exclusive area uses
Typically more casual leisure uses such as fishing and tourism	This includes activities such as wind production or extraction of resources

3.4.2 Development Process

The Danish Energy Agency recognizes the value in supporting OSW developers by conducting preliminary area surveys to allow investors to better understand a site before planning a project, subsequently lowering project planning costs [18]. Denmark has historically promoted public input throughout the OSW farm development process. The first OSW farms in Denmark (and thus the world) were developed by small-scale machinery manufacturers backed by strong public support[10] [18]. The Danish industry has since moved towards a more standardized approach with larger project developers. Presently, Danish OSW projects follow a structured development approach, typically beginning with a government-led tender[11] [18]. The Danish Energy Agency makes decisions on awarding projects largely based on the proposed cost of electricity supplied by a project considering its potential feed-in tariffs (for example, the lowest-priced Danish OSW farm as of 2017 has a tariff of 0.27 DKK/kWh, about CAD 0.06/kWh) [18]. Once a project has been identified, the Danish Energy Agency serves as a "one-stop-shop" for developers, providing the necessary licences for project development [18]. These are, in the order they are acquired, described as [18]:

1. Licence for preliminary investigations
2. Licence to establish OSW turbines following an EIA
3. Licence to exploit wind power for 25 years with possibility of extension
4. Licence to generate electricity according to current electricity legislation

3.4.3 Spatial Priorities

In Denmark, although no National MSP exists, the Danish Energy Agency leads a spatial planning committee tasked with identifying potential areas for OSW [18]. The committee is made up of different government bodies, each responsible for various offshore areas of interest [18]. The committee is able to leverage its various bodies to perform GIS mapping analyses considering at a minimum the following technical and competing use factors [18]:

- Wind conditions
- Sea depths
- Grid connection

[10] Middelgrunden being a notable case of this: http://base.socioeco.org/docs/a118_doc1.pdf.

[11] Denmark notably also has an open-door policy whereby developers can submit an unsolicited application. However, these types of projects face stricter requirements, and none had been completed this way as at 2017 [18].

- Seabed conditions
- Marine life
- Shipping routes
- Environmentally sensitive areas
- Fishing areas
- Resource extraction

Denmark is currently producing a national MSP that is expected to consider the following sea area uses [17]:

- Fisheries
- Cables and pipelines
- Mineral extraction
- Military activities
- Oil and gas exploration
- Shipping
- Infrastructure
- Tourism and recreation
- Renewable energy
- Protected areas
- Aquaculture

One of the guiding principles employed in the development of the Danish MSP is the use of an ecosystem-based approach (EBA) to maritime planning [17]. The EBA establishes one of the goals of the Danish MSP as ensuring that collective pressures on the environment from human activities are kept to such a level that marine ecosystems maintain an ability to adapt to human-induced changes [17]. Additionally, sustainable development plays a significant role as a driving force behind the Danish MSP planning process [17].

3.5 Netherlands

3.5.1 Industry Summary

As of the end of 2019, the Netherlands holds approximately 4% of global offshore wind capacity [2]. The Dutch area of the North Sea has four existing wind parks: Egmond aan Zee, Prinses Amalia, Luchterduinen and Gemini. There are also four other Designated Wind Areas that have been identified: Borssele, Hollandse Kust, IJmuiden Ver and Ten noorden van de Waddeneilanden [19]. Dutch companies have also become particularly active in the emerging OSW industry in the US. The Dutch Ministry of Foreign Affairs recently signed a memorandum of understanding with the US Bureau of Ocean Energy Management (BOEM) demonstrating strong interest in collaboration between the two jurisdictions [20]. The Netherlands Enterprise Agency (NEA) is the lead in this collaboration [20].

3.5.2 Development Process

The NEA is responsible for carrying out tenders and defining leasing area for new OSW projects [21]. The Dutch government awards subsidies to winning bids based on the difference between their electricity prices and those supplied by fossil fuels [21]. The government also takes on the role of performing specific site assessments (in addition to the initial suitable area definitions carried out by most

jurisdictions), further reducing project costs and risks to developers [21]. To this end, the Dutch government regulates all conditions for building OSW farms as outlined in their legal framework designed to streamline the process as much as possible. The tender process operates under the Stimulation of Sustainable Energy Production (SDE+) tender and subsidy legislation [21]. More information on the Dutch OSW areas, including the SDE+ program and overall Legal Framework, can be retrieved from the NEA website[12].

3.5.3 Spatial Priorities

The Dutch MSP process is defined in the *Policy Document on the North Sea 2016-2021*, in accordance with the government's commitment to ensure a robust statutory framework for the development of OSW that includes the interplay between various offshore area uses [22]. Shared use of OSW areas with military use, while largely prohibitive, can be considered. As of 2017, shared use with OSW farms is permitted for recreational activities that do not disturb the seabed, while the passage of certain vessels remains a permitted use [22]. While the Dutch plan seeks to minimize horizon impacts as much as possible, to achieve goals of 700–1,400 MW in the Coast of Holland area, OSW areas have been defined within the 12 nm coastal buffer, under the consideration that horizon impacts be kept to a minimum, as opposed to being strictly prohibited [22].

The Netherlands MSP is based on the *North Sea Policy Document* which, in addition to the national priorities, considers fishing, aquaculture, recreational activities and cultural heritage. The Dutch *Integrated Maritime Spatial Policy Map* is provided in Appendix B – Netherlands. The priority activities of national interest in the Netherlands are identified as [23]:

- Oil and gas extraction
- Shipping
- Sand extraction
- Renewable energy
- Defence

CO_2 storage is currently a priority use area identified in the MSP. However, it is seen as a potentially temporary constraint, as the country is seeking to move towards a fully renewable energy supply, making future CO_2 storage requirements uncertain [23]. Other economic sectors included as policy drivers include [23]:

- Fishing
- Aquaculture
- Tourism
- Cultural heritage
- Nature protection
- Submarine cables
- Pipelines

The spatial considerations that guide Dutch MSP activities include [23]:

- Coastal protection

[12] https://english.rvo.nl/

- Protection of Natura 2000 sites and marine ecosystems
- Horizon views to 12 nm from coast
- Pipeline networks
- Protection of archaeological values

As part of the Dutch MSP process, an assessment framework was developed by a Safe Distances Working Group which recommends safe distances between various offshore activity areas [24]. A safety buffer of at least 500 m is a standard practice for the minimum safe distance around shipping lanes, with a distance of 2 nm being recommended within the Dutch EEZ [24]. This distance is intended to be used as a guideline, with the recommendation that more specific case-by-case evaluation be performed based on the length and maneuverability of expected passing vessels [22]. Additionally, a 5 nm buffer zone is recommended for oil and gas pipelines as a soft constraint and, depending on the presence of a helicopter pad, a 0.8 nm buffer for radar stations [22]. The designated wind areas are seen as being variable, with minimum, maximum and desirable options laid out. As an example, the "minimum" scenario (least wind space) would start with the recommended 2 nm shipping lane buffer and 5 nm buffer around oil and gas platforms. The "maximum" would start with only the 500 m safety buffer around shipping lanes and assume that oil and gas infrastructure will become obsolete and therefore non-restrictive to wind power development before 2050. The "preferred" scenario operates under the same assumption of oil and gas phaseout but takes a middle-ground to shipping lane buffer zones, opting for an ideal case-by-case analysis [24].

3.6 United States

3.6.1 Industry Summary

The United States currently has an existing 30 MW OSW farm off Block Island, Rhode Island, and over 26 GW of OSW power in the project pipeline across 10 states along the East coast, in the Great Lakes, and along the coast of California in the West [25]. In the US, renewable energy projects are regulated by the Federal Department of the Interior's (DOI) Bureau of Ocean Energy Management (BOEM) through consultation with other government departments such as the National Marine Fisheries Service in accordance with the *Endangered Species Act* when marine mammals are concerned [26]. When considering potential impacts to migratory birds, BOEM consults with the US Fish and Wildlife Service [26]. Particularly for migratory birds, common flight paths along the coast must be accounted for when considering turbine placement and orientation [26].

The OSW industry states of Rhode Island, New York and California provide useful case studies. The Block Island wind farm off the coast of Rhode Island is currently the only OSW farm in the US, and the Rhode Island Special Area Management Plan (SAMP) provides extensive information on the project's location selection process [27]. New York has completed the definition of OSW leasing areas and has awarded contracts for projects representing a potential capacity of 1,700 MW of OSW, with another auction phase planned for 2020 with the intent of adding a further 1,000 MW or more to the project pipeline [28]. The National Renewable Energy Laboratory (NREL) performed an initial analysis to begin identifying possible OSW leasing areas off the coast of California [29].

3.6.2 Development Process

BOEM develops and owns the leasing areas for OSW according to four key steps outlined in Figure 2 [30]. During this process, BOEM adheres to the *National Environmental Policy Act* (NEPA) for site assessment activities [30].

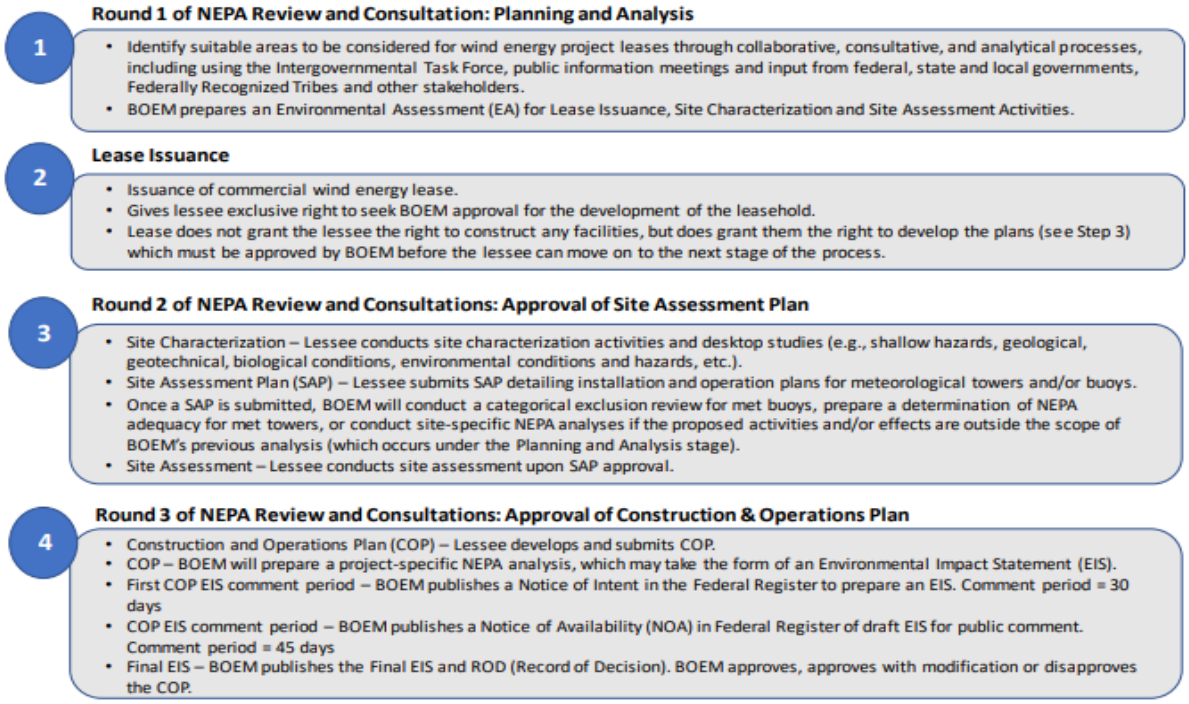

Figure 2: BOEM Process for Authorizing Wind Energy Leases [26]

3.6.3 Block Island

The 30 MW Block Island offshore wind farm is currently the only OSW farm operating in the US [31]. This wind farm is located in the designated Renewable Energy Zone (REZ) south and east of Block Island, which is defined as part of the Rhode Island Ocean SAMP [27]. In order to delineate this area, the Rhode Island SAMP uses a Technology Development Index (TDI) method to quantify the potential for renewable power projects on a uniform grid [27]. The TDI at a given location is a ratio of the degree of difficulty of project development to power production potential [27]. A lower TDI score indicates a more promising development opportunity [27]. A map of the Rhode Island TDI results is provided in Appendix B – United States. The TDI calculation follows this formula:

$$TDI = \frac{Technical\ challenge\ Index\ (TCI)}{Power\ Production\ Potential\ (PPP)} = \frac{Technical\ Requirements + Cable\ Distance}{Measure\ of\ Extractable\ Energy}$$

where the TCI can be expressed as the cost of installation in a given area, or a qualitative rating of construction difficulty (i.e., from 1 to 5, with 5 representing the most difficult construction), and the PPP involves some measure of the expected power output for a given location [27]. For the SAMP, the TCI was an estimated cost based on geological conditions and required cable length, and the PPP was the expected power density (W/m^2) of a given location [27]. The REZ was ultimately refined to include only grid cells with TDI values less than 3, with the following areas also removed [27]:

- Shipping lanes and other vessel routes
- Dredge disposal sites
- Military use
- Unexploded ordnance
- Airport buffer zones
- Coastal buffer of 1 km

The SAMP further breaks down areas as Areas of Particular Concern (APCs) and Areas Designated for Preservation (ADPs) [27]. APCs provide limited availability for development and include uses such as shipping lanes, recreation and historical or cultural significance [27]. ADPs generally prohibit development and include area uses such as certain animal habitat areas, mineral extraction and dredged material disposal [27]. Shipping lanes also prohibit development which would disrupt commercial navigation [27].

3.6.4 New York

New York has recently undergone a successful contract award for OSW projects located in potential OSW areas initially defined by the New York State Energy Research and Development Authority (NYSERDA) [32]. Phase 1 of the procurement process was completed according to the following process:

1. NYSERDA identified potential OSW areas and submitted these to BOEM to create leasing areas.
2. The initial request for proposals (RFP) was developed with input from developers and stakeholders along with a request for information informing the initial RFP.
3. A draft RFP and a standard agreement were prepared for a public webinar and comment period.
4. For the evaluation, interviews were conducted with prospective proponents to validate their experience and aspects of a proposed project such as economic benefits and technical viability [32].

The evaluation of the final project selection was performed using a weighted scoring metric whereby projects were evaluated with their different aspects receiving scores totalling to a maximum of 100 points [32]. The evaluations were broken down as follows: 10 points were available for project viability, 20 points were available for economic benefits to New York, and 70 points were available based on the price of the proposed project [32]. The evaluation process followed five main steps [32]:

1. Receipt and distribution of proposals
2. Proposal completeness and eligibility review (including proposer interviews)
3. Preliminary rank order
4. Portfolio evaluation
5. Determination of final award group

On October 23, 2019, two projects were awarded contracts: the Equinor Wind US LLC's 816 MW Empire Wind Project and Sunrise Wind LLC's 880 MW Sunrise Wind Project [32]. The average all-in development cost for these projects was CAD 113/MWh with Offshore Wind Renewable Energy Certificate (OREC)[13] average prices of CAD 34.35/MWh, representing an expected impact to customers of

[13] Bought by NYSERDA and sold back to load-serving entities for each MWh of power supplied by an OSW farm (similar to Belgian Green Certificates) - https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Offshore-Wind-Solicitations/ORECs.

approximately CAD 0.98/month [4][14]. Overall, these costs represent OSW costs roughly 40% lower than previous NYSERDA predictions [4], [32].

3.6.5 California

The National Renewable Energy Laboratory undertook an initial assessment of potential OSW locations off the coast of California in 2016 [29]. The technical exclusion limits considered for this activity were [29]:

- Average annual wind speeds of at least 7 m/s
- Distance from shore up to 200 nm
- Water depth up to 1,000 m

Areas were further optimized according to the following considerations [29]:

- Lowest use conflicts
- Transmission on land
- Proximity to ports
- Visual impacts to shore
- Shipping lanes
- Protected areas

[14] USD 83.36/MWh, USD 25.14/MWh and USD 0.73/month, respectively. Converted with Bank of Canada rates.

4. Jurisdictional Summary

Upon reviewing the OSW development in the United Kingdom, Germany, Belgium, Denmark, the Netherlands and the United States, it is apparent that there are broad similarities between jurisdictions in the approach taken to designate suitable areas for offshore wind. In general, several countries, including the UK, the US and the Netherlands, have gone through processes to formally define offshore wind leasing areas and have then held competitive auctions to transfer development rights to the successful bidder. In addition, many countries have undertaken MSP processes covering large geographic areas to manage interactions between various offshore activities and ocean area uses, one of which is offshore renewable energy development. These jurisdictions have typically employed a permitting process whereby applications for offshore wind projects within the MSP area are evaluated on a case-by-case basis. Belgium is currently moving towards a competitive bidding process and designation of new dedicated offshore wind designated areas.

In general, each jurisdiction uses some form of spatial analysis for selecting areas where OSW farms can be developed. Each country reviewed for this report has a framework in place to minimize negative social, environmental, and economic impacts that may arise from OSW development. The primary regulatory bodies responsible for handling these requirements and defining suitable OSW areas in each country are identified in Table 6.

Table 6: OSW Regulatory Bodies in Each Jurisdiction Reviewed

Country	OSW Primary Regulatory Body
UK	The Crown Estate
Germany	The Federal Maritime and Hydrographic Agency
Belgium	The Federal Minister of Energy
Denmark	The Danish Energy Agency
Netherlands	The Netherlands Enterprise Agency
US	The Bureau of Ocean Energy Management

Most jurisdictions use a combination of exclusions and restrictions to categorize various ocean use considerations and to assist in identifying appropriate areas for offshore wind development. In this report, exclusions are defined as areas where no further development or activity is permissible. Common exclusions identified amongst jurisdictions include:

- Shipping lanes
- Existing offshore wind zones
- Pipelines and submarine cables
- Environmental protected areas
- Oil and gas extraction
- Military activity
- Unexploded ordnance

- Material disposal sites

Restrictions, also termed priority considerations, do not necessarily prohibit further activity but may have certain constraints or conditions attached. Common restrictions include:

- Fisheries
- Aquaculture
- Leisure and tourism
- Heritage
- Scientific research

Various other restrictions were considered, depending on the jurisdiction, including proximity to ports and airports, anchorages, offshore tidal, CO_2 storage and marine mineral evaporite deposits. Figure 3 presents a summary of ocean use exclusion and restriction considerations relevant to offshore wind within each reviewed jurisdiction. A more detailed break-down is available in Table 7 in the Appendix. Certain area considerations require buffer distances in relation to wind turbines, and certain jurisdictions define suggested distances which are summarized in Table 8.

The results in these tables should be considered with regard to the differences between MSPs and OSW area definitions. The MSP sources typically map out general ocean uses, either established or under development. Where available, information about area uses that preclude other uses within an MSP was reflected. The OSW area (or leasing area) definition activities were developed with the specific goal of defining areas suitable for OSW and, as such, also include certain additional considerations such as technical parameters (wind speeds, water depth, etc.) or ocean uses that may not be particularly relevant to an MSP.

Consideration	DE[1]	BE[2]	NL[3]	DK[4]	US[5]	UK[6]
Shipping	●	●	●	◒	●	●
Existing offshore wind zones	●	●	●	◒		●
Pipelines	●	◒	●	◒	●	●
Environmental protected areas	●	◒	●	◒	●	◒
Oil and gas extraction	◒		●	◒	●	●
Military activities	◒	◒	●	◒	●	◒
Material extraction / dredging	◒	◒		◒	●	●
Submarine cables	◒	◒	◒	◒		●
Heritage		◒	◒		◒	●
Material disposal					●	◒
Unexploded ordnance					●	
Fisheries	◒	◒	◒	◒	◒	◒
Leisure and tourism	◒		◒	◒		
Aquaculture		◒	◒	◒		◒
Scientific research / interest	◒	◒				
Other[7]					◒	◒

MSP process

Leasing area definition process

[1] Germany MSP
[2] Belgium MSP
[3] Netherlands MSP
[4] Denmark MSP
[5] Rhode Island SAMP
[6] UK Round 4 Lease
[7] e.g. ports, airports, anchorage, offshore tidal, CO_2 storage, mineral evaporites

● Exclusion

◒ Restriction or identified priority

Figure 3: Summary of Offshore Considerations by Jurisdiction

5. Suitability Assessment for Canadian Context

With one of the largest EEZs in the world, Canada has a significant responsibility of stewardship for all of its offshore activities [33]. To that end, through the *Oceans Act*, Canada has a commitment to conserve, protect and sustainably develop its maritime areas [33]. Canada does not currently have a national MSP, but the Department of Fisheries and Oceans (DFO) is initiating MSP processes in five of the thirteen marine bioregions, shown in Appendix B – Canada [33]. These MSP efforts build on previous integrated ocean management planning efforts, with plans expected to be developed by 2024 [33]. The five marine bioregions with MSPs being developed are [33]:

1. The Strait of Georgia
2. The Northern Shelf
3. The Estuary and Gulf of St. Lawrence
4. The Scotian Shelf
5. The Newfoundland-Labrador Shelves

A maritime planning activity took place from 2011 to 2016 within the PNCIMA called the Marine Plan Partnership for the Canadian Pacific North Coast (MaPP) [33]. The MaPP was developed through collaboration between BC and 16 member First Nations, and is divided into four sub-regions: Haida Gwaii, North Coast, Central Coast and North Vancouver Island [34]. The MaPP plans provide guidance for use, development and protection of key areas in their respective regions [34]. The ultimate goal of the MaPP is sustainable economic development and stewardship of BC's coastal marine environment [34]. While the current MaPP MSPs are largely focused on environmental protection, the Haida Gwaii MSP does define a Special Management Zone (SMZ) for the development of renewable energy [35]. This zone was developed based on the formerly developed NaiKun Offshore Wind Energy project [29], which was sold to Northland Power and announced in March 2020. While this process is not entirely in line with other jurisdictions, where projects would typically be proposed after the development of wind energy leasing areas, the Haida Gwaii MSP provides some guidance towards a holistic development process for Canadian offshore wind projects.

For the advancement of offshore wind in Canada, further MSP activities are required. To develop such a plan for the Canadian context, this report has provided some information on the processes undertaken by other countries with more advanced offshore wind industries. Based on a review of other jurisdictions, the definition of OSW leasing areas in Canada could proceed according to the following steps:

1. An initial resource assessment and technical analysis (wind speed, geology, water depth, etc.)
2. Removal of exclusion considerations (the specifics of which could be determined through stakeholder, governmental and broad public engagement)
3. Identification of area restrictions and other considerations (based on engagement, as in step 2 above)
4. Definition of leasing areas for offshore wind lease areas (possibly completed within a GIS mapping environment, for example)

Significant work will be required to understand the implications of considering OSW in a Canadian context. More understanding of the technology and financial trends of the OSW industry is required, along with further understanding of the impacts and opportunities of an OSW from various perspectives, including Federal, Provincial, Regional and local considerations. On the technical side, understanding the implications of Canada's marine geology and ocean characteristics for OSW foundations requires more detailed investigation. There are also considerations that have yet to be taken into account by other jurisdictions, such as potential icing impacts on OSW turbines and the impact to specific species native to Canada. Regional, provincial, local and indigenous considerations must also be brought forward, all of which require significant consultation. One possible next step would be to review existing technologies and trends for the future of the global OSW industry with the goal of integrating this knowledge into a Canadian context. While there is a wealth of information and varying approaches from other jurisdictions that can be leveraged, Canada's OSW industry requires more specific consideration from a Canadian perspective, including the regulatory framework, in order to move forward.

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7. Appendix A – Tables and Figures

7.1 EEZs in the North Sea

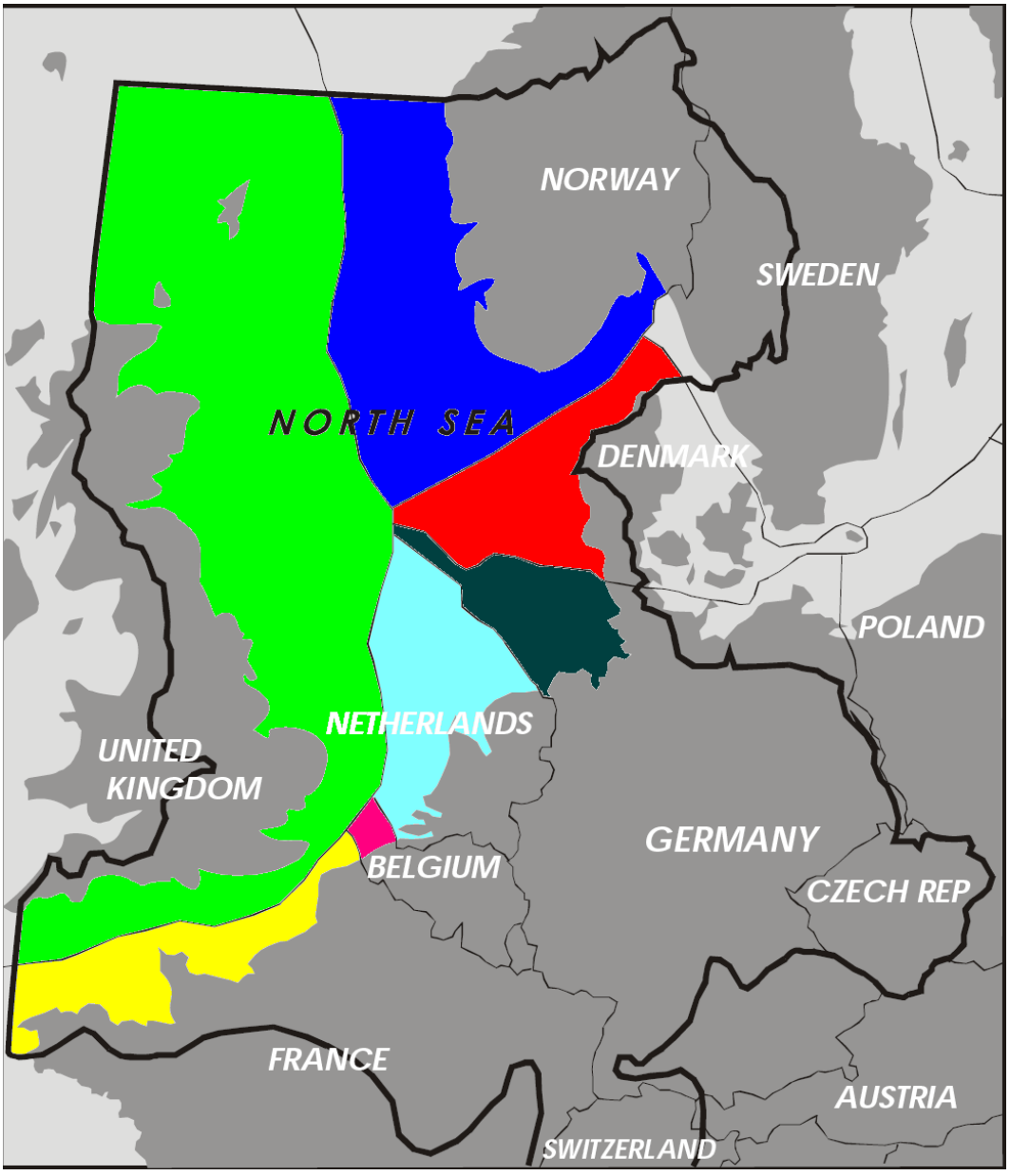


Figure 4: Exclusive Economic Zones of Countries Bordering the North Sea. Source: https://commons.wikimedia.org/wiki/File:North_sea_eez.PNG

7.2 Constraints

Table 7: Summary of Constraints Considered by Jurisdiction

Jurisdiction	Germany	Belgium		Netherlands	Denmark	USA		United Kingdom				
Source	MSP	MSP	GAUFFRE Project	MSP	MSP	California Study	Rhode Island	England MSP	Scottish MSP	Shetland Islands	Round 4 Lease Area	Count
Shipping	x	x	x	x	-	x	x	x	x	x	x	11
Fisheries	o	-	-	o	o	o	o	x	x		o	10
Leisure and tourism	o	-	o	o	o		o	o	x	x	o	10
Existing wind zones	x	x	x	x	-	x		x	x	x	x	10
Material Extraction/ Dredging	o	-	-		-		x	o	o	x	x	9
Military Activities	o	-	-	x	-		x	x	x		o	9
Nature Conservation/ Protected Areas	x	-	-	x	-	x	x	o			o	9
Oil and gas Extraction	o		-	x	-		x	x	x	x	x	9
Submarine Cables	o	-	-	o	-			x	x	x	x	9
Aquaculture		o	o	o	-		x	x		o	o	8
Pipelines	x	-	-	x	-		x			x	x	8
Ports		-	o			o		x	x	x	o	7
Heritage	-	-		o			o	o			x	6
CO2 Storage				o				x	x		o	4
Offshore Tidal								x	x	x	o	4
Material Disposal			-				x			x	o	4
Scientific Research/ Interest	o	-									o	3
Ammunition Dump	-	-	x									3
Other vessel activity	o										o	2
Airport			-				x					2
Radar Masts			-							o		2
Unexploded Ordinances			-				x					2
Weather			o							o		2
Anchorage			-								o	2
Governance								o				1
Mineral Evaporites											o	1

x = exclusion (precludes further development of conflicting uses)
o = restriction (restricts development based on various sensitivities)
- = priority undefined (MSPs are not specific to OSW and so do not define competing use priorities as explicitly as leasing area definitions)

7.3 Buffers

Table 8: Summary of Suggested Buffer Distances Between OWFs and Other Constraints

Constraint	Buffer	Range	Comments	Source
Base Buffer	500 m		Basic safety standard	[24]
Lease Area	4 km		NY practice	[32]
Shipping Lane	2 nm	500 m–2 nm	Based on typical vessel length	[24]
Coast	1 km	1 km–12 nm		[27]
Airport	3 km	3 km–6 km	Based on runway size	[27]
O&G Platform	5 nm			[22]
Pipeline	5 nm			[22]
Cables	500 m	500 m–1,000 m	Further for active cables	[22]
Harbour	5 nm			[22]
Helicopter Pad	5 nm			[22]
Mining Site	5 nm		Restriction	[22]
Radar Stations	0.8 nm			[22]
Marina	1 nm		Restriction	[8]
Bathing Beaches	1 nm		Restriction	[8]

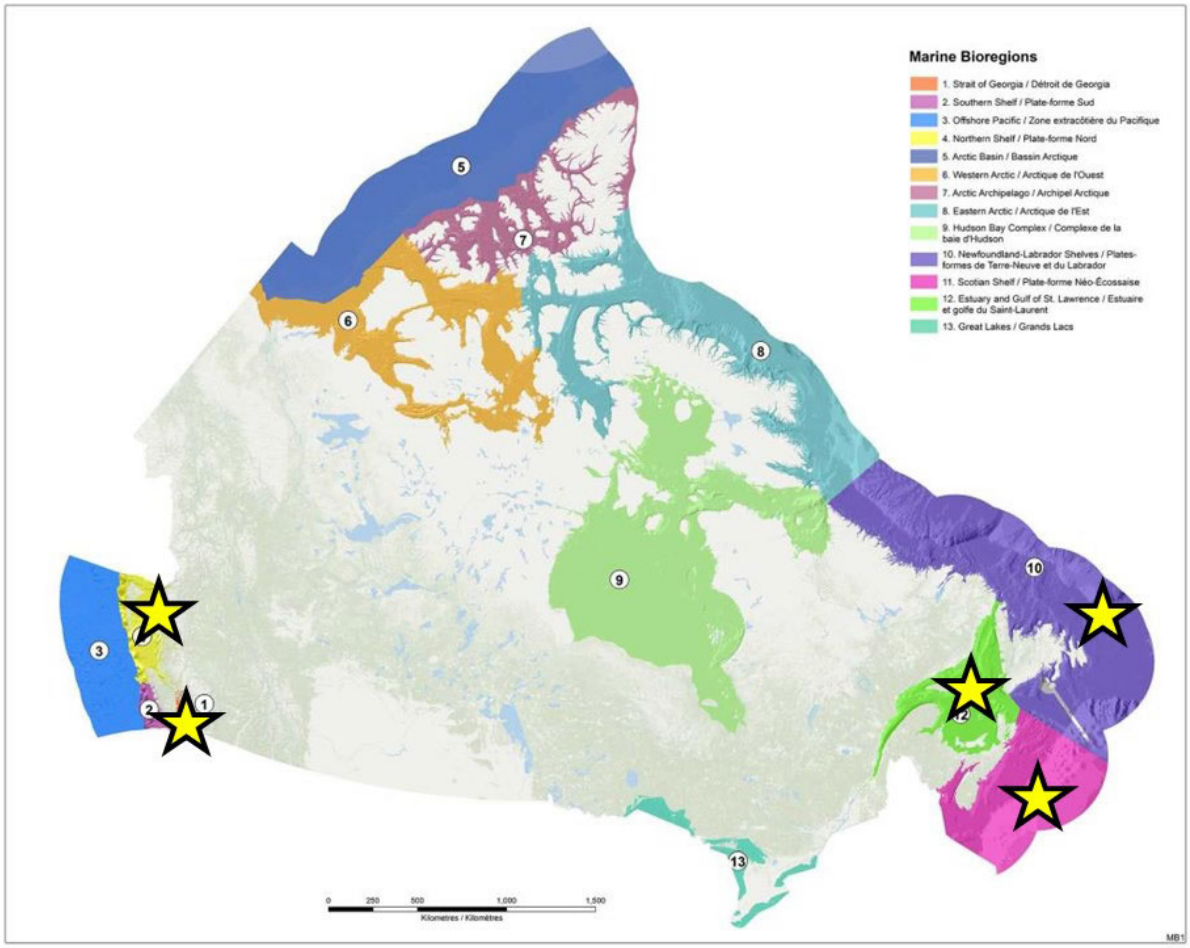
8. Appendix B – Marine Spatial Planning Maps

8.1 Foreword

Unless otherwise specified, the maps in this catalog were obtained from a country's respective information profile available through the European MSP platform[15]. In general, this website is an effective repository for MSP activities in Europe. The UN United Oceanographic Commission's website is also generally useful for information on a country's MSP practices[16].

[15] https://www.msp-platform.eu/msp-practice/countries
[16] http://msp.ioc-unesco.org/world-applications/overview/

8.2 Canada



http://www.dfo-mpo.gc.ca/transparency-transparence/mtb-ctm/2019/binder-cahier-1/1F3-oceans-eng.htm

8.3 United States

Block Island SAMP (Special Area Management Plan)

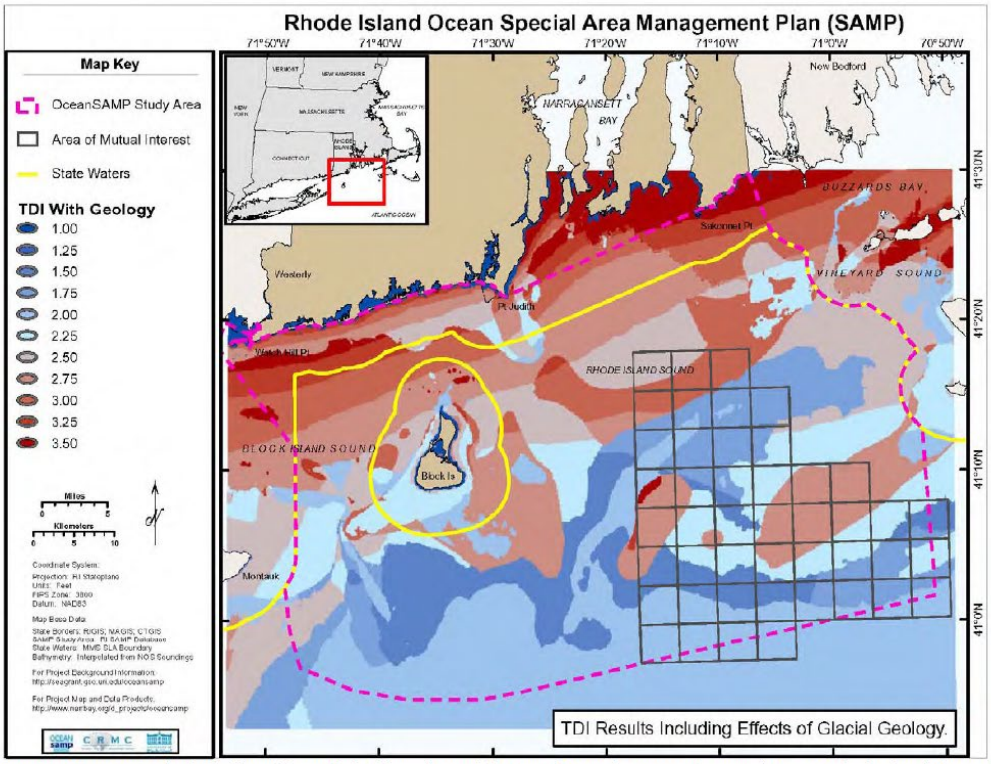
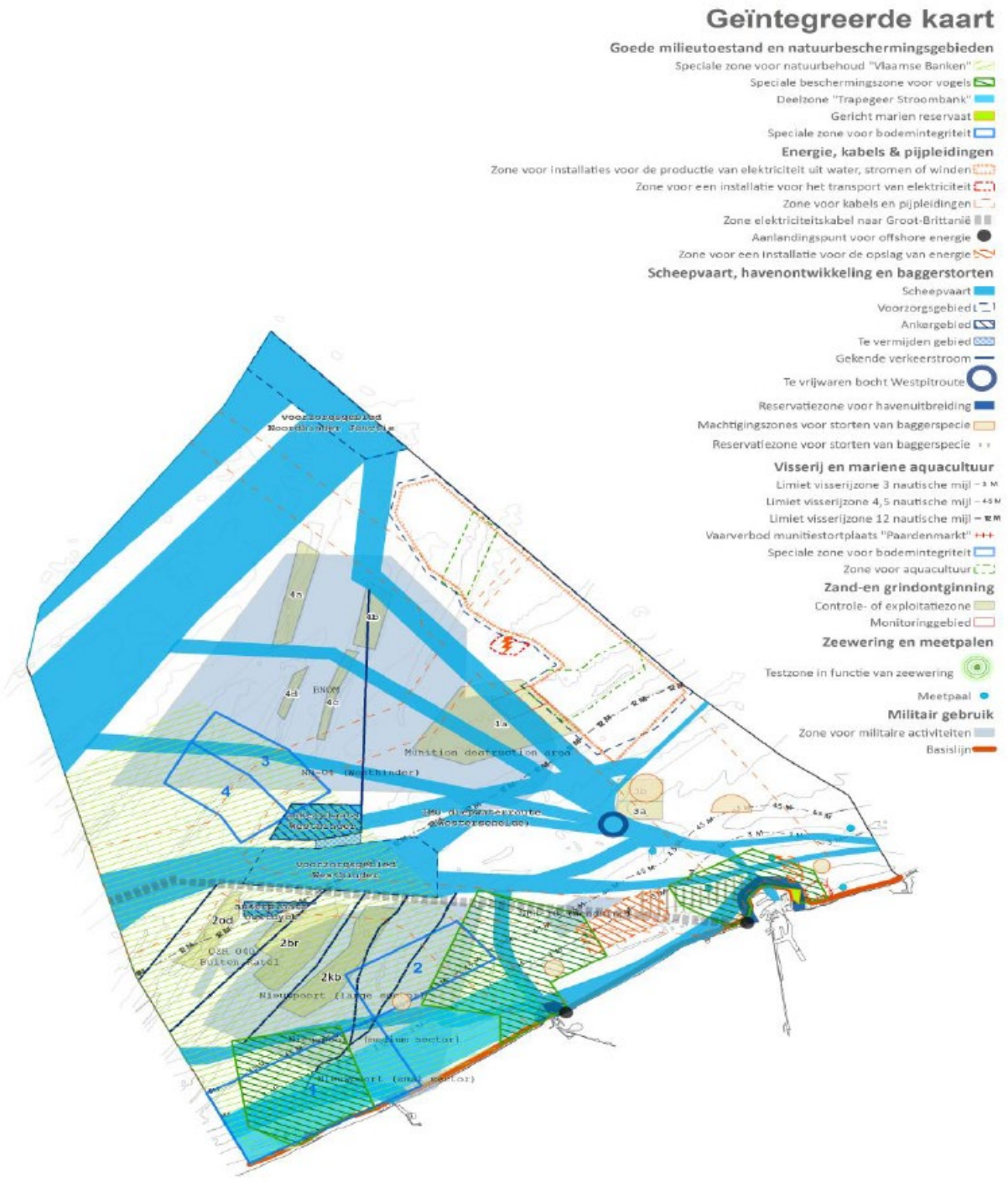


Figure 8.58. TDI results including effects of glacial geology with Area of Mutual Interest. (See section 830.2 for further information on the TDI analysis.)

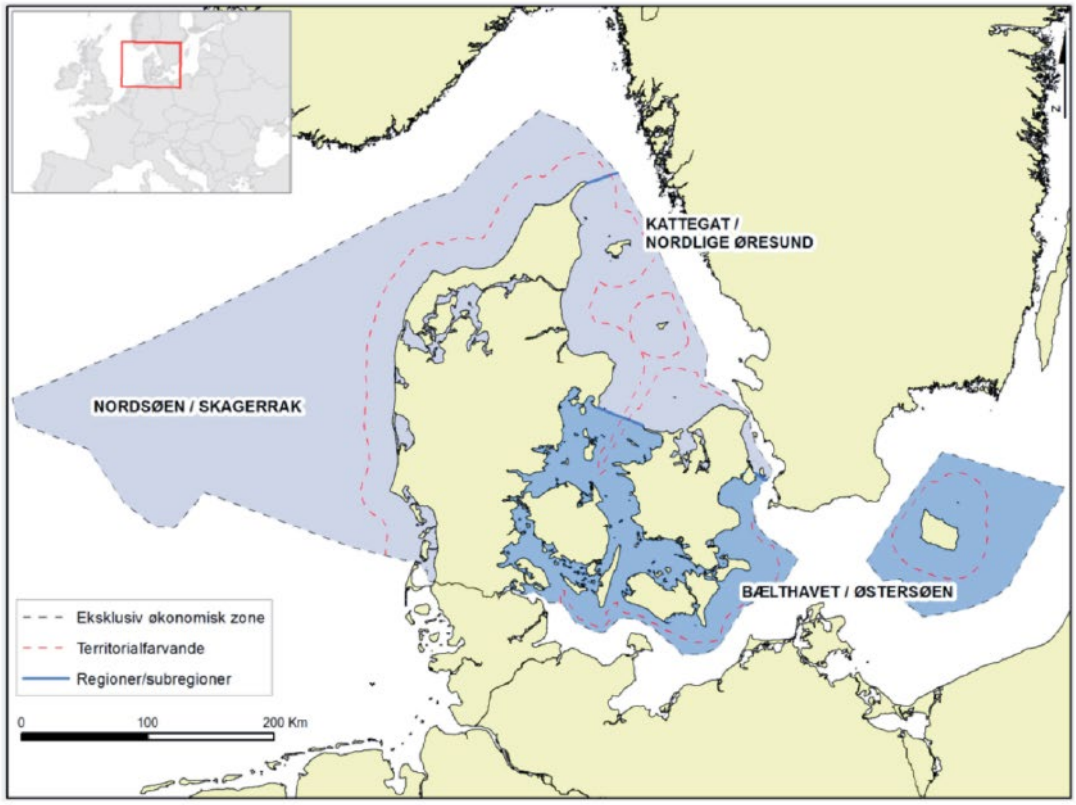
8.4 Belgium

Page 108 of Summary Marine Spatial Plan



8.5 Denmark

No complete and comprehensive plan. However, a range of sectoral plans exist (energy, infrastructure, fisheries).



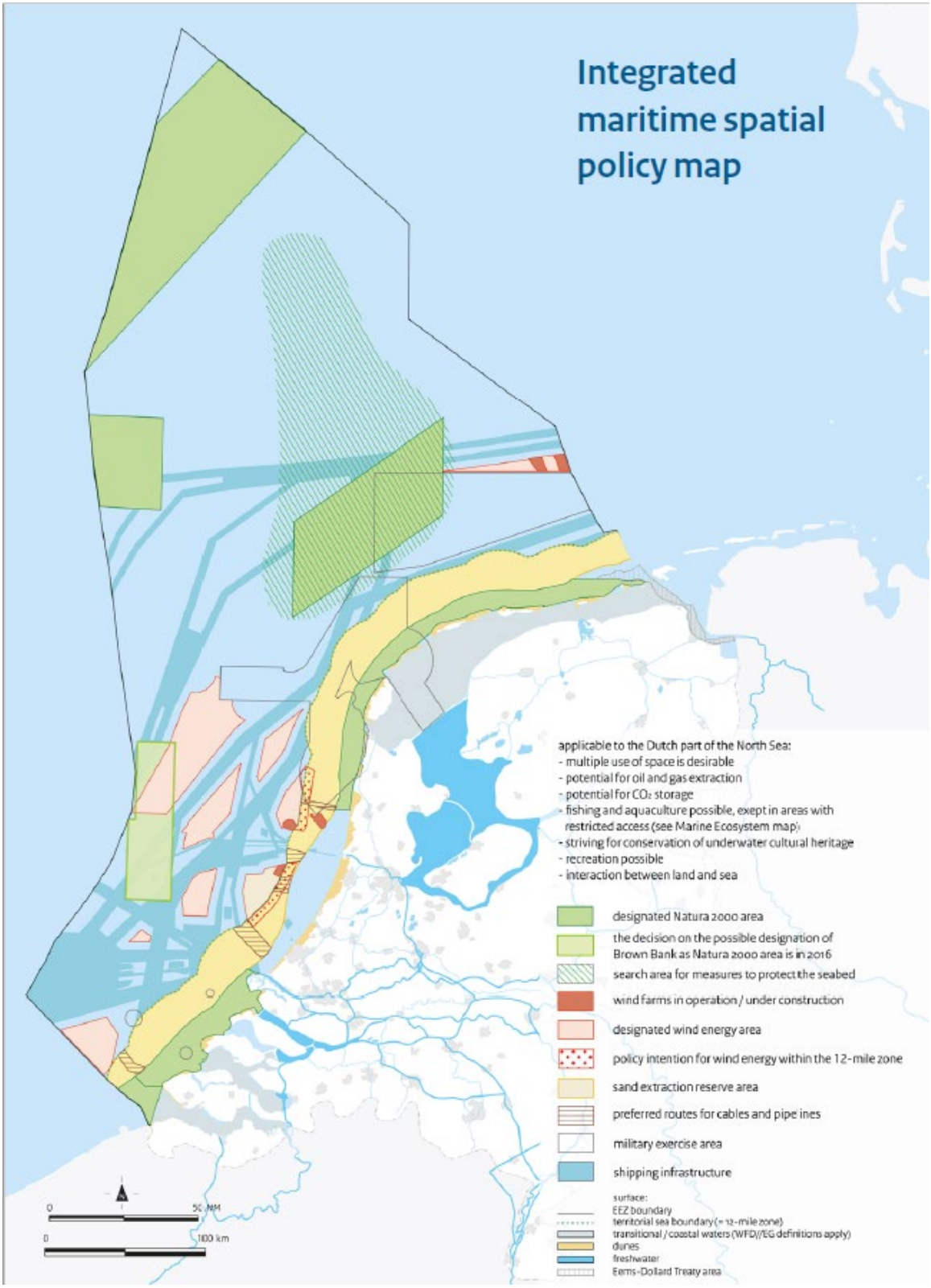
Marine Strategy legal delimitation

8.6 Germany

Area covered

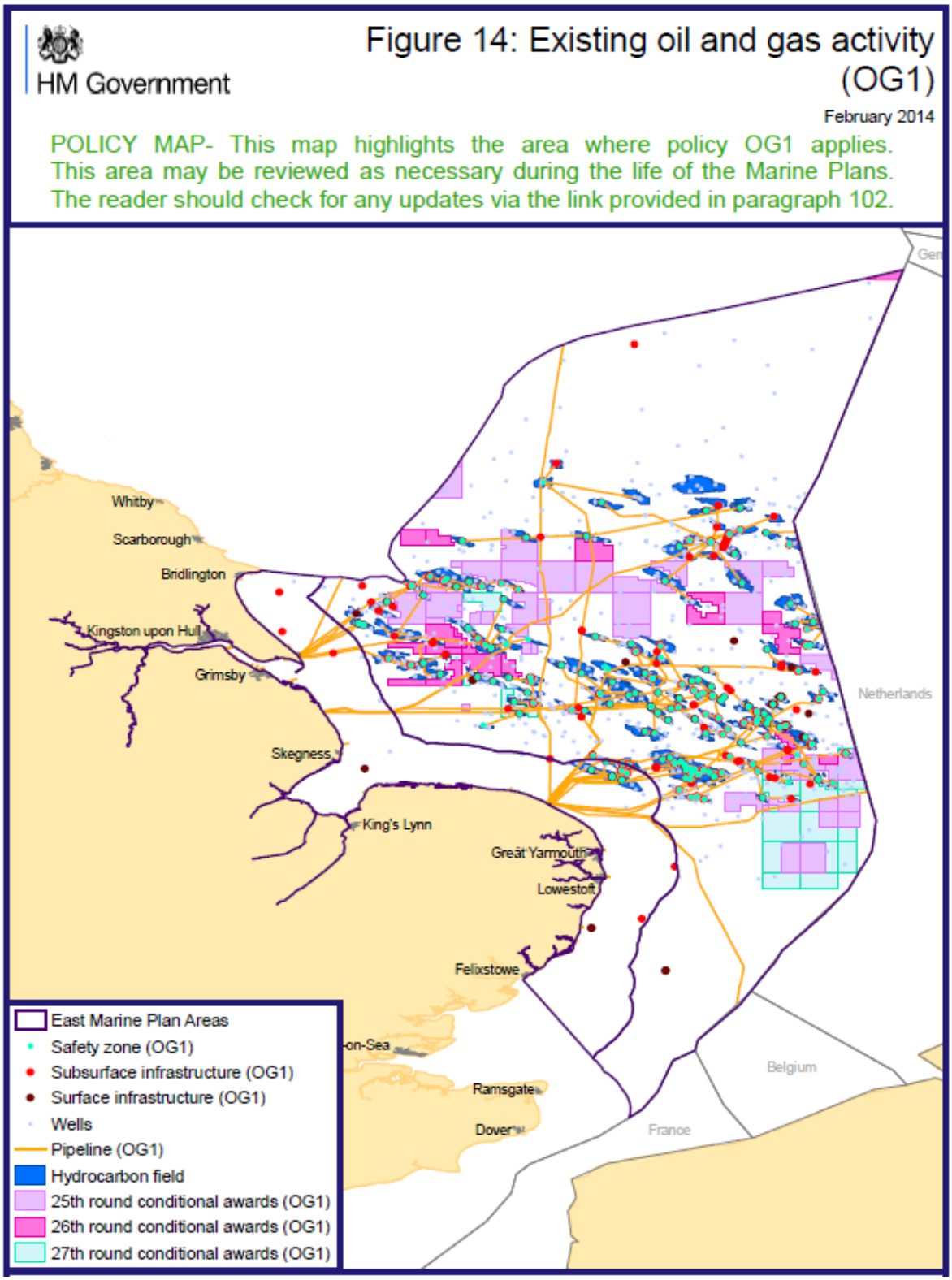
Figure 4: MSP for German EEZ. Source: BSH

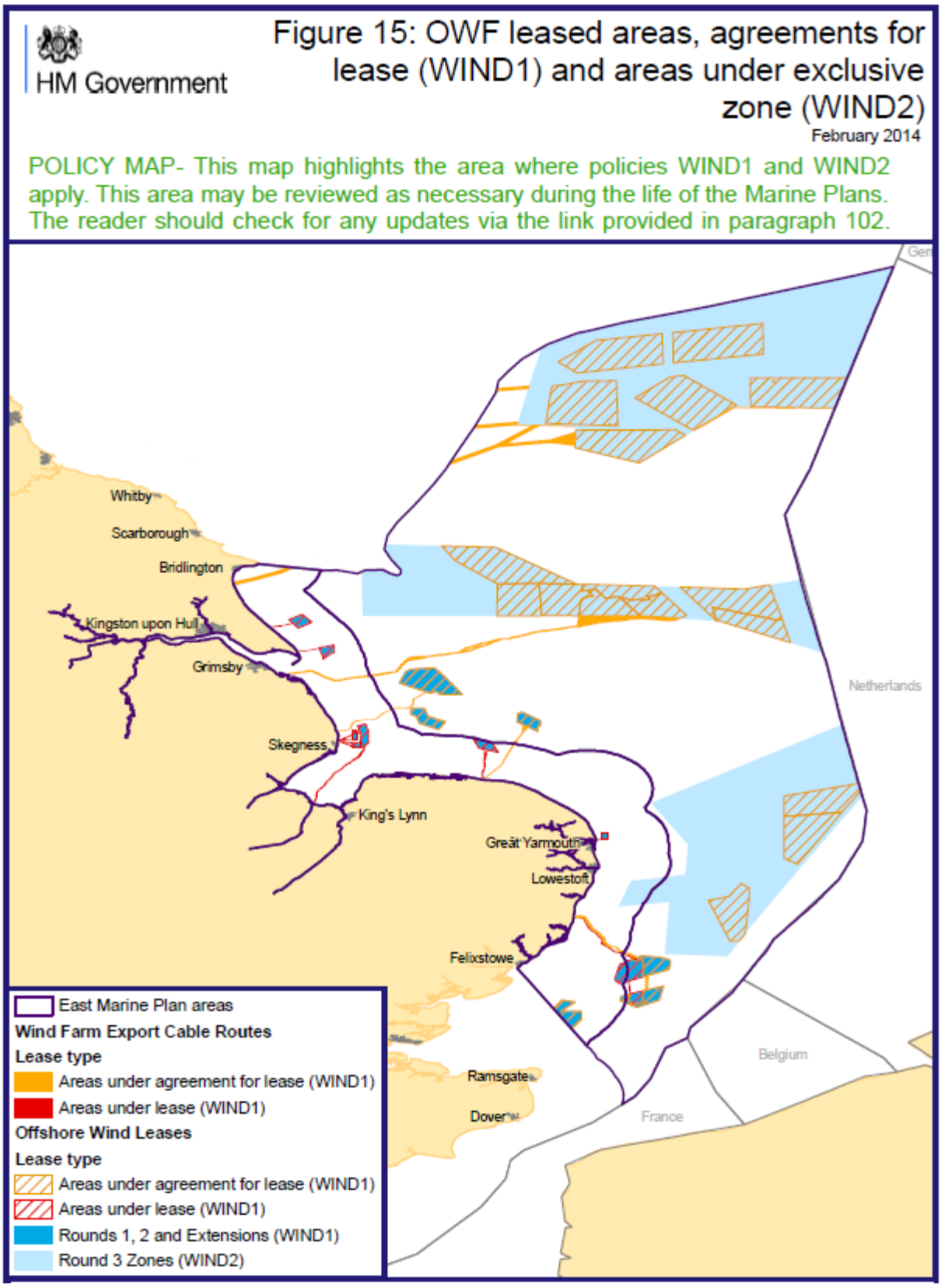
8.7 Netherlands

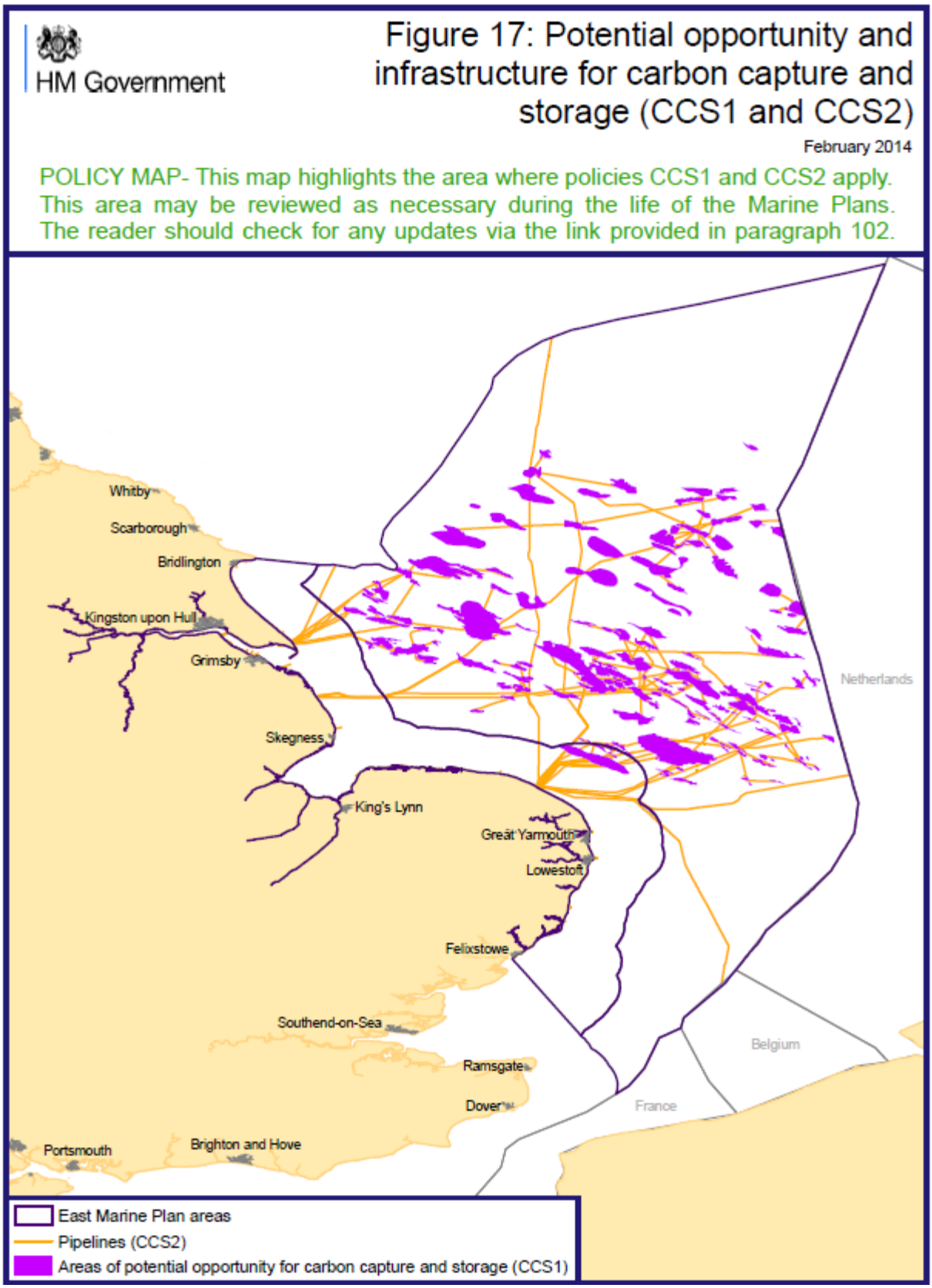


8.8 United Kingdom

April 2014 – East Inshore and East Offshore Marine Plans




HM Government
Figure 15: OWF leased areas, agreements for lease (WIND1) and areas under exclusive zone (WIND2)
February 2014
POLICY MAP- This map highlights the area where policies WIND1 and WIND2 apply. This area may be reviewed as necessary during the life of the Marine Plans. The reader should check for any updates via the link provided in paragraph 102.
Whitby
Scarborough
Bridlington
Kingston upon Hull
Grimsby
Skegness
King's Lynn
Great Yarmouth
Lowestoft
Felixstowe
Ramsgate
Dover
Netherlands
Belgium
France
East Marine Plan areas
Wind Farm Export Cable Routes
Lease type
Areas under agreement for lease (WIND1)
Areas under lease (WIND1)
Offshore Wind Leases
Lease type
Areas under agreement for lease (WIND1)
Areas under lease (WIND1)
Rounds 1, 2 and Extensions (WIND1)
Round 3 Zones (WIND2)


HM Government
Figure 17: Potential opportunity and infrastructure for carbon capture and storage (CCS1 and CCS2)
February 2014
POLICY MAP- This map highlights the area where policies CCS1 and CCS2 apply. This area may be reviewed as necessary during the life of the Marine Plans. The reader should check for any updates via the link provided in paragraph 102.
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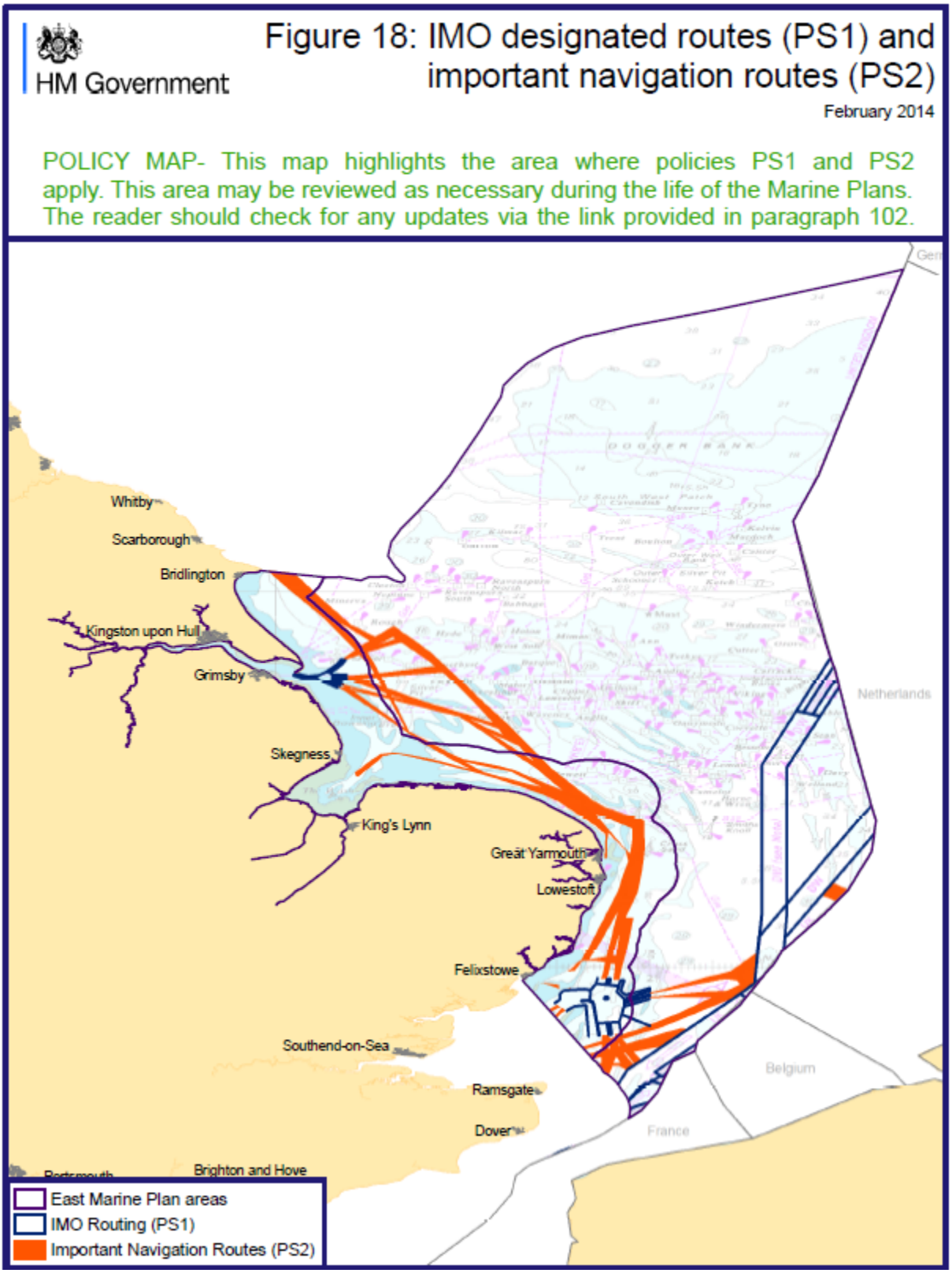
King's Lynn
Great Yarmouth
Lowestoft
Felixstowe
Southend-on-Sea
Ramsgate
Dover
Portsmouth
Brighton and Hove
Netherlands
Belgium
France
East Marine Plan areas
Pipelines (CCS2)
Areas of potential opportunity for carbon capture and storage (CCS1)


HM Government
Figure 18: IMO designated routes (PS1) and important navigation routes (PS2)
February 2014
POLICY MAP- This map highlights the area where policies PS1 and PS2 apply. This area may be reviewed as necessary during the life of the Marine Plans. The reader should check for any updates via the link provided in paragraph 102.
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Felixstowe
Southend-on-Sea
Ramsgate
Dover
Brighton and Hove
Netherlands
Belgium
France
East Marine Plan areas
IMO Routing (PS1)
Important Navigation Routes (PS2)

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Natural Resources Canada's CanmetENERGY is the Canadian leader in clean energy research and technology development. Our experts work in the fields of clean energy supply from fossil fuel and renewable sources, energy management and distribution systems, and advanced end-use technologies and processes. Ensuring that Canada is at the leading edge of clean energy technologies, we are improving the quality of life of Canadians by creating a sustainable resource advantage.

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