Seanergy 2020

Offshore Renewable Energy and Maritime Spatial Planning

Recommendations for Adaptation and Development of Existing and Potentially New International Marine Spatial Planning Instruments

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INTRODUCTION

A high level of cooperation between Member States is crucial for a fast and optimal deployment of offshore renewable energies and related grid infrastructure. Some international Maritime Spatial Planning instruments have been developed in the last years but they do not necessarily take into consideration the specific features of offshore renewable energies.

This report analyses the existing international maritime spatial planning instruments with the objective to identify the critical elements within these instruments that impact on a coordinated development of offshore renewable energy. Chapter 1 analyses the different existing national zoning plans of the 17 Members States covered by the SEANERGY2020 project compared to existing International MSP instruments, in order to highlight eventual inconsistencies and to qualify the effect of International MSP instruments on the deployment of offshore renewable energies (ORE). Chapter 2 focuses on the offshore grid infrastructure and cable routing for a pan-European grid at sea, for which a strategic planning at international level is necessary.

This document closes with conclusions and recommendations for the further development on MSP on international, regional and European level, in order to facilitate the co-ordinated development of offshore renewable energy sources, through enhanced cooperation between Member States.

1 ANALYSIS OF OFFSHORE RENEWABLE ENERGIES SITING PLANS RELATIVELY TO EXISTING INTERNATIONAL MSP INSTRUMENTS

The objective of this section is to analyse the different existing national siting/zoning plans, the National Renewable Energy Action Plans[1] and compare this "zoning information" to the existing international MSP instruments. For the states where geographical areas have explicitly been identified by national policy or other projects, these will be compared against the boundary conditions as set by the current international MSP instruments.

Finding appropriate sites that avoid conflicts with other sea users will be important in order to accelerate offshore deployment. It will be discussed in how far possible spatial conflicts endanger national goals and expected ORE deployment. In particular, it will be analysed how possible conflicts can be mitigated beforehand.

1.1 Existing International MSP Instruments

The legal framework related to maritime issues and offshore exploitation is extensive. Many documents of different types and with different legal forces and jurisdictional value exist and regulate maritime activities. Most of these instruments and conventions focus on a particular activity, such as navigation or fishery, with strong historical claims and receiving often priority based on economic considerations. Amongst all these international MSP instruments, several agreements, conventions and international or regional organisations relate to the protection of the marine environment.

Report 3.1 is available on the project website and provides an overview of existing MSP instruments (laws, conventions, agreements) at the international, European and regional level. The aim of each instrument has been interpreted and its possible impact on the deployment of offshore renewables is analysed.

[1] http://ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm

Table 1: Existing International MSP instruments and related offshore maritime sectors

Sector	International	European	Regional
Shipping & Navigation	IMO: • COLREG • SOLAS • MARPOL		
Fishery	• Regional Fisheries Management Organization (RFMOs) • UN Fish Stock Agreement (UNFSA) • International Convention for the Conservation of Atlantic Tunas (ICCAT)	• Common Fishery Policy (CFP)	• Convention on the future multilateral cooperation in North East Atlantic Fisheries (NEAFC) • Agreement for the Establishment of a general Fisheries commission for the Mediterranean (GFCM)
Marine environment protection	• Espoo Convention • Protocol on Strategic Environmental assessment • Convention on Biological Diversity (CBD)	• Marine Strategy Framework Directive (MSFD) • Habitats and Birds Directive (Natura 2000) • SEA- and EIA-Directive	• OSPAR Convention • HELCOM • International conferences on the protection of the North Sea • Bonn agreement (pollution) • ICZM Protocol • Barcelona Convention • MAP

All marine legislation comes under the 'umbrella' of the United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS defines the different maritime zones at sea and the legal status of these zones. UNCLOS authorises coastal states to extend their jurisdiction up to 200 nm to create Exclusive Economic Zones (EEZs), in which the coastal state is allowed to deploy offshore renewable energy projects. It is worth specifying that UNCLOS provides general rules. Detailed regulation is organised through specialised bodies and specific agreements.

None of the existing and analysed instruments contains explicit provisions or restrictive elements for renewable offshore installations. This is due to the fact that offshore renewable energy activities are recent. Nevertheless, these international instruments may impact the deployment of ORE and influence the location of ORE activities, the permitting and licensing procedures as well as the construction and operational phases.

In order to highlight the possible influence of the existing international MSP instruments on the planning of offshore renewable activities in the sea, these have been classified according to the different phases of an offshore renewable energy activity (table 2).

Table 2: Summary table of the impact of the instruments on the phases of offshore renewable energy development

Phase of project development	Instrument	Relevant elements influencing offshore renewable energies deployment
Location	UNCLOS	• With respect to UNCLOS, offshore renewable energy installations may be built anywhere within EEZ and a safety zone of 500m around can be established. • Related to cable lying: Coastal State cannot control the laying by other States of cables passing through its EEZ. UNCLOS preserve the freedom to do so (Art58). However delineation of cables is subject to the consent of the Coastal State (Art 79). Within Territorial Sea, the coastal State has more comprehensive control on cable and pipeline lying, and can impose restrictions to these.
	IMO	• Sea-lanes and traffic separation schemes regulated by IMO are considered as excluded zones in the sea. • PSSA introduced the principle of deviating shipping routes.

	RFMOs	• By establishing fishing limits and controlled zones, with respect to sustainable fisheries, RMFOs may influence the location of renewable offshore activities.
	CBD	• Under CBD, Parties can establish marine protected areas (MPAs) in and outside national jurisdiction (including EEZ). The designation of marine protected areas under CBD (legally binding treaty) may influence the location of offshore renewable energy infrastructure; meanwhile possible synergies need to be clarified.
	Birds and Habitat Directive	• The Birds Directive calls for the establishment of Special Protected Areas (SPAs) for birds. The Habitats Directive calls for the establishment of Special Areas of Conservations (SACs) for habitats or species. The protected areas defined by these directives are legally binding and define key number of criteria to be met when developing activities within these protected areas. • These directives don't exclude offshore renewable energy installations within protected areas, however if this would occur the developer must show that the activity will not harm the conservation goals set out for the particular area. • The synergies with other functions/ uses within protected areas should be studied further and clarified (e.g. ORE, aquaculture etc)
	CFP GFCM NEAFC	• Presently, there are no regulatory restrictions on the development of fishery and the establishment of ORE activities such as wind farm. But fisheries are a well-known and wide spread sea use function in European waters. CFP aims to ensure sustainable exploitation of fish resources. This means reducing the number of fishing vessels and the duration of fishing period, the establishment of open and closed fishing seasons and areas. These influence the location and some operational phases of offshore renewables. Meanwhile, the compatibility between fisheries and offshore infrastructure should be clarified such as fishing conditions in the vicinity of wind farms.
	Barcelona Convention	• Barcelona Convention encourages the establishment of specially protected areas called "Specially Protected Area of Mediterranean Interest" (SPAMI) and provides protective measures for the Protection of the Mediterranean Sea against Pollution. The protection measures for SPAMI should be taken into account in MSP and may influence the location of offshore renewable activities.
	Espoo Convention	• The Espoo Convention promotes consultation and cross-border cooperation in the planning process of activities and outlines specific conditions to be incorporated into national environmental impact assessment (EIA) procedures.
	Birds and Habitat Directive	• The Habitats Directive requires an assessment of plans or projects that may significantly impact a NATURA 2000 sites.
Permitting & Licensing	EIA-Directive	• Offshore renewable activities require an Environmental Impact Assessment according to the EIA Directive. The results of the EIA are presented in an Environmental Statement (ES) and are submitted together with license and consent applications.
	OSPAR	• OSPAR Commission adopts legally binding regulation requiring Member States to adopt procedure and actions related to Marine Environment Protection, which can influence the licensing and permitting procedure for the development phase of offshore renewable energies projects. • OSPAR serves as a platform for exchange of information and plays an important role in starting discussions on new issues.
Monitoring	UNCLOS	• UNCLOS obliges its parties in principle to protect the marine environment and stipulates obligations to environmental monitoring and assessment.
	OSPAR	• OSPAR Commission adopts legally binding regulation requiring Member States to adopt procedure and actions related to Marine Environment Protection. Under OSPAR, parties have the obligation to realize regular marine environmental monitoring campaigns.
	CFP GFCM NEAFC	• Construction and maintenance activities could be influenced or restricted during particular fishing (open and closed fishing seasons and areas).

Construction & Operation	Bonn Agreement	• Chapter 8 of the Bonn Agreement Counter-Pollution Manual sets out the considerations that need to be taken into account if any problem appears related with wind farms. It states on the payer-pollution principle.
Removal/ Decommissioning	UNCLOS	• UNCLOS (Art60) state the principle of the obligation to remove abandoned or disused offshore installations.
	IMO	• IMO adopted in 1989 guidelines and standards for the Removal of offshore installations and structures on the Continental Shelf and in the EEZ.
	CFP GFCM NEAFC	• CFP, GFCM and NEAFC request to reduce or limit activities during particular fishing period (open and closed fishing seasons and areas) which might impact the phase of removal planning of an ORE project
	OSPAR	• OSPAR Commission adopted in 1998 a legally binding regulation for the disposal of disused offshore installation. Parties have the obligation to foresee the disposal of disused offshore installations.

International, European and regional instruments set up provisions influencing the legislative and procedural requirements for offshore renewable energy deployment and the necessary grid infrastructure.

In this sense, location and procedural rules for offshore renewable energy may be influenced by international and regional or European regulations, but planning decisions remain subject to national specific administrative and procedural rules, defined through national legal frameworks.

International MSP instruments do not explicitly consider offshore renewable energy. Therefore it may be assumed that the latter do not hamper deployment of renewable offshore energies. At the same time international MSP do not explicitly refer to, and thus support, offshore renewables deployment.

Nevertheless, national and international regulations need to be more linked to each other and require more flexibility of internationally adopted regulations and advanced MSP at national level. Compatibilities or incompatibilities as well as synergies between different users (including ORE) should be studied further in detail, as well as the possibilities to adapt some historically strong regulations.

Flexibility of internationally adopted regulations will be necessary in the future. Up to now a basic assumption is to treat the existing international system as fixed. However, the system needs to be able to evolve to adapt to changing socio-economic needs. Currently, the international instruments can be revised but it remains a lengthy process.

This is especially the case for the instruments regulating navigation. Sea-lanes and traffic separation schemes regulated by IMO are considered as exclusion zones. These zones are reserved for navigation and shipping. Therefore, they cannot be considered compatible with offshore energy generation, mainly for the sake of safety of both shipping and offshore power plants. The priority principle for navigation has been firmly anchored in the UNCLOS and is consequently reflected in the dominant positions of the shipping sector vis-à-vis other legitimate maritime activities, such as offshore renewable energies.

However, the expansion of offshore activities and the development of new uses of the sea will enhance the need to discuss maritime spatial conflicts.

Following this, adaptations are mainly made at national level and within national jurisdictions' scope. Some decisions, however, need to be enforced by receiving international support. An example would be decisions relating to safety zones of contiguous uses, such as the definition of a safety zone around shipping routes and offshore infrastructure (max. 500m according UNCLOS): currently these are drawn separately and thus cumulated, reducing available space considerably.

A harmonised interpretation of international legislation should be recommended in order to harmonise practices and opportunities for ORE deployment. This is the case for instance for the Birds and Habitat Directives, with regards to the establishment of the Natura 2000 network, and its compatibility with ORE activities. While these directives do not exclude offshore renewable energy installations within NATURA 2000, several countries erroneously consider these protected areas as no-go for ORE.

The existing international conferences involve co-operation between different parties related to the use of the sea, they can play an important role in starting discussions on new issues and influencing management decisions at national level. Offshore renewable energy deployment should be taken into consideration in the framework of these discussions.

1.2 National Renewable Energy Action Plans

All 27 Member States submitted (during 2010 and early 2011) a National Renewable Energy Action Plan (NREAP) as provided by Article 4 of the Renewable Energy Directive (2009/28/EC), in which the contribution of renewables are quantified in order for each Member State to reach its binding 2020 target.

The 17 Coastal States[2] of the 4 European sea basins (North Sea, Baltic Sea, Mediterranean Sea and Atlantic Coast) covered by the project announced quantitative objectives for offshore renewable energies and some of them identified the area dedicated to offshore renewable energy activities. Table 3 characterises the different Coastal States with their potential sea area (EEZ area), and where a geographical zone for ORE has been identified, the part this area represents in the sea area.

Table 3: 2020 ORE targets in comparison with sea space potentialities

State	2020 Target	Needed ORE area to meet 2020 Target	EEZ Area	ORE Area	% of ORE Area in EEZ	Installed OWF	% of installed capacity vs. 2020 target
Denmark	1 339 MW	140 km²	105 989 km² (1)	1012 km²	0.9 %	853,7 MW	64 %
Sweden	182 MW	18 km²	39 960 km²	-	-	163,65 MW	90 %
Finland[3]	900 MW	90 km²	52 472 km²	1000 km²	1.9%	26,3 MW	3 %
Estonia	250 MW	25 km²	36 992 km² (1)	-	-	0 MW	0 %
Latvia	180 MW	18 km²	28 000 km²	-	-	0 MW	0 %
Lithuania	No 2020 Target in NREAP Other sources: 100 MW	10 km²	6 425 km²	-	-	0 MW	0 %
Poland	500 MW	50 km²	33 307 km²	2500 km²	7.5%	0 MW	0 %
Germany	10 000 MW	1000 km²	NS: 28 539 km²	NS:880 km²	NS: 3%	180,3 MW	2 %

[2] **Baltic Sea**: Sweden, Finland, Estonia, Latvia, Lithuania, Poland and Denmark-East,
North Sea: Denmark-West, Germany, the Netherlands, Belgium and United Kingdom-East,
Atlantic coast: United Kingdom-West, Ireland, France, North Spain and Portugal
Mediterranean Sea: Southern Spain, Southern France, Italy and Greece.

[3] Finland did not breakdown its wind targets into onshore and offshore deployment in its original NREAP submission to the Commission. In a subsequent submission the 2,500 MW of wind power by 2020 were broken down into 900 MW offshore wind and 1,600 MW onshore.

			BS: 4 454 km²	BS:130 km²	BS: 2.9%		
Netherlands	5978 MW	600 km²	59 000 km²	1000 km² Total goal is to identify 1,000 km2 dedicated for offshore wind.	1.7%	Wind:228 MW Consented and awarded 600 MW Consented only: 2650 MW	4 %
Belgium	2000 MW	200 km²	3600 km²	270* km²	7.5%	186,5 MW	9 %
UK	18 GW UK target for 2020 as currently expressed by the Government is 18 GW by 2020	3300 km²	773 676 km²	Area expands with the announcement of each new leasing area announced by the Crown Estate So far around 49.2GWe worth of leases have been issued for ORE (39602 km²)	5.1%	1525 MW	8.5 %
Ireland	Wind: 550 MW Wave & Tidal: 75 MW	55 km²	410 310 km² (1)	6 areas have been identified for potential ORE deployment: 9800 to 12500 MW Deduction of 900 – 1200 km²	0.3%	25.2 MW Consented OWF: 1600 MW	4 %
France	6000 MW	600 km²	AC & EC: 334 604 km² MS: no claimed EEZ	AC & EC: 533 km²	0.2%	0 MW	0 %
Spain	3000 MW	300 km²	AC: 683 236 km² MS: no claimed EEZ	Not delimited A zoning exercise identified potential areas in accordance to environmental restrictions	-	0	0 %
Portugal	Wind: 75 MW Wave & Tidal : 250 MW	7.5 km²	1 714 800 km²	Wind: 1300 km² (fixed WT) + 16100 km² (floating WT) Wave&Tidal: 3800 km²	1.2%	Wind: 0 MW Wave & Tidal: 0.4 MW	0 %

Italy	*Wind: 680 MW* *Wave & Tidal: 3 MW*	*7 km²*	*No claimed EEZ*	-	-	*0 MW* *Consented OWF: 245 MW*	*0 %*
Greece	*Wind: 1500 MW* *Wave & Tidal : 28 MW*	*150 km²*	*No EEZ zone and TS is limited to 6 nautical miles from the shore*	*531.9 m2*	-	*0 MW*	*0 %*

Figures in this table are based on information collected in the Nations Reports of WP2
(*)MB 3-2-2011 modified and reduced the offshore wind energy zone (following complaints of navigation that the block hindered safe navigation at two corners of the zone) ORE Area: 238 km², 6.6% of EEZ

EEZ areas: source http://en.wikipedia.org/wiki/Exclusive_Economic_Zone

As the table shows, marine area dedicated to ORE deployment currently represent a small part of most of the EEZs. Only for UK, Belgium and Poland the surface dedicated to ORE reaches approximately 5% and 7.5% of EEZ. Belgium is the Coastal State with the smallest sea area (3,600 km²) in which a 270 km² area has been delimited and allocated to OWF. Poland identified a 2,500 km² ORE area, which is the largest ORE area identified after the 39,602 km² in UK.

The percentages of installed capacity with regard to the 2020 targets highlight the early stage of ORE deployment, except for Denmark and Sweden. These countries published very low targets with regard to the available sea space .

The column “Needed ORE area to meet 2020 Target” verifies whether enough has been zoned to satisfy the 2020 target. The reference density used for offshore wind farm is 10 MW/km². The minimum ORE area given in this column should be considered as a rough estimation of the needed ORE area in order to satisfy the 2020 target. This density will change depending on the existing wind conditions of the sea basin. As shown in table 3, the countries that did delimit an ORE area designed it to satisfy the 2020 target. France it is the only country for which the ORE area currently delimited is not sufficient to satisfy the2020 target. It should be reminded that for France the 6,000MW target is expected through 2 tender rounds. The first round was published in July 2011 and designated a 533 km².

The deployment of offshore renewable energy in the different EU Coastal States is more constrained by limited MSP policy and related legal framework or complex permitting and incentives procedures at national level than by MSP Instruments at International or regional level.However, expansion of offshore activities and the development of new uses of the sea will enhance the need to discuss maritime spatial use / conflicts.

2 OFFSHORE ELECTRICITY INFRASTRUCTURE AND INTERNATIONAL MSP INSTRUMENTS

As discussed in chapter 1, international MSP is currently not constraining the construction of offshore wind farms or their connection to shore. However, offshore space is a limited resource and the increasing offshore capacity reduces the available space. Therefore a strategic planning of offshore infrastructure is necessary. As future offshore wind infrastructure will interconnect across country borders, planning should be coordinated on an international level.

This chapter focuses on the offshore grid infrastructure and carries out the following tasks or assesses the following questions:

- To what extent does international planning for offshore grids exist today,

- Discussion whether the Ten Years Network Development Plan (TYNDP), the results of the EU OffshoreGrid project and the EC blueprint among others take into account strategic planning and international MSP,
- Feeding the OffshoreGrid project[4] results into the WindSpeed Decision Suport System (DSS) tool[5] that maps all relevant maritime sea uses and thus allows identifying possible spatial conflicts.

The last task allows fostering a unique cooperation between three important EU projects in the field of offshore wind energy. Along with the necessary data exchange, each party could further deepen the understanding of projects they were not directly involved in.

2.1 Strategic Planning of OffshoreGrid Infrastructure

The liberalisation of the electricity markets was triggered by Directive 96/92/EC[6]. However, the issues of grid development were left to the national TSOs, while the electricity markets were further coupled to contribute for the development of an integrated European market. The dena grid study (dena grid study I)[7], which reserved international kudos, clearly illustrates this mindset: Dena, published in 2005, was a leading study in addressing the issue of strategic grid planning by setting up a German grid development plan for the coming 10 years. The exchange of electricity with neighbouring countries however was regrettably neglected, partly because models for such analysis did not exist, and partly because the general mindset did not at the time focus on these issues.

However, this changed recently as it became clearer that cross border flows were rapidly increasing due to market coupling as well as RES deployment. Moreover, the first integrated European studies were conducted such as TradeWind[8] or EWIS among others. Even though these European studies still lack the detail that national studies achieved, it is clear that any future studies on grid infrastructure that aim at public, political and scientific acceptance will have to be based on an European power flow and market modelling.

With the Regulation 714/2009[9] international grid planning was brought to a next level as it was institutionalised in Entso-E's Ten Year Network Development Plan (TYNDP). Article 8.10 stipulates that the planning should be based not only on national grid analyses but also on integrated community-wide modelling. Still, as discussed below, the TYNDP does not cover the complete scope of the European grid development: offshore grid connections and a possible offshore grid interconnection are not envisaged, at least not in the first TYNDP published in June 2010.[10]

It is clear that for any future developments of international interconnecting offshore grids, European studies should be considered as transnational power flows are of great importance. Subsequently, the most relevant studies in this regard will be reviewed and whether they treat the issue of maritime spatial planning will be discussed.

2.1.1 Ten Year Development Plan (TYNDP)

The ENTSO-E Ten Years Development Plan investigates the development of the European transmission grid from 2010 to 2020. Even though the overall document focuses on the onshore

[4] IEE project, project life time: 2008-2011, www.offshoregrid.eu
[5] Within the IEE project WindSpeed (www.windspeed.eu) the DSS tool was developed. The DSS tool helps to identify conflicts of use in the European Seas.
[6] Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity
[7] dena-Netzstudie I, 2005, dena
[8] TradeWind was a European project funded under the EU's Intelligent Energy-Europe Programme. The project addressed one of the most challenging issues facing wind energy: its maximal and reliable integration in the Trans-European power markets, http:// www.trade-wind.eu
EWIS: the European Wind Integration Study (EWIS) is an initiative established by the European transmission system operators for Electricity (ENTSO-E) in collaboration with the European Commission, http://www.wind-integration.eu/
[9] Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003
[10] TYNDP, June 2010, Entso-E

grid development, it clearly recognises that "achieving the integration of large amount of offshore resources will require a significant amount of investment and offshore grid infrastructure measures"[11]. The study clearly states that an offshore grid can be seen as a key building block to develop the European electricity market and to exchange renewable energy among European countries. In line with this, ENTSO-E adopted the EWEA target for offshore wind energy of 40 GW in 2020.

The overall importance of the offshore grid becomes clear in section 10 of the TYNDP that is, in particular, dedicated to the long term development of an "offshore grid in North Sea, the Mediterranean ring", the "*supergrid*". ENTSO-E highlights the importance of Kriegers Flak[12] as a pilot project and finally develops a roadmap towards a North Sea Offshore Grid.

It should further be mentioned that the TYNDP lists a large number of envisaged subsea interconnections of different member states (MS)..

TYNDP and MSP

MSP is not in the scope of the TYNDP. However the roadmap lists the barriers for an offshore grid. Some of these may be seen as related to the MSP:

- According to ENTSO-E, a clear vision on who will be responsible to build the offshore grid is needed. National approaches differ largely and international coordination is required. National governments must therefore clearly support faster permitting and authorisation processes and ensure international coordination[13].
- Permitting procedures and regulatory approval for an onshore and offshore grid development are not sufficiently aligned among Member States. Policymakers and regulators should coordinate, smoothen and speed-up permitting procedures[14].

Moreover, the TYNDP never states explicitly that the development of an offshore grid can be hampered by insufficient MSP procedures. However, indirectly, the aforementioned demand for faster permitting procedures - and in particular international regulation - is an issue that can be taken up by MSP.

The TYNDP does not propose a specific offshore grid design. This is also picked up by the European Commission (EC) in its Blueprint: the TYNDP does not include an adequate assessment of the infrastructure needed to connect upcoming new offshore wind capacities[15].

2.1.2 OffshoreGrid Project

The OffshoreGrid (Intelligent Energy Europe programme[16]) looks into the development of an offshore grid in Northern Europe based on a techno-economic analysis. It is the first study that investigates suitable designs and technologies in detail. Furthermore, the study investigates the costs and benefits of such an offshore grid.

In particular, the project looks into different possible offshore grid designs. Starting from a so-called reference case of radial connections of the offshore wind farms, the case of hub connection (bundled connection) and, finally, the case of a meshed grid are investigated.

OffshoreGrid Project and MSP

Marine use and marine spatial planning are not a prime goal of the OffshoreGrid project. The issue was, however, brought up by national authorities (such as the BSH, approval authority in Germany) during the OffshoreGrid workshops[17,18] and was intensely discussed. This was also the

[11] Entso-E TYNDP, p. 17
[12] Kriegers Flak is a maritime area in the Baltic Sea. In particular it covers the tri-junction where the EEZ zones of Denmark, Germany and Sweden meet. There is Danish, a German and a Swedish wind farm planned at this tri-junction. Therefore in energy policy the name Kriegers Flak is used as a synonym for a three-leg interconnector that could be built by interconnecting via the three wind farms.
[13] Entso-E TYNDP, p. 158
[14] Entso-E TYNDP, p. 158
[15] Priorities for 2020 and beyond — A Blueprint for an integrated European energy network, 2011, p. 17 and p. 29
[16] http://www.offshoregrid.eu/
[17] 1st Northern European Stakeholder Workshop, European Offshore Wind Conference 2009

reason behind the cooperation between WindSpeed and OffshoreGrid. WindSpeed looks into the different marine use conflicts and provides data on certain marine use that were then considered in OffshoreGrid: for example the cable crossings that have a significant cost impact fed into the techno-economic analysis.
The cooperation between OffshoreGrid and WindSpeed is again fostered within the SEANERGY2020 project. Within SEANERGY2020 a Non-Disclosure-Agreement (NDA) was signed that allowed mapping the OffshoreGrid scenarios on the WindSpeed maps in order to highlight certain marine use conflicts. The results of this cooperation are in chapter 2.3.

2.1.3 EC Offshore Blue Print

On 17 November 2010, the EC published the *Priorities for 2020 and beyond — A Blueprint for an integrated European energy network*[19]. The document outlines the strategy for an efficient and coordinated transmission grid development. The offshore grid is an important element of this strategy.
The initial plan was to publish a concrete vision of the future offshore grid. This idea was abandoned when the first findings of the EU project OffshoreGrid stated that the fundamental parameters mainly economic development and technology advances can significantly change the optimal design of the future grid. Therefore the EC decided that the Blueprint should rather set the framework and outline the general design instead of publishing a concrete offshore grid.

Figure 1 - published within the Blueprint only shows **one possible** future offshore grid design.

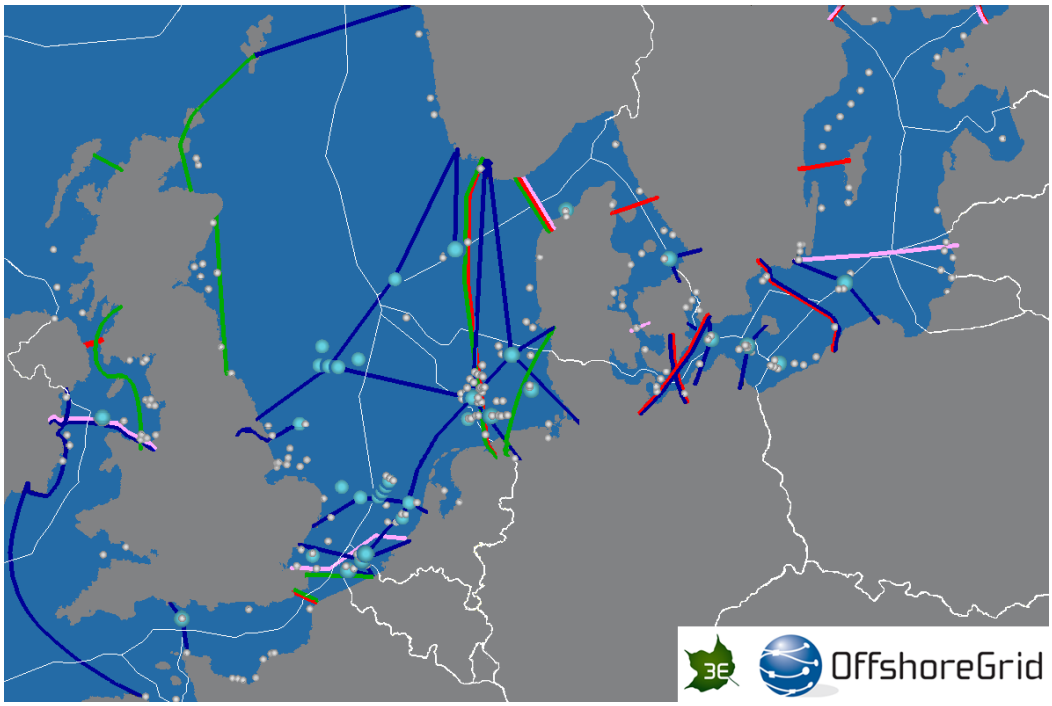

Figure 1: Illustration of a possible offshore grid concept for the North Seas and the Baltic Sea («mixed approach» scenario showing existing (red), planned (green) and commissioned (pink) transmission lines as well as additional lines (blue) necessary according to OffshoreGrid calculations)

EC Offshore Blueprint and Maritime Spatial Planning

The Blue Print highlights that, for offshore cross-border energy installations, maritime spatial planning should be applied to ensure a straightforward, coherent and more informed planning process. Maritime spatial planning and the definition of zones for offshore wind and ocean energy can enhance its development and ease investment decisions in the sector[20].

Stockholm, 14 September 2009
[18] 2nd Northern European Stakeholder Workshop, Brussels, 10 June 2010,
[19] More information available on http://ec.europa.eu/energy/infrastructure/strategy/2020_en.htm
[20] Priorities for 2020 and beyond — A Blueprint for an integrated European energy network, 2011, p. 17 and p. 30

The blueprint discusses the different possible offshore grid designs and mentions that costs can be reduced significantly by working from the radial point to point connection towards the hub and meshed connection of offshore wind energy. The Blueprint however focuses on the economic benefits and does not elaborate, for instance, on the fact that an integrated grid design brings the benefit of minimised space use and thus minimised maritime spatial conflicts.

As the blueprint scenario is based on the OffshoreGrid results, possible conflicts with maritime spatial planning will be further discussed in chapter 2.3 in which the OffshoreGrid results are mapped against maritime constraints.

2.1.4 EWEA Master Plan

In 2009 EWEA published a long term vision on the development of the offshore wind and grid development[21] in *Oceans of opportunity: harnessing Europe's largest domestic energy resource* report and discussed possible barriers and solutions. The envisaged EWEA offshore grid design is illustrated in Figure 2.

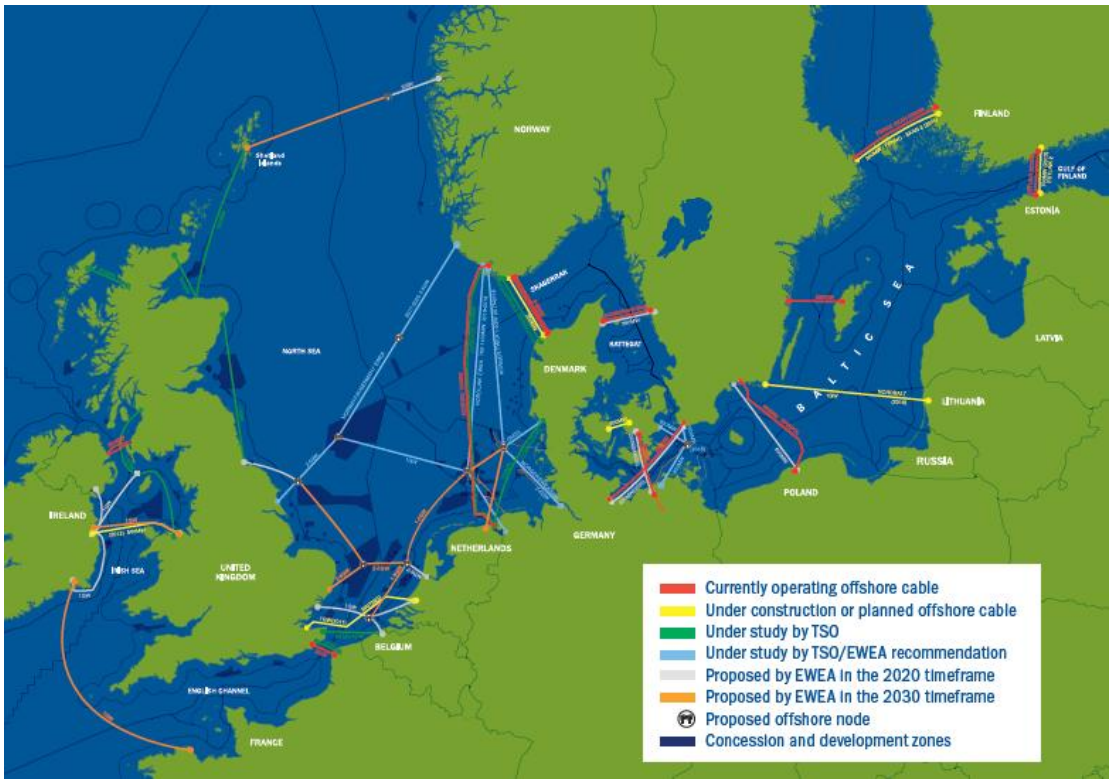

Figure 2: EWEA Master Plan 2009.

EWEA Offshore Grid Masterplan and MSP

The *Oceans of Opportunity report* underlines the importance of maritime spatial planning (MSP) and emphasises that lacking national MSP is further aggravated by the absence of an integrated and coordinated approach to maritime spatial planning (MSP) between the different Member States and regions. Cross-border cooperation on MSP would support projects crossing several Economic Exclusive Zones such as large-scale offshore wind projects, and the interconnectors of the future pan-European grid[22].

As the EWEA Master Plan was developed in close cooperation with the OffshoreGrid consortium, it shows strong similarities with the OffshoreGrid design, therefore the in depth discussion in chapter 2.3 can also be transferred to the EWEA Master Plan.

[21] Oceans of opportunity: harnessing Europe's largest domestic energy resource, EWEA, 2009.
[22] Oceans of Opportunity - Harnessing Europe's largest domestic energy resource, p. 21 and p. 23

2.1.5 Friends of the Super Grid (FOSG) – first phase

Friends of the Supergrid (FOSG) is an initiative of leading European companies in the field of offshore wind energy that promotes the development of an European Supergrid. The Supergrid shall interconnect generation and consumption centres to enhance market integration and increase the reliability and security of the European power system. The focus is on the integration of renewable energies by covering a sufficiently large area with a Supergrid in order to allow smoothing effects to reduce the large variability of weather dependent energy sources as wind and solar energy.

Figure 3: 2050 Supergrid development proposed by FOSG

FOSG Supergrid and MSP

The FOSG, however, focus in their assessments on an appropriate grid design rather than on high level economic benefits, financing issues, grid code requirements, logistical supply chain issues etc. Maritime spatial planning is, on the other hand, discussed in the internal working groups and will be further detailed in the FOSG roadmap by the end of 2011.

However it is obvious that such a large infrastructure measure as a Supergrid would heavily "consume" maritime space, which might conflict with other marine uses. The construction of such a Supergrid can be largely accelerated if supported by international MSP.

2.2 Importance of International MSP for the Offshore Grid Infrastructure

From the examples above it may be seen that none of the current relevant projects in the field of offshore grid infrastructure addresses maritime spatial planning in depth. This, however, should not lead to the assumption that international MSP is not a relevant issue for the design of an offshore grid.

The current discussions in Germany show that even for the German wind farms that will be solely connected to the German transmission grid; the room for cabling is scarce. An offshore wind farm might be in the way of the connection cable of another one. Conversely, it is more complex to construct a wind farm in an area where cables are already installed. At national level, the projects are often handled by one single national approval authority and thus the cable laying can be coordinated and corridors for future cables can be foreseen.

On international level that approach becomes more complex. The mind game illustrated in Figure **4** gives a typical example: the EEZ of country A and B both host two wind farms that connect to an offshore hub. This hub in turn is connected to the countries' onshore transmission grid. As a variety of studies show, it might be beneficial to connect the two offshore hubs in order to allow cross border trading, increase the stability and the n-1 (or n-2) security of the power system. This would then indeed be a step towards a meshed offshore grid.

As shown in Figure 4, the direct connection of the hubs is strongly hampered by the existing offshore wind farms and their internal grid connections. The necessary room for such an interconnection was not foreseen. Mid to long-term MSP might reduce future constraints of this kind.

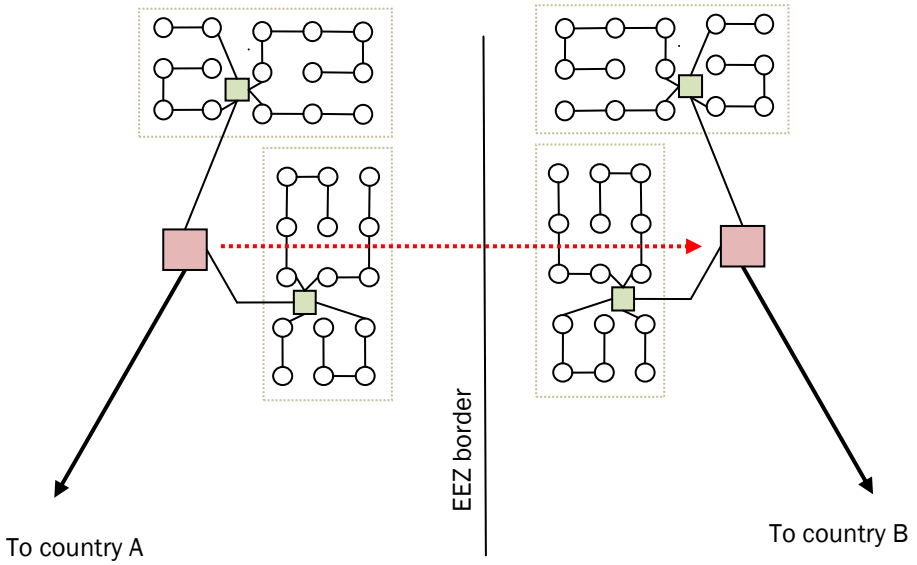

Figure 4: Hub connection via EEZ borders. (Source: 3E)

2.3 SEANERGY2020-OffshoreGrid-Windpseed Cooperation

Benefits of Project Cooperation

As discussed above the OffshoreGrid study is the only project that mapped a concrete offshore grid based on techno-economic analysis so far. It is thus of particular interest within the SEANERGY2020 project to analyse these first results in view of MSP restrictions.

For this purpose, the SEANERGY2020 project fostered an extensive data exchange between the three EU projects SEANERGY2020, WindSpeed and OffshoreGrid. All three EU projects benefit from this exchange:

- SEANERGY2020: The data exchange allows SEANERGY2020 to discuss the importance of MSP by reviewing a concrete vision of a future meshed grid design.
- WindSpeed: The cooperation allows testing in how far the WindSpeed findings can be applied to non-WindSpeed data. If successful, the general applicability of WindSpeed is proven.
- OffshoreGrid: The OffshoreGrid consortium will receive an evaluation of the results based on maritime spatial restrictions. This feedback can be used to refine the findings or can be taken into account in future similar analysis.

In order to make this cooperation possible, a Non-Disclosure Agreement was signed by all parties involved (3E, Senergy Econnect, ECN) in order to protect associated intellectual property.

OffshoreGrid results and conflicts with international or European MSP

The environmental impact of an offshore turbine or a substation is completely different from the electric cable connection. For instance, the offshore wind turbines and substations can never be built within shipping lines and will also conflict largely with other marine use as fishery, nature conservation, military use etc. Even though task 3.3 will focus on grid infrastructure, the project consortium decided to map in addition the wind farm locations against the MSP constraints.

Detailed cable planning requires a case by case study of each cable that takes into account tides, bathymetry and aspects beyond the scope of this study given the fact that all cables are only

hypothetical at this stage. As the OffshoreGrid results were not available at the time of this deliverable, the assessment below is relatively short. Moreover, it does not focus on international MSP issues alone and focuses also at constraints on national level.

2.3.1 OffshoreGrid cable connection

IMO Shipping Lines

The UNCLOS recognises a coastal State's sovereignty within its territorial sea (UNCLOS Art 2). According to UNCLOS, the coastal states may adopt laws and can impose the use of specified sea lanes and traffic separation schemes, taking into account recommendations of the competent international organisation, the International Maritime Organisation (IMO), customary practices and the nature and density of the traffic (UNCLOS Art 21).

Cables and pipelines are not affected much by shipping. Under normal operating conditions they are safely positioned on the seabed while the ships float on the water surface and stay well clear of the bed. Only in accidental situations when a ship runs aground where a cable or pipeline is laid, damage is likely to occur[23]. Furthermore, ships might anchor for emergency stopping. Such an emergency stop anchor trenches up to several meters into the seabed, thus cables in the way will be cut.

Therefore it is of particular interest for the offshore wind farm operators to minimise the cable length in the area of shipping routes. This is illustrated in Figure 5 for the example of the wind farm connection Alpha Ventus. The cable connecting the wind farm to shore crosses the shipping routes almost perpendicularly. The cable is installed this way even though the overall cable has to go a longer way. The same can be observed for the data cables which are marked pink.

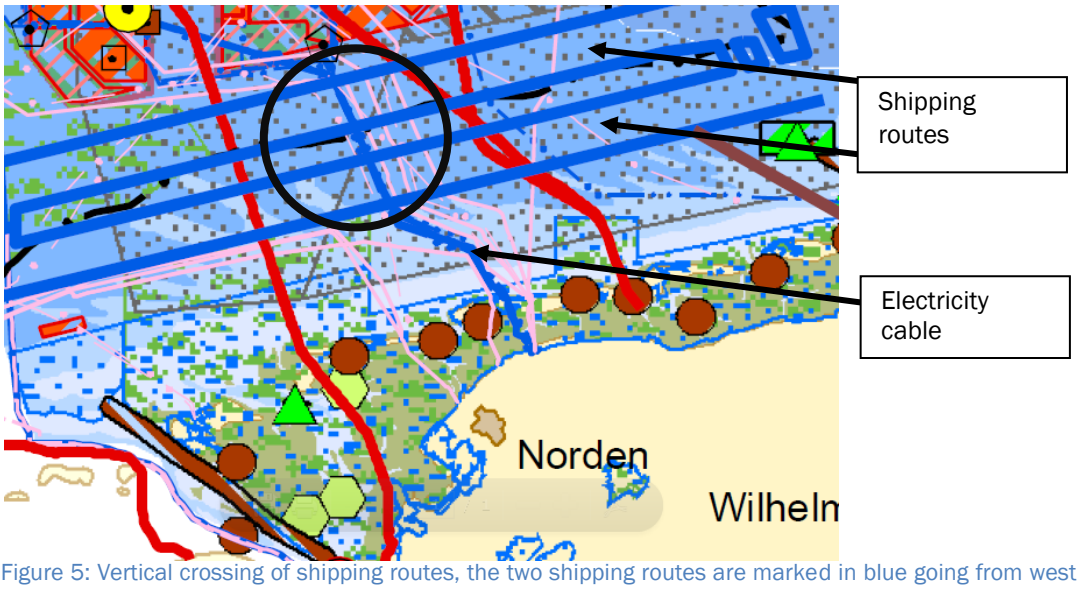

Figure 5: Vertical crossing of shipping routes, the two shipping routes are marked in blue going from west to east, the energy cable that connects the wind farm alpha ventus is also market in blue. The circle marks the almost vertical crossing of the electricity cable across the shipping routes (source: BSH, maps of the maritime uses in the North Sea).

Figure 6 shows the cables planned according to the OffshoreGrid project. As one can clearly note from this figure, the idea of crossing shipping lanes the shortest way was not taken into account. This option has not been considered in the results of the techno-economic assessment of the OffshoreGrid project, although the necessary cable deviations would be minimal. It suggests that future similar projects take the findings of SEANERGY2020 and WindSpeed into account in order to reach a higher level of detail in cable laying and its accuracy.

It is important to mention that there are also significant amounts of traffic outside the IMO shipping routes that also need to be taken into account when planning cable routs.

[23] WindSpeed project, "Identification and analysis of interaction between sea use functions", WP3 Report D3.2

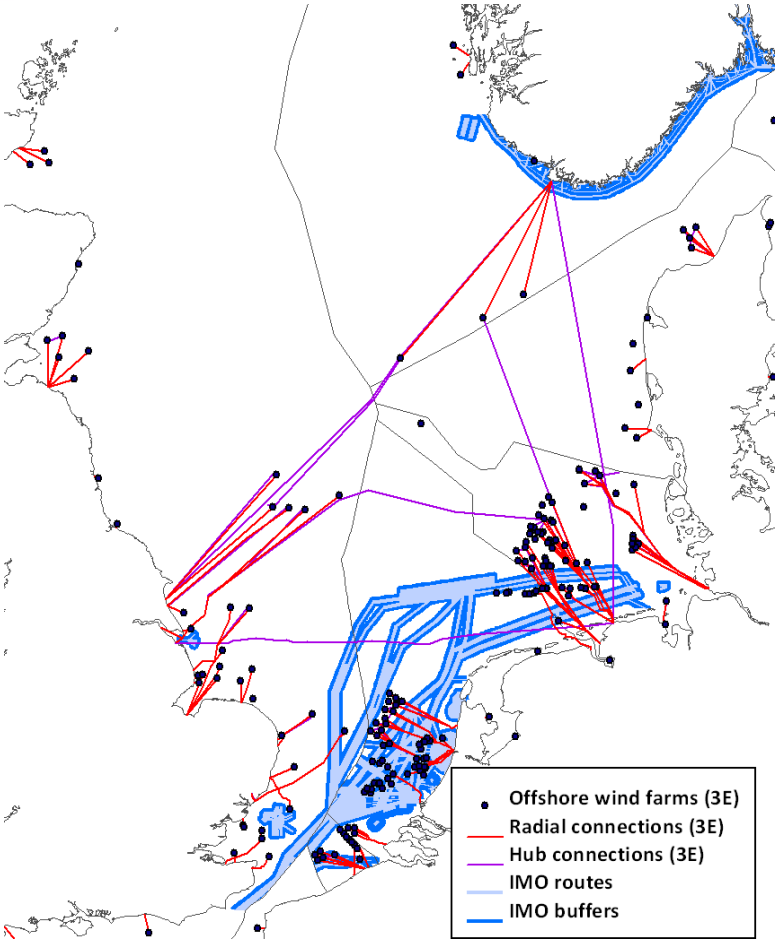

Figure 6: OffshoreGrid meshed grid design mapped against the IMO routes (source: ECN, WindSpeed project).

Existing Offshore Infrastructure: pipelines and subsea cables

With respect to offshore installations, UNCLOS confers exclusive rights to states to construct, authorise and regulate the construction, operation and use of artificial islands, installations and structures. States may establish safety zones of 500 metres or less around artificial islands, installations and structures. Within EEZs the freedom of navigation, the laying of cables and pipelines and other lawful uses of the sea are protected.

Figure 7 clearly shows that WindSpeed allows mapping all cables and pipelines. Possible conflicts as for instance the laying of cables and pipelines too close to each other or not crossing the shortest way (rectangular) can be easily identified.

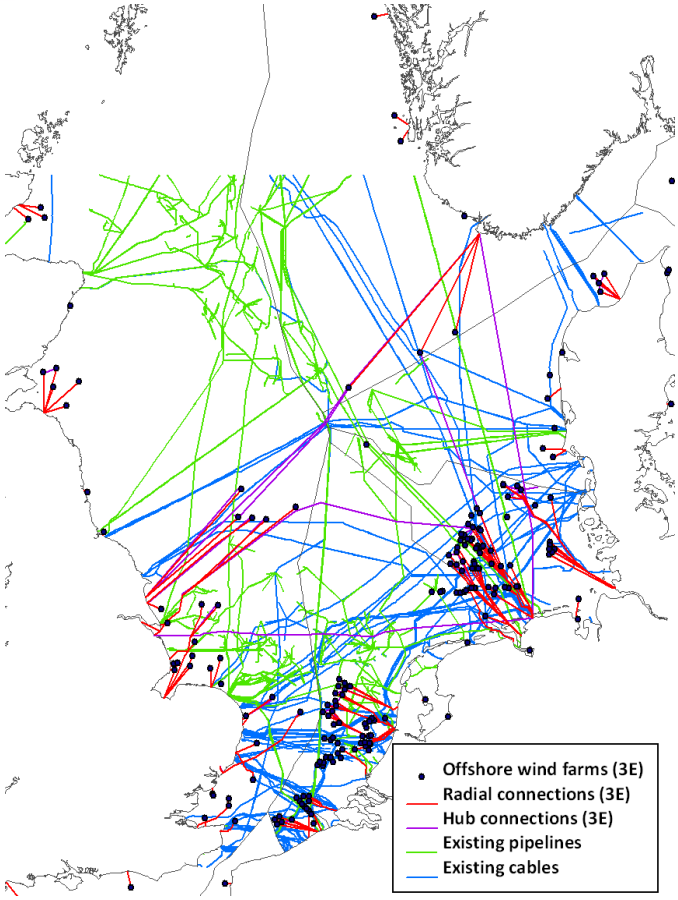

Figure 7: OffshoreGrid meshed grid design mapped against the existing pipelines and cable routes (source: ECN, WindSpeed project).

Nature conservation areas

The Habitats Directive[24] and the Birds Directive[25] require Member States to identify and protect areas for the conservation of species or habitats they host. The Birds Directive requires the establishment of Special Protection Areas (SPAs) for birds. The Habitats Directive similarly requires Special Areas of Conservation (SACs) to be designated for other species, and for habitats. Together, SPAs and SACs constitute the Natura 2000 network.

These directives do not exclude offshore renewable energy installations within protected areas, however if this occurs, the developer must show that the activity will not harm the conservation goals set out for the particular area. Indeed, the Habitats Directive requires an appropriate assessment of plans or projects that may significantly impact a NATURA 2000 site.

Figure 8 illustrates the OffshoreGrid design and the embedded wind farms as well as the nature conservation areas in the North Sea. One can see here that the NATURA 2000 does not exclude wind farms. The mapping illustrates where cables cross nature conservation areas and where possible conflicts may occur.

To avoid Nature conservation areas is in many cases in the interest of the offshore infrastructure developer, as this might significantly accelerate the approval process. When cables are built in a nature conservation area, they can be bundled in corridors and laid at the same time in order to reduce the environmental impact. This is for instance planned in the case of several cable projects in Germany.

As shown in the figure above, within the OffshoreGrid design there are various cables that cross nature conservation areas. The mapping allows one to identify possible deviations or bundling.

[24] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora,
25 Council Directive of 2 April 1979 on the conservation of wild birds (79/409/EEC)

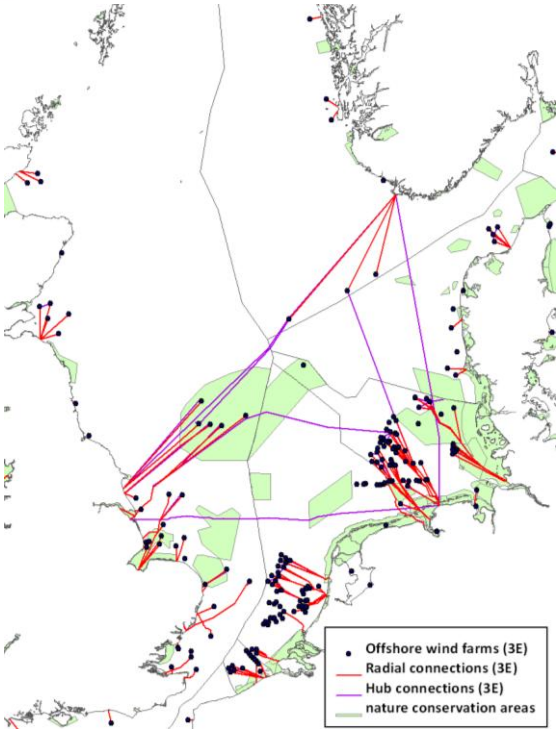

Figure 8: OffshoreGrid meshed grid design mapped against nature conservation areas (source: ECN, WindSpeed project).

Please note that in all discussed cases the bundling of connection and interconnections in cable corridors with high rated cables significantly reduces the spatial impact. This minimises maritime conflicts of use and additionally facilitates the approval process.

3 CONCLUSIONS AND RECOMMENDATIONS

Within chapter 3 conclusions and recommendations are developed – partly based on the findings of previous chapters and partly developed within chapter 3. Some conclusions and recommendations touch EU level issues while others go further and discuss international aspects.

Thus, they are categorised accordingly. Throughout this chapter we clearly distinguish between the MSP on international and EU-level in order to categorise the recommendations. When referring to international MSP, all instruments excluding EU level MSP instruments are considered. This allows the reader to clearly distinguish between the two.

This part refers to the conclusions and recommendations relevant for different levels of MSP: international MSP, MSP at EU level and MSP defined by bilateral or multi-lateral agreements at regional level.

3.1 Comparison of international and EU level approaches

As discussed in chapter 1, International MSP instruments do not explicitly consider offshore renewable energy. Therefore it may be assumed that the latter do not hamper deployment of renewable offshore energies. But at the same time international MSP does not explicitly refer to, and thus support, offshore renewables deployment neither.

It should be highlighted that one of the most important international MSP instruments, the UNCLOS or the "Constitution of the Seas", creates more opportunities than obstacles for the deployment of renewable offshore energies. Nevertheless, there is room for further improvement of conditions for offshore renewables within the international MSP framework.

One of the most important achievements of the UNCLOS is that it authorises coastal states to extend their jurisdiction up to 200 NM to create EEZs. The UNCLOS confers sovereign rights on coastal states in the EEZ. Under article 56, coastal states are given sovereign rights for the purpose of exploring, exploiting, conserving and managing the living and non-living resources. 'Energy from the water, currents and winds' (Art 56.1) is considered a non-living economic resource in the EEZ. Under article 60, coastal states have the exclusive jurisdiction to construct, to authorise and regulate the construction and operation of artificial islands, installations and structures.
According to Rothwell & Stephens[26], article 56 (1) "…was drafted broadly, in the expectation that it would need to be able to embrace future scientific and technological developments…. Parties to the UNCLOS may rely upon this provision for the granting of licenses in their EEZs for renewable energy facilities such as offshore tidal power generators, wave barrages and wind farms." This sovereign right is however not unlimited: "… coastal states will not be able to derogate from the freedom and safety of navigation, nor cause damage to the marine environment …"

The fundamental right to lay submarine cables is equally firmly anchored in the international law of the sea and has been used as such since the end of the nineteenth century for telecommunications, fuels and electricity transport needs.

As mentioned above, even if the current international MSP instruments do not appear to stand in the way of the development of offshore renewable energies, new international MSP instruments may be desirable for spurring the deployment of the ORE industry.

New international MSP instruments could be created in various ways, by:

- The establishment of a set of sectoral international standards and guidelines for the an optimal development of offshore renewable energies.
  International sectoral organisations like International Maritime Organisation, Food and Agriculture Organisation of the United Nations, Convention on Biological Diversity, United Nations Convention on the Law of the Sea Legal secretariat, International Cable Protection Committee, Global Wind Energy Council, etc. seem to be the most appropriate organisms to develop these international MSP standards and guidelines related to ORE development;
- An international agreement on the increasing role and space needed by offshore renewable in the maritime area.

[26] The International Law of the Sea, op.cit., p 89.

Even though there is room for improvement of MSP at international level, the question is whether the focus of MSP policies should be kept at international or at EU level. It has to be highlighted that changes of international legislation or international agreements are very lengthy and resource binding processes. At the same time, international MSP will have to build a broader consensus and may therefore be vaguer in the definition of rules and instruments compared to EU level MSP. Still, even though ORE development will take place mostly on European territory or within European EEZs, the development of ORE will always touch international issues, for instance the fundamental agreements as the right of way for international shipping. International MSP can therefore give guidelines and frameworks for EU level legislation and this way support ORE development.

Therefore, for the accelerated development of offshore renewables in Europe it is recommended to treat EU level MSP as priority as it is already an ambitious task to achieve a coherent MSP framework within the EU. UNCLOS provides general rules, assuming that detailed regulation is organized through specialized bodies and specific agreements. UNCLOS gives in this sense opportunities and support for EU level MSP developments for all necessary MSP instruments at EU level.

International MSP development could be initiated based on best practice EU examples. Completely new and holistic[27] international MSP agreements however may not be necessary for an accelerated development of the ORE sector.

Still, there are some recommendations given for international level that can facilitate ORE deployment as further developed in chapter 3.2.

The development of international sectorial standards and guidelines related to ORE may be very useful for a coherent and efficient development of ORE, from a technical (standardisation of the industry) and financial (investment security) point of view.

3.2 International Approaches

3.2.1 International MSP Development and Implementation for Offshore Renewables

International MSP related to offshore renewable energy (ORE) should be pragmatic and result-oriented in the first place. In order to prevent or to minimise international conflicts concerning ORE deployment, international MSP should ideally result in the establishment of internationally accepted standards and guidelines for best MSP practices in this field.

Given the emergence of offshore renewable energies, mainly offshore wind, in Europe but also in other parts of the world like China[28], South Korea[29] and the United States of America[30], the issuing of international MSP standards related to ORE development may be useful for the deployment of a global ORE industry.

[27] COM(2008)395 Guidelines for an Integrated Approach to Maritime Policy: Towards best practice in integrated maritime governance and stakeholder consultation

[28] The first offshore wind power demonstration project, which is also the first offshore wind project outside of Europe, the Shanghai Donghai Bridge Offshore wind farm, began generating power in June 2010. (source: gwec.net)

[29] The Korean government has set an ambitious strategy for offshore wind power development, and has announced a strategy to attract investments worth USD 8.2 billion (EUR 5.8 billion) in developing offshore wind farms with a total capacity of 2.5 GW over the next nine years. The government is aiming to set up a private-public partnership (PPP) to install about 500 turbines off the country's west coast. Under this PPP, 100 MW of wind projects should be operational by 2013, a further 900 MW by 2016 and the final 1.5 GW by 2016.In addition, local governments are promoting another 4.5 GW of offshore wind projects across the country. (source: gwec.net)

[30] « A National Offshore Wind Strategy: Creating an Offshore Wind Energy Industry in the United States" was published in February 2011 by the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Wind and Water Power Program. The strategy outlines the actions it will pursue to support the development of a "world-class offshore wind industry" in the United States. (source: eere.energy.gov/windandhydro/pdfs/national_offshore_wind_strategy.pdf)

The establishment of ORE standards and guidelines should be initiated through soft law. [31]

As stated by Rothwell and Stephens[32], soft law can respond more rapidly to the newly emerging maritime activity of offshore renewable energies than international treaties and conventions. The attractiveness of soft law lies with its ability to be determined on a relatively rapid basis without all of the formality associated with a treaty negotiation, and to respond to newly emerging issues which require action[33].

In certain fields, mostly related to signalisation and nautical safety, international norms and standards for ORE activities have already been developed. For example, norms for aviation (ICAO) and navigation (IALA) signalisation[34] in and around offshore wind farms have been established and are widely applied.

International MSP could set a series of sectoral guidelines and standards constituting best practices for spatial planning related to ORE. Coastal states could subsequently integrate the internationally accepted MSP standards related to ORE deployment into legally binding national MSP regulation.

International MSP should aim at facilitating and accelerating the setting up of national MSP policies and should generate a harmonising effect on the more legally binding national MSP instruments.

International MSP should consist of international guidelines laying down a series of spatial planning criteria that are taken into account when screening maritime zones for possible ORE development sites. Such international guidelines should contribute to the establishment of European, regional (sea basin) and national MSP. The integration and implementation of internationally agreed guidelines into EU or national MSP is likely to minimise international conflicts concerning offshore wind energy deployment.

In this context, the Convention on Environmental Impact Assessment in a Transboundary Context, elaborated under the auspices of UNECE (United Nations Economic Commission for Europe), adopted at Espoo (Finland) on 25 February 1991 that entered into force on 10 September 1997, is recommended to be used as a model for cross border consultation related to ORE deployment[35]*.*

3.2.2 International Agreement on Offshore Renewable Deployment on Sea

It is important to give a clear signal to current and future investors that the development of offshore renewable energies will contribute, in a substantial way, to the global ambition of decarbonising electricity generation. This ambition could equally be expressed at the international level by an international agreement stating that a part of the oceans and seas worldwide will be needed for ORE deployment, as offshore renewable will occupy significant maritime space in the future. Moreover, when developing such an agreement, one needs to take account of the fact that ORE are the very few maritime activities that need to use maritime space for a relatively long period (minimum 20 years).
With such an agreement, coastal states could have a solid basis for identifying appropriate sites for ORE development.

This designation of ORE zones will most likely not be a sufficient condition for the security of ORE investment, but it may as well be a necessary preliminary one. International MSP related to ORE could equally provide a long term vision for governments and public authorities in the domain of

[31] A “Soft law" is a quasi-legal instruments without legally binding force, or with a binding force that is "weaker" than the binding force of traditional law, often contrasted with soft law by being referred to as "hard law". A soft law can e.g. be contracts, statements of intent or guidelines. .
[32] The International Law of the Sea, op.cit. p 24.
[33] The International Law of the Sea, op.cit. p 25.
[34] The International Association of Marine Aids to Navigation to Navigation and Lighthouse Authorities (IALA) and International Civil Aviation Organisation (ICAO) have developed international norms and standards for the signalisation for offshore wind farms in order to prevent collision incidents from navigation and aviation activities in the neighbourhood of wind farms.
[35] The Convention now has 45 Parties[35]. The Espoo Convention stipulates that its Parties shall assess the environmental impact of certain activities at an early stage of planning. It also requires States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across borders.

energy policy (security of supply, RES, electricity grid design…), R&D policies, support mechanisms, etc.

As analysed in EU studies and reports[36], a combination of other than MSP parameters such as grid connection, stable support mechanisms etc, will equally determine the investment opportunity for ORE development, in Europe and elsewhere.

However, having legal certainty about the increased role in the maritime space for ORE development may constitute an important criterion for long-term investment strategies, for private investors as well as for public authorities. In order to create long term security of investment it is important that the relevant public bodies start to invest also by enhancing capacity building in the relevant government departments, financing ORE R&D programmes, and by integrating ORE development in public scientific research policies.

SEANERGY2020 highlights that:

It is a fact that offshore renewables will occupy maritime space in the future. Therefore it should be assessed how an agreement at international level can be reached that clearly recognises this fact. A formal recognition of this will facilitate further discussion and emphasize the importance of martime spatial planning.

3.2.3 Suggestions/recommendations towards a future implementation of International MSP related to ORE.

In order to initiate and follow up international legislation, processes like international MSP, need clear responsibility assignments. Therefore it would be most convenient to identify existing supranational entities.

The establishment of international MSP should be prepared by an overarching cross sector institution such as the Office of Legal Affairs of UN's Division for Ocean Affairs and the Law of the Sea.

International MSP guidelines related to ORE development should be submitted and approved by the international organisations having supranational regulatory power in their respective sectors:

- *International Maritime Organisation for navigational matters (nautical safety, prevention marine pollution from ships etc.);*
- *Food and Agriculture Organisation of the United Nations (and Regional Fisheries Management Organisation) for fisheries;*
- *Conference of the Parties (COP) for Convention on Biological Diversity related to marine biodiversity conservation, United Nations Economic Commission for Europe for the SEA protocol related to marine environment protection.*

3.2.4 Facilitate the approval of wind farms close or across borders.

The approval of wind farms close to or across borders could be facilitated in some cases[37] by the delimitation of maritime zones of coastal states. The Law of the Sea lays down the general principles which coastal states have to implement in bi- or multilateral maritime boundaries agreements.

If the maritime boundaries are settled in bi- or multilateral agreements, the approval of wind farms close or across borders can still raise problems for neighbouring countries for socio-economic or environmental reasons.

Making bi- or multilateral consultation on maritime activities entailing a possible cross border social, economic or environmental impact mandatory is likely to contribute to the approval of wind farms close to or across borders. This consultation process should be one of the criteria of international MSP related to ORE deployment.

[36] Wind barriers, etc.

[37] For EU countries, this is the case for most Mediterranean coastal states.

However, the facilitation of approval processes can most easily be organised at EU level. The international arrangements should mainly be designed to support EU level, multi- and bilateral agreements.

3.2.5 International Approaches to Facilitate Cross-Border Grid Infrastructure

All states are entitled to lay submarine cables and pipelines on the continental shelf and on the seabed underlying the high seas[38]. Article 58.1 refers to the rights of all states to lay submarine cables and pipelines in the EEZs of other coastal states. This right to lay submarine cables refers to the traditional freedoms of the high seas (art 87). The fundamental principle of the freedom related to the laying of submarine cables and pipelines is equally anchored in the chapter related to the continental shelf regime. Art. 79.1 of the UNCLOS stipulates that "all states have the right to lay submarine cables and pipelines on the continental shelf". This fundamental right, to which all states can appeal to, cannot be obstructed by a coastal state but can be restricted in limited cases, which are enumerated in Art. 79.2: a coastal state can take measures having possibly a restrictive impact on cable laying activities if it concerns the exploration of the continental shelf and the exploitation of the natural resources from it, or measures to prevent the pollution of the marine environment by pipelines. Art 79. 3 states that a coastal state has to approve the routing of a pipeline but this does not apply to cables that are not submitted to the same constraints as pipelines.

The infrastructure for transport of offshore renewable electricity should, *a priori*, enjoy the same freedom and rights as other utilities infrastructure connections have enjoyed in the past and continue to.

An example of the common practice of freedom of cable lying on the seabed is described by Sohn *et al*[39]:

"*The first transatlantic telegraph cable was laid in 1866. By the year 2000, more than 370.000 kilometres of submarine fibre-optic cable had been laid across the ocean floors, enough to circle the globe almost ten times. By 2008 this figure has tripled…*"

However, the freedom of laying submarine cables is not absolute and must therefore be exercised "with due regard to the interests of other states… " [40]

In order to balance the fundamental freedom of submarine cable laying on the one hand and the interests of coastal states on the other hand, it is recommended to facilitate cross border submarine cable projects by developing international standards and guidelines for the laying of offshore submarine cables. For instance, a set of MSP criteria such as recommended burial depth, recommended buffer distances between cables and pipelines, etc. could be developed.

Possible appropriate organisations for developing international spatial planning standards for submarine cable laying are the Division for Ocean Affairs and the Law of the Sea[41], the International Seabed Authority (ISA)[42] or the International Cable Protection Committee[43].

[38] « Law of the Sea, in a nutshell", Louis B.Sohn, West Publishing CO, 2010, p.24
[39] Sohn e.a.:ibid., p.24
[40] Ibid. p 29
[41] http://www.un.org/Depts/los/doalos_activities/about_doalos.htm
The Division for Ocean Affairs and the Law of the Sea serves as the secretariat of the United Nations Convention on the Law of the Sea and provides information, advice and assistance to States with a view to promoting a better understanding of the Convention and the related Agreements, their wider acceptance, uniform and consistent application and effective implementation.
[42] http://www.isa.org.jm/en/home; *The International Seabed Authority (ISA) is an autonomous international organisation that administers mineral resources in the Area, defined as the seabed and subsoil beyond the limits of national jurisdiction. The ISA is currently developing the "Mining Code", which refers to a comprehensive set of rules, regulations and procedures issued by the International Seabed Authority to regulate prospecting, exploration and exploitation of marine minerals in the international seabed Area. The ISA could e.g. elaborate, like the Mining Code, international MSP guidelines for the laying of submarine cables, which could include recommendations and standards of a technical nature (AC or DC technology, kV standards) , or of a nautical nature (cable burial depth recommendations), appropriate siting of offshore HVDC hubs, etc..*
[43] http://www.iscpc.org

The International Cable Protection Committee (ICPC) is an international organisation with the objective to produce and maintain industry recommendations that define the minimum standards for cable route planning, installation, operation, maintenance and protection.

The ICPC is recommended as the most appropriate international organisation for developing a set of international standards and guidelines related to submarine cable laying given its historic expertise in this domain and its experience in facilitating the exchange of technical, environmental and legal information pertaining to submarine cable systems.

The European Union should further play an active role in the development of an international submarine cable code, given the innovative projects related to interconnecting grids and offshore energy transmission that are currently being developed and co-financed within the EEPR[44] programme. Projects such as the offshore HVDC hub in the UK, the Kriegers Flak project or COBRA could generate interesting experience and recommendations for international standards for submarine cabling related to ORE development.

3.2.6 Ensure long term planning security (cross border wake effects)

It would be interesting if the organisation that is entrusted with the development of international MSP standards related to ORE development could integrate a universal standard of a minimum distance to be respected between cross border wind farms in order to annihilate or reduce to a the cross border wake effects. An internationally accepted standard of good practice related to measures reducing or annihilating wake effects between neighbouring wind farms situated on both sides of national maritime borders could be developed so that they can be implemented in national MSP policies related to ORE activities.

For instance, in the offshore wind sector, the '8D/6D'[45] rule is currently applied as an informal standard distance for reducing wake effects in and between wind farms in the North Sea. An international recognition of such a best practice example for reducing or annihilating wake effects in offshore wind farms, a buffer zone between maritime boundaries, could be proposed. However concrete numbers for such stand-offs need extensive research as they depend on the region, wind climate, wind farm size, turbine type and relative dimensions, etc.

If a recommended distance between offshore wind farms (depending on different parameters) would formally be approved as an international best practice, it should be recognised as an international good MSP practice for offshore wind farms close to maritime boundaries of adjacent coastal states.

This distance to be recognised however can vary for different sea basins depending for instance on the prevailing wind directions.

The same standard could be elaborated for other offshore renewables such as tidal and current energy installations although less empirical data are available on the vicinity effect of wave and tidal devices.

It should be noted that a standard for the minimum distance does not have to be introduced at international level, it might be even more advisable to focus at EU level concerning this issue.

3.2.7 Shipping and international MSP

The movement of shipping lanes can be beneficial for both ORE development and shipping it self in particular in regard to the safety of shipping. Therefore the moving shipping routes to accommodate new uses of the sea such as ORE should be investigated, even though the process may be a difficult and complex. It is furthermore important to analyse possible negative ecological impacts, such as higher fuel use and consequent CO_2 emissions: The potential environmental impact of moving a shipping route has to be measured against the positive environmental impact of increased renewable penetration via ORE deployment.

One of the sacrosanct rules of the law at sea is the freedom and safety of navigation. This fundamental principle is translated into the right of innocent passage for ships in the territorial

[44] European Energy Programme for Recovery (EEPR): see website DG ENER for the exhaustive list of EEPR interconnection projects. http://ec.europa.eu/energy/eepr/index_en.htm

[45] 8D/6D: 8 X dimensions rotor diameter and 6 X dimensions rotor diameter for distances between wind turbines.

sea, as laid down in article 17 of the Law of the Sea Convention (UNCLOS). Art. 17 stipulates that all ships, regardless of the fact that they are under the flag of coastal states or not, enjoy the right of innocent passage in the territorial sea. A coastal state can pass laws and regulations with the aim of restricting and/or organising the navigation in the territorial sea for a series of reasons such as nautical safety, protection of cables or pipelines, conservation of living natural resources, prevention of infringement of coastal state fishery laws, etc. (Art. 21). However, a coastal state may, as a general rule, not impede the innocent passage of foreign ships through its territorial sea (art 24).

The same importance of free and safe navigation is adopted in the Exclusive Economic Zone (EEZ). Art. 58 prescribes that all states, whether they are coastal states or not, enjoy the freedom of navigation in the EEZ.

The priority principle for navigation has been firmly anchored in the UNCLOS and is consequently reflected in the dominant positions of the shipping sector vis-à-vis other legitimate maritime activities, such as offshore renewable energies.

This is illustrated in art. 60, section 7 of the UNCLOS, in which the priority of official shipping routes is established at the expense of the setting up of artificial islands, installations and constructions in the exclusive economic zone.

This principle of the freedom of navigation is mentioned in "Roadmap for Maritime Spatial Planning: Achieving Common Principles in the EU" (Communication from the Commission, November 2008)[46].

"Also of importance is the principle of freedom of navigation guaranteed under UNCLOS, which is conditional upon rules and standards on maritime safety and protection of the marine environment being met. The International Maritime Organisation (IMO) establishes internationally recognised rules and standards for shipping and maritime transport such as traffic separation schemes."

> *From a legal point of view, but also given longstanding and common practices, relocation of shipping lanes in order to enable the construction and operation of offshore renewable energies can be challenging and requires an appropriate analysis in order to support it.*
>
> *However, if demonstrated that the relocation of official navigational routes could have a net benefit without compromising nautical safety, this may be desirable from the perspective of identifying additional space for ORE[47].*

An illustration of the practice in which other than navigational interests can prevail, is the possibility, created by MARPOL[48], COLREG[49], SOLAS[50], CBD[51] or by coastal state jurisdictions, to designate different types of 'no-go' areas for shipping. These areas "to be avoided" or "precautionary areas" are proposed, discussed and eventually approved within the NAV workgroup of the IMO[52].

3.2.8 Allocating International ORE Areas

The possibility created by IMO conventions COLREG (1972) & SOLAS (1974) to install and recognise "areas to be avoided" and "precautionary areas"[53] could be explored in the context of international MSP related to ORE development. The designation and the international acceptance of such zones by the approval of IMO could be seen as an interesting practice that could be transposed for the designation of ORE zones.

The legal status of the high seas and the deep seabed as a 'res communis' area in which non-living resources are open to be used by all states could be further explored in the context of international MSP related to ORE.

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[46] http://ec.europa.eu/maritimeaffairs/pdf/com08_791_en.pdf
[47] See Seanergy 2020, Analysis existing international MSP instruments, p.30
[48] The International Convention for the Prevention of Pollution from Ships, 1973
[49] Convention on the International Regulations for Preventing Collisions at Sea, 1972
[50] International Convention for the Safety of Life at Sea, 1974
[51] Convention on Biological Diversity, 1992
[52] International Maritime Organization
[53] As an illustration, the wind energy development area in the Belgian part of the North Sea has been officially approved by NAV-workgroup as a "precautionary area".

Rothwell and Stephens[54] state that offshore renewable energy sources such as currents, wave and wind continue to be subject to the freedom of the high seas: "The deep seabed regime (of common heritage of mankind) under UNCLOS applies only to solid, liquid or gaseous mineral resources in or beneath the seabed. Therefore it does not apply to other non-living resources potentially exploitable on the high seas, such as energy that could be harvested from currents, waves and wind. Such resources continue to be subject to the freedom of the high seas, and may be utilised freely by states subject only to the requirements to have due regard for the interests of other states in their exercise of the freedom of the high seas".

The development of offshore renewable energies in the high seas is, according to the international law of the sea, not restricted, as opposed to the activity of the exploitation of mineral resources.

In this context, the opportunity to create an ORE zone within the high seas area, for instance, in the Mediterranean Sea[55] should be explored. An ORE zone in the high seas should constitute an interesting precedent and case study on the UNCLOS freedom to harvest wind, waves and currents in the high seas.

The Commission's Communication 'Towards an Integrated Maritime Policy for better governance in the Mediterranean (2009) states that: "The semi-enclosed nature of the Mediterranean Sea and the trans-boundary impacts of maritime activities call for increased co-operation with non-EU Mediterranean partners".

Such increased co-operation with non-EU Mediterranean partners should be tested in the field of ORE. An international consortium composed of EU and non-EU Mediterranean countries could submit to the NAV workgroup of IMO a joint proposal of possible locations, after having conducted preliminary geotechnical survey campaigns and risk assessments, for ORE development zones in the high seas of the Mediterranean. Once one or several international ORE zones within the Mediterranean high seas are approved by the NAV workgroup and IMO, several subsequent consultations could be started: EUROMED for the cross border aspects and relations with non-EU Mediterranean states, FAO for the fisheries impact, etc…

After formal approval of all statutory stakeholders (IMO, UNCLOS juridical advice, ….) and favourable opinions of other stakeholders, these areas could then be proclaimed international ORE zones. These zones would not be subject to national jurisdiction of an adjacent coastal state nor would they be reserved for development of ORE for a particular coastal state. The international ORE zones in the high seas would be subject to the provisions of the international law of the sea.

These international ORE zones should subsequently be designated or tendered for ORE development in the high seas of the Mediterranean demonstrating innovative ORE technologies, such as floating substructures, efficient long distance transport of ORE electricity, etc… It could also drive the development of a cooperation mechanism for renewable energy[56], thus spurring the creation of a cooperation mechanisms market in order to achieve the EU 2020 renewable energy target.

There are no precedents for high seas ORE areas in Mediterranean. Thus, the idea needs to be investigated in-depth, and the Mediterranean costal countries consulted before drawing concrete conclusion on the value and effectiveness.

From a maritime spatial planning point of view, the international law of the sea allows ORE activity in High Seas zones. From a financing point of view, the European Union could enable, through the Renewables directive (2009), the development of joint support mechanisms for such projects.

Examples of joint development in other sea basins, where maritime boundaries have not been delimited or where doubts remain as to the outer limits of a coastal state's continental shelf, have already proved to enable the development of common mineral resources. One of the most recent

[54] "The International Law of the Sea", op.cit. p. 290

[55] "A large part of the Mediterranean marine space is made up of High Seas. It appears that approximately 16% of the marine space is made up of Territorial Sea and 31% is made up of diverse maritime zones (fishing zone, ecological protection zone)…" Source: Call for tenders No MARE/2010/05 "Costs and benefits arising from the establishment of maritime zones in the Mediterranean Sea.

[56] Cooperation mechanisms, as foreseen in the Renewable Energy Directive 2009/28/EC

joint development zones is being set up in the East China Sea[57]: "… where in 2008 China and Japan reached agreement in principle to develop jointly an identified area of the seabed, around 2,700 km². This provisional agreement allows the cooperative development of an area of the East China Sea that remains hotly contested between the two states. "

Given the equally 'hot' context of non-delimitation of EEZs and the subsequent presence of high seas maritime zones in the Mediterranean Sea basin, a similar possibility of a joint ORE development zone in the high seas should be explored.

Sohn[58] *et al* also mentions the practice of joint development zones, in which two or more states are granted rights of development. These zones have been established regarding living and non-living resources, but also regarding marine scientific research and environmental regulation. In the EU, no such joint development zones appear to have been created to date.

Joint development zones should be built on these existing international practices of joint development zones in the context of ORE development (Mediterranean Sea, Atlantic Ocean etc.).

3.3 MSP development on EU level – The Current Status

To date, most of the ORE developments have taken place in the European seas. MSP related to ORE has been, consequently, developed more in the European seas than in other maritime areas.

The SEANERGY2020 report analyses how MSP can contribute to deliver the Energy Policy objectives for 2020 and beyond.

Within the scope of SEANERGY2020 report, it is thus more relevant to investigate how MSP at the European level could be beneficial for the further development of ORE and whether European MSP related to ORE development could contribute substantially to the European 20 % RES objective by 2020.

For EU MSP related to ORE, three of the common EU MSP principles seem to be relevant:

- Using MSP according to **area** and **type of activity**
- Defining **objectives** to guide MSP
- Ensuring the **legal effect** of national MSP

These three common EU MSP principles could legitimise an ORE oriented, quantitative and legally binding EU objective for MSP

3.3.1 EU MSP Instruments -

In order to introduce the possibilities of MSP development at EU level, the current status of MSP is discussed below.

Communication from the Commission: Guidelines for an Integrated Approach to Maritime Policy: Towards best practice in integrated maritime governance and stakeholder consultation (2008)

This Communication proposes a set of guidelines aimed at encouraging Member States and other players to take steps towards adopting an integrated approach to sea-related affairs within their governance frameworks. It further states that integrated maritime planning could be best addressed at regional sea basin level.

The guidelines of this Communication are rather generic. So far, the Integrated Maritime Policy (IMP) approach does not seem to have produced tangible results for European MSP related to ORE.

Communication from the Commission: Roadmap for Maritime Spatial Planning (MSP): Achieving common principles in the EU (2008)

MSP is considered to be an important instrument for the European Integrated Maritime Policy (IMP). As a general objective, the Commission "seeks to encourage a debate to help guide the development of MSP in the EU".

[57] Ibid., p.291
[58] «Law of the Sea, in a nutshell", Louis B.Sohn, Kirsten Gustafson Juras, John E. Noyes and Erik Franckx, West Publishing CO, 2010

The Communication identifies a set of common principles of relevance to MSP in the EU:

- Using MSP according to area and type of activity
- Defining objectives to guide MSP
- Developing MSP in a transparent manner
- Stakeholder participation
- Coordination within Member States – Simplifying decision processes
- Ensuring the legal effect of national MSP
- Cross-border cooperation and consultation
- Incorporating monitoring and evaluation in the planning process
- Achieving coherence between terrestrial and maritime spatial planning
- A strong data and knowledge base

These common principles apply to a comprehensive MSP approach. MSP with a holistic approach within the context of the Integrated Maritime Policy (IMP) may turn out to be a lengthy process and therefore needs concerted action. The first Blue Paper on this subject was already elaborated in 2007.

Test projects on EU Maritime Spatial Planning: Baltic Sea and North Sea and North East Atlantic and -Plan Bothnia, MASPNOSE and MESMA

The EU co-finances two test projects on MSP in the Baltic Sea and in the North East Atlantic, including the North Sea and the Channel area. Each project involves bodies from different Member States and aims to gain practical experience of applying MSP in a cross-border area. These projects started at the end of 2010 and will run for 18 months.

The MASPNOSE[59] project addresses maritime spatial planning in the North East Atlantic/North Sea/Channel Area and gathers partners from the Netherlands, Belgium, Germany and Denmark.

The Plan BOTHNIA[60] project looks into maritime spatial planning in the Baltic Sea. Experts from Finland and Sweden are participating in the project.

MESMA[61] is an EU-FP7 project on monitoring and evaluation of spatially managed marine areas (2009-2013). Within MESMA, the case studies cover the European Seas: the North Sea, Baltic, Mediterranean, Atlantic, and Black Sea. Here, the focus is specifically on competing uses within regions, but also across the different seas. There is a comparisons part on a European scale that can contribute with general solutions for conflicts.

The deliverables of these test projects on EU MSP can be expected by 2012-2013 at the earliest. The development of an EU MSP instrument related to ORE cannot await the outcome of these test projects, given the 2020 time horizon and the rather long lead time of the development of ORE projects.

Communication 'Maritime Spatial Planning in the EU - Achievements and future development'

On 17 December 2010, the European Commission adopted the Communication 'Maritime Spatial Planning in the EU - Achievements and future development'[62]. This Communication takes stock of the debate the Commission launched with the Roadmap Communication of 2008. The 2010 Communication reports the results of the stakeholder workshops organised as part of the Roadmap consultation process, and reviews concrete and conceptual developments at both national and EU level. The European Commission (EC) emphasises that the implementation of MSP is the responsibility of Member States. However, the EC is ready to act as a facilitator for cooperation and development of a common approach since it will help to achieve a coherent framework for MSP within the EU.

The Communication further states that MSP is crucial for legal certainty, predictability and transparency, and that MSP will reduce costs for investors and operators, in particular those operating in more than one Member State.

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[59] https://www.surfgroepen.nl/sites/CMP/maspnose/news The EU Preparatory Action on Maritime Spatial Planning in the North Sea (MASPNOSE), focusing on cross-border issues in Member States in the Southern North Sea, was officially launched on 3 March 2011.

[60] http://planbothnia.org/ The PLAN BOTHNIA project, co-ordinated by the HELCOM Secretariat, will test Maritime Spatial Planning (MSP) in the Bosnian Sea area as a transboundary case between Sweden and Finland.

[61] http://www.mesma.org/

[62] http://ec.europa.eu/maritimeaffairs/pdf/com_2010_771_en.pdf

The Communication concludes that action is now needed at EU level to ensure that MSP is deployed in the most coherent and effective way possible across sea basins.

3.3.2 Official European Long Term Vision for Offshore Renewables

In the following the long term targets of the EU and its MS in regard to ORE deployment are discussed in view of the pulling effect of long term goals.

Europe has expressed its vision on climate and energy policy including the ambition for offshore wind energy within the 2020 objective and beyond. An EU target of 150 GW for offshore wind has been mentioned in COM (2008)768. Europe has equally demonstrated ambition in the development of a pan European electricity grid by financially supporting innovative interconnection projects through EEPR aid and by facilitating the development of a European offshore grid.

So far the NREAP plans of the national governments state 2020 targets for ORE. However these targets are not translated into space to be reserved for ORE deployment. This is mainly because the maritime space for the overall planned capacity for 2020 in Europe is still small in comparison to the available maritime space.

National governments long-term goals should be established, e.g. in line with the recently published European 2050 roadmap, to clearly show the need to discuss maritime spatial conflicts.

The idea of regional long term offshore deployment goals has been previously proposed by the WindSpeed project as a requirement for large scale offshore wind energy deployment in the North Sea.[63]

3.3.3 Cross-Border Permitting and Licensing

As mentioned above an efficient interconnecting offshore grid is supposed to be an important corner stone of Europe's future power system. The OffshoreGrid project suggests building by modularly developing it, based on offshore wind farms and offshore wind farm hubs.

Today the approval of a national wind farm and its cable connection to the same country is a complex process in most Member States with sometimes different approval processes for the EEZ and the 12nm zone.

This process is even more complex for cross-border projects like international hub-to-hub connections, the tee-in[64] of a wind farm or hub into a country-to-country interconnector or for instance the concrete three-leg interconnector in the Kriegers Flak region in the Baltic Sea.

With this backdrop how far the approval process of cross border projects can be simplified and how far it is necessary to enhance the compatibility of different national approval regimes should be assessed. European Guidelines, preferably based on best-practice examples for cross-border approvals, can significantly facilitate and accelerate approval processes.

[63] http://www.windspeed.eu/publications.php

[64] Tee-in is the T-joint connection of a wind farm into an interconnector. The T-connection can still be build when the direct interconnector is already existent. Vice versa also an existent wind farm can be connected to a newly built interconnector.For details please see Final Report of the EU project OffshoreGrid (www.offshoregrid.eu)