Renewable Energy and the Law of the Sea

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1.Introduction

Over the past few decades, several different technologies have been developed for generating electricity offshore.[1] Offshore wind energy produced by turbines fixed to the seabed is well-established, and turbine generating capacities continue to increase.[2] Tidal barrage energy is also well-established.[3] Wave and tidal current energy technologies are moving gradually from prototype stages toward potential future commercialisation.[4] Ocean thermal energy conversion has been discussed as a means of producing power with enormous potential for decades, but high capital costs, a lack of practical experience, and environmental concerns have prevented progress beyond small-scale prototypes.[5] Possibilities for using well-established onshore technologies for solar and geothermal power generation offshore are being explored. Finally, the introduction of floating wind turbines makes it possible to

[1] INTERNATIONAL RENEWABLE ENERGY AGENCY, OFFSHORE INNOVATION WIDENS RENEWABLE ENERGY OPTIONS: OPPORTUNITIES, CHALLENGES, AND THE VITAL ROLE OF INTERNATIONAL CO-OPERATION TO SPUR THE GLOBAL ENERGY TRANSFORMATION 1 (2018) [hereinafter IRENA OFFSHORE INNOVATION BRIEF].
[2] *Id.* at 2.
[3] INTERNATIONAL RENEWABLE ENERGY AGENCY, INNOVATION OUTLOOK: OCEAN ENERGY TECHNOLOGIES 12, 26-35 (2020) [hereinafter IRENA OCEAN ENERGY TECHNOLOGIES].
[4] IRENA OFFSHORE INNOVATION BRIEF, *supra* note 1, at 8-9.
[5] IRENA OCEAN ENERGY TECHNOLOGIES, *supra* note 3, at 13, 46-49.

produce electricity from wind in marine areas that have previously been off limits because shallow water depths were needed to situate turbine foundations on the seabed.[6]

The emergence of these technologies has coincided with major advances in direct current cable technologies for transmitting electricity from where it is produced to consumers. High voltage direct current (HVDC) cables now offer a preferable alternative to alternative current (AC) cables for the transmission of electricity from wind farms situated far out to sea.[7] Emerging HVDC Voltage Source Converter (VSC) technologies offer more scope than was previously available for linking separate offshore transmission cables to create a meshed grid which is cable of conveying power from offshore wind farms to several potential destinations.[8] In this regard, Denmark has announced plans to create two 'energy islands', one (Bornholm) on a Baltic Sea island and the other as an artificial structure in the North Sea. The islands will serve as hubs for electricity generated by surrounding offshore wind farms, "and will be connected and distribute power between Denmark and neighbouring countries."[9] It is envisaged that the hubs will also accommodate other technologies including for storage and hydrogen production from electricity supply when this is not required to meet consumer demand.[10]

The United Nations Convention on the Law of the Sea 1982 (UNCLOS) presciently anticipates offshore power production as an activity States may wish to undertake in their exclusive economic zones (EEZs).[11] Even so, the rapid rollout of marine power generation and transmission, coupled with possibilities opened up by floating wind turbines for their conduct without constructing fixed turbine foundations and in areas lying beyond the 200 nautical miles maximum extent of coastal States' exclusive economic zones (EEZs), raises questions of the legal framework that UNCLOS establishes. Fundamental considerations arise over whether and, if so, how offshore power technologies, particularly floating turbines, fit with the treaty's conceptualization of 'installations', 'structures', and 'artificial islands'. Possibilities for establishing an offshore grid serving multiple States test the treaty's

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[6] INTERNATIONAL RENEWABLE ENERGY AGENCY, FLOATING FOUNDATIONS: A GAME CHANGER FOR OFFSHORE WIND POWER 1 (2016) [hereinafter IRENA FLOATING FOUNDATIONS]; IRENA OFFSHORE INNOVATION BRIEF, *supra* note 1, at 10-11.
[7] Asimenia Korompili, Qiuwei Wu & Haoran Zhao, *Review of VSC HVDC Connection for Offshore Wind Power Integration*, 59 RENEWABLE & SUSTAINABLE ENERGY REVIEWS 1405 (2016).
[8] *Id.*
[9] Danish Energy Agency, *About Energy Islands*, ENS.DK (last visited March 31, 2021); *Denmark to Build "First Energy Island" in North Sea*, BBC (Feb. 4, 2021) (online).
[10] Danish Energy Agency, *supra* note 9.
[11] United Nations Convention on the Law of the Sea, Dec. 10, 1982, art. 56(1)(a), 1833 U.N.T.S. 397 [hereinafter UNCLOS].

provision on the exercise by States of jurisdiction over sea uses. The anticipated massive growth of offshore power necessitates the fleshing out of its provisions on managing conflict between the rights and duties of States offshore. In addition, detailing of high-level duties for marine environmental protection is needed both to address the effects of offshore energy development on an industrial scale, and to manage them whilst addressing the combined existential threats posed for marine ecosystem functioning by climate change, ocean acidification, biodiversity loss, and other consequences of already excessive pressures from human activities.

The chapter categorizes ways in which marine energy technologies are challenging the legal framework established by UNCLOS. It focuses on offshore wind energy as it far exceeds other such technologies in its current development and future potential, but similar issues are raised by wave and tidal current electricity technologies as their commercialization progresses. Section 2 examines the allocation of rights to exploit offshore resources for electricity production, to undertake related activities, and to apply national laws to their conduct amongst States. Section 3 looks at guidance on States' rights to apply their laws to the transmission of electricity from offshore turbines to onshore grids and at related potential for concurrent and conflicting jurisdictional claims. Particular consideration is given to rights to govern the development and operation of a multistate offshore wind electricity grid. Section 4 considers direction on situations where States' exercise of rights may affect other States in the exercise of their rights under the law of the sea, including of navigation. Do 'due regard' and other requirements for reciprocal respect by States for each other's rights and duties under UNCLOS need further detailing to address problems which offshore renewables are likely to cause due to the immense areas of the seabed occupied by relevant projects?[12] Sections 5 and 6 examine the environmental aspect. Much additional detailing of existing laws has already been provided under relevant treaty organizations to tackle the impacts of offshore power technologies. What more needs to be done to address the unprecedented scale of development at a time of environmental threat? How can the environmental benefits driving massive expansion of non-carbon emitting means of energy generation be reconciled with the effects these will have on already vulnerable marine environments?

[12] For example, the Hornsea One development, located off the U.K.'s east coast in the part of the North Sea under U.K. jurisdiction and currently the world's highest capacity operational offshore wind farm, covers an area of 407km^2. *See About the Project*, ØRSTED (last visited Mar. 25, 2021).

The chapter concentrates on UNCLOS which has been ratified by 167 of the 193 United Nations member States as well as the European Union and signed by thirteen more.[13] Some States, notably including Turkey and the United States, are either party only to one or more of the treaties agreed in 1958 at the first UN Conference on the Law of the Sea or to no law of the sea treaties.[14] Their relations with other States offshore are therefore governed either by the 1958 treaties when States concerned have ratified them or by customary international law. Space does not allow for examination of positions that differ to those under UNCLOS, and even the United States accepts that the balance of interests and regimes in the treaty reflect customary international law. Nearly all UN member States are parties to UNCLOS and it is the normative point of departure for any analysis in the field of oceans law and policy. Many of UNCLOS' key provisions are part of the law of the sea in customary international law or a strong case can be made for this because such a high proportion of UN Member States, some 93 percent, have either ratified or signed UNCLOS.[15]

2. Rights to Exploit Resources

2.1. Electricity Generation

Coastal States have sovereignty over the territorial sea zone extending up to 12 nm from their coastlines, and therefore have exclusive rights to conduct activities in them including the generation and transmission of electricity and the construction and regulation of associated installations and infrastructure.[16] The position with regard to electricity generation in the EEZ is also clear. Article 56 UNCLOS includes "the production of energy from the water, currents and winds" amongst "other activities for the economic exploitation and exploration of the zone," which the relevant coastal State has sovereign rights to conduct.[17] Coastal States also have the exclusive right in their EEZs to authorize and regulate the construction, operation, and use of artificial islands and of installations and structures for the purposes provided for in Article 56.[18] The position is less clear where the continental shelf subject to the jurisdiction of a coastal State extends beyond its EEZ as Part VI UNCLOS does not

[13] UNCLOS, *supra* note 11.
[14] Robin Churchill, *The 1982 UN Convention on the Law of the Sea in* THE OXFORD HANDBOOK ON THE LAW OF THE SEA 24, at 35 (Donald Rothwell et al. eds., 2015).
[15] *Id.* at 37-8 and 45.
[16] UNCLOS, *supra* note 11, art. 2.
[17] *Id.* art. 56(1)(a).
[18] *Id.* arts. 60(1)(a)-(b).

expressly confer permission for energy production from the waters, currents and winds. This determination is not surprising as the continental shelf regime laid down in Part VI is concerned with exploitation of the seabed and subsoil and as waters lying above it where it extends beyond a coastal State's EEZ belong to the high seas.

It has been suggested that Article 80 UNCLOS may create de facto exclusive rights for States to produce electricity from turbines placed on their continental shelves by advising that "Article 60 applies *mutatis mutandis* to artificial islands, installations and structures on the continental shelf."[19] Article 60 refers back to the sovereign rights conferred by Article 56. Yet there are grounds for questioning an interpretation of this provision that would turn it into a backdoor route for conferring a right to conduct activities not involving the exploitation and exploration of the natural resources of the seabed and its subsoil in the continental shelf zone.[20]

All States have the freedom to construct artificial islands and erect installations for any purpose, including power generation, in waters forming part of the high seas.[21] The high seas include waters overlying the seabed in areas where the seabed subject to a coastal State's jurisdiction extends beyond its EEZ—that is, an 'extended' or 'outer' continental shelf. States other than the coastal State would be entitled to generate power in these waters if the exclusivity argument discussed above is not made out.[22] The exercise of this freedom would be subject in practice to the Coastal state's exclusive right to authorize, construct and regulate artificial islands and also installations and structures that may interfere with the exercise of its continental shelf rights.[23]

Questions arise over whether the legal status of floating offshore wind turbines would differ from that of fixed turbines under UNCLOS because of differences in how they are fixed to the seabed. Floating turbines sit on top of foundations which are anchored or moored to the seabed.[24] They are therefore easier to move than fixed turbines whose foundations are

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[19] Sarah McDonald & David L. VanderZwaag, *Renewable Ocean Energy and the International Law and Policy Seascape: Global Currents, Regional Surges*, 29 OCEAN Y.B. ONLINE 299, 302-03 (2015).
[20] Karen N. Scott, *Tilting at Offshore Windmills: Regulating Wind Farm Development Within the Renewable Energy Zone*, 18 J. ENV'T L. 89, 96 (2006); Paul Elsner & Suzette Suarez, *Renewable Energy from the High Seas: Geo-spatial Modelling of Resource Potential and Legal Implications for Developing Offshore Wind Projects Beyond the National Jurisdiction of Coastal States*, 128 ENERGY POL'Y 919, 925 (2019).
[21] UNCLOS, *supra* note 11, art. 87(1)(d).
[22] *Id.* arts. 78, 87(1)(d).
[23] *Id.* art. 80.
[24] IRENA FLOATING FOUNDATIONS, *supra* note 6, at 5.

pile-driven into the seabed or held to it by their weight.[25] In view of their greater mobility, could floating turbines be viewed as 'ships' under UNCLOS rather than as 'installations'? If so, they would be required to register with a flag State and would be partially subject to that State's jurisdiction even where being used to produce electricity in the EEZ of a different coastal State.[26] In addition, rights and responsibilities of coastal States in respect of installations in EEZs, including the establishment of safety zones, would not apply.[27] Some treaties concerned with shipping include floating devices within their definition of 'ship' even where they are not able to move independently, although others do not, using the ability to navigate and to transport people or goods as essential characteristics in their definitions.[28]

Unfortunately, the terms 'ship' and 'installation' are not defined under UNCLOS.[29] That lack of fidelity necessarily allows coastal States some discretion in defining what should be regarded as a ship or installation in national legislation but does not give them unbridled freedom to do so. To reach that conclusion would be to ignore that the intended scopes of these two terms are implied by their use to allocate certain rights, duties, and powers to specified States.[30] The current stage of technological development for floating turbines would make it difficult to argue credibly that it would be inappropriate to view them when in situ as falling under 'installation' as the term is used in UNCLOS. The fact that means are used to hold them to a particular location, albeit without the permanence of turbines with fixed foundations, fits within an ordinary understanding of 'installation'.[31] UNCLOS, whilst not defining installations, clearly views them alongside artificial islands and structures as entities that shipping should be protected from and vice versa, including by the establishment of safety zones because of their occupation of marine space and their more than momentary

[25] Alexander Severance & Martin Sandgren, *Flagging the Floating Turbine Unit: Navigating Towards a Registerable, First-Ranking Security Interest in Floating Wind Turbines*, 39 TUL. MAR. L.J. 1, 7-13 (2014).
[26] UNCLOS, *supra* note 11, art. 92.
[27] *Id.* art. 60.
[28] Rainer Lagoni, *Merchant Ships, in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, ¶¶ 1-2 (Anne Peters ed., 2011); Robert Veal, Michael Tsimplis & Andrew Serdy, *The Legal Status and Operation of Unmanned Maritime Vehicles*, 50 OCEAN DEV. & INT'L L. 23, 25-26 (2019).
[29] *Id.*; Alex G. Oude Elferink, *Artificial Islands, Installations and Structures, in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, ¶ 1 (Anne Peters ed., 2011).
[30] Veal, Tsimplis & Serdy, *supra* note 28, at 26-7.
[31] *Installation*, OXFORD ENGLISH DICTIONARY ONLINE (last visited Mar. 31, 2021) (defining *installation* as "a mechanical apparatus set up or put in position for use").

immobility.[32] In addition, turbines installed to date and planned developments have been or are to be towed by ships to their destination.[33]

Typical concerns associated with resources held in common by States arise that a resource for low carbon energy supplies from which all could benefit if it is used appropriately for this purpose is currently open for exploitation by any State possessing the capacity to do so. The fear with such resources is that their 'commons' nature allows capture and use of the resource by the wealthiest most technically advanced States in ways that only they benefit from, or that is suboptimal for States collectively in other respects.[34] Alternatively, the potential value for decarbonization could be squandered by use of the high seas for activities which prevent their use for renewable energy production. Concerns of this nature were of academic interest only until recently due to the limitations of offshore renewable energy technologies (e.g. offshore wind energy could only be exploited in areas with a maximum sea-bed depth of around 50m because of their fixed foundations), but have been made more tangible by the development of floating wind turbine technology.[35] The early stage of the technology's development, the currently very high capital costs of floating turbine power plants, and questions over the feasibility and financial viability of transmitting electricity from areas lying much farther out to sea than the most distant wind farms under current contemplation mean that related problems are not imminent.[36] Even so, advance consideration of them would be desirable in view of potential benefits from the resource for humankind. It should also be borne in mind that the rate at which offshore power technologies have improved and that costs for producing electricity from them have declined have far exceeded expectations.[37]

The development of floating turbine technology has prompted questions on the legal basis for electricity generation in the high seas. The high seas freedoms set out at Article 87(1) of UNCLOS do not include the production of energy from water, currents, and winds, but States are free to "construct artificial islands and other installations permitted under

[32] UNCLOS, *supra* note 11, arts. 60(3)-(7), 147, 258-262.
[33] Zhiyu Jiang, *Installation of Offshore Wind Turbines: A Technical Review*, 139 Renewable & Sustainable Energy Reviews 110,576 (2021).
[34] PHILIPPE CULLET, DIFFERENTIAL TREATMENT IN INTERNATIONAL ENVIRONMENTAL LAW 23 (2003); Elisa Morgera, *The Need for an International Legal Concept of Fair and Equitable Benefit Sharing*, 27 EUR. J. INT'L L. 353, 358 (2016).
[35] *See* IRENA FLOATING FOUNDATIONS, *supra* note 6, at 1 and 4.
[36] *Id.*
[37] *See* IRENA OFFSHORE INNOVATION, *supra* note 1, at 3-5.

international law."[38] The list of freedoms is also not exclusive.[39] UNCLOS is silent on which State has the right to exercise jurisdiction over an installation established on this basis.[40] However, references in the treaty to installations having a 'State of registry' in connection with the prosecution of unauthorized broadcasting, the adoption of pollution controls for activities in the Area, and identification markings for scientific research installations envisage that jurisdiction for applying and enforcing relevant laws will lie with whichever State an installation is registered with.[41] It would therefore fall to the registry State to comply with its duty under UNCLOS to reduce, control, and prevent pollution from installations including by 'preventing accidents', 'dealing with emergencies', and 'ensuring the safety of operations at sea'.[42] UNCLOS does not establish an equivalent regime for installations to that of the flag State under which parties must set conditions for conferring their nationality on a ship whilst ships must register with a State and take on its nationality.[43] This suggests that, under UNCLOS, the nationality of a high seas installation is that of the State exercising its freedom to construct an installation in or to produce power from the winds of the high seas. However, UNCLOS is silent on this.

Express permission is lacking for States to establish safety zones around installations in the high seas save where they are used for carrying out activities in the Area or for marine scientific research.[44] Compliance with national laws that establish such zones would therefore depend on whether other States regard themselves as bound by their 'due regard' duty to respect constraints on their enjoyment of freedoms, such as in the vicinity of a wind farm. Section 4 below examines the scope for interstate disputes over whether blocking off high seas areas by constructing large offshore wind farms with safety zones around them is compatible with the sponsoring State's duty to show due regard to the enjoyment of freedoms by other States.

In addition, legal scholars have asked questions about how power production from floating wind turbines would fit with certain UNCLOS provisions governing activities offshore. First, will rules concerning uses of the sea-bed apply to this technology, given that

[38] UNCLOS, *supra* note 11, art. 87(1)(d).
[39] Elsner & Suarez, *supra* note 20, at 924-25.
[40] *Id.* at 925; CHATHAM PARTNERS, OFFSHORE WIND IN HIGH SEAS: UNLIMITED POTENTIAL BEYOND NATIONAL CONTROL? 13-14 (2019).
[41] UNCLOS, *supra* note 11, arts. 109(3)(b), 209(2), 262.
[42] *Id.* art. 194(3)(d).
[43] *Id.* arts 91-92.
[44] *Id.* arts. 147(2)(c), 194(3)(d).

the turbines are not fixed to the seabed by permanent foundations?[45] As with fixed turbines, the answer will turn on whether Chapter VI of UNCLOS on the continental shelf is applicable to development which does not involve exploitation of the seabed and its resources. Second, would floating wind turbine developments be subject to the regime established for the Area, and, if so, how would the regime affect such development?[46] Impacts are likely to be limited to rules governing relationships between Area activities and other sea uses. Attachment of floating turbines to the seabed does not fall under UNCLOS' definition of the "activities of exploration for and exploitation of resources of the Area" to which the Part XI regime applies.[47]

2.2. Electricity Transmission

UNCLOS is silent on the laying of cables for transmitting electricity from generating stations which it gives coastal States the exclusive right to establish in their EEZs. It has been suggested that this was not seen as necessary as the exclusive right to produce energy in the EEZ must carry with it a right to lay cables from generating stations to the coastal State's onshore transmission system if it is to be given effect.[48] The later confirmation that rules at Article 79 on laying cables on the sea-bed where this is subject to the jurisdiction of a coastal State do not interfere with the coastal State's "jurisdiction over cables constructed or used in connection with the…operation of artificial islands, installations and structures under its jurisdiction" appears to confirm this assumption.[49] In any event, Article 79 advises that "[a]ll States are entitled to lay submarine cables…on the continental shelf," subject to coastal State regulation and other considerations which the article mentions.[50] This provision means that power from generating stations situated in one State's EEZ could be transmitted through another State's EEZ if that were more convenient than exclusive direct connection to the onshore grid of the State in whose EEZ the generating station is situated. This right would be of little value without agreement of the coastal State concerned for cable laying and electricity transmission in the territorial sea over which it has full sovereignty and for connection to its onshore electricity system. This is a first instance of the need for

[45] McDonald & VanderZwaag, *supra* note 19, at 303; Richard Barnes, *Energy Sovereignty in Marine Spaces*, 29 INT'L J. MARINE & COASTAL L. 573, 591 (2019).
[46] Barnes, *supra* note 45, at 591.
[47] UNCLOS, *supra* note 11, arts. 1(3), 133(a), 134(2).
[48] HANNAH KATHARINA MÜLLER, A LEGAL FRAMEWORK FOR A TRANSNATIONAL OFFSHORE GRID IN THE NORTH SEA 34-38 (2015).
[49] UNCLOS, *supra* note 11, art. 79(4); MÜLLER, *supra* note 48, at 36.
[50] UNCLOS, *supra* note 11, art. 79(1).

collaboration between States if best use is to be made of the offshore renewable electricity resource.

All States enjoy the freedom to lay submarine cables in the high seas. This freedom is subject to Part VI UNCLOS where cables are laid on parts of the continental shelf under the jurisdiction of a coastal State.[51] It has again been argued, although it is not stated in UNCLOS, that the freedom must include the right to use cables laid to transmit electricity if it is to be given effect.[52] As with the right to lay cables to transmit electricity produced in one State's EEZ across another State's EEZ, the freedom would be of limited value without ultimate agreement from terminus States for cables to be laid in their territorial seas and connected to their onshore electricity systems for onwards transmission to consumers. Again, collaboration is needed for States to derive full benefit from the freedom.

2.3. Collaboration on Offshore Renewable Electricity Generation and Transmission

Interstate collaboration on developing offshore generation and transmission capacities could be more advantageous for States individually than exploiting offshore renewables resources alone. This is particularly the case where exploitation takes place in semi-enclosed seas such as the North Sea. It can enable greater economic efficiency and reduced environmental effects in exploiting the resource.[53] Grids combining connections to the electricity systems of other regional States with network connections for offshore renewables assist both with addressing renewable energy intermittency by giving access to electricity from more controllable renewables (e.g. hydropower) and with reducing regional costs of a low carbon electricity system by enabling flows from areas in which windy or sunny conditions are leading to electricity overproduction to those experiencing weather-related shortfalls. Such benefits may be lost if States do not collaborate from the outset on exploiting shared offshore renewable resources.

Adoption of interstate framework treaties under which relevant development takes place would assist with taking advantage of the benefits that collaboration may offer including by preventing States from following pathways individually that would prevent a

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[51] *Id.* art. 87(1)(c).
[52] MÜLLER, *supra* note 48, at 42.
[53] Olivia Woolley, Peter J. Schaumberg & Graham St. Michel, *Establishing an Offshore Electricity Grid: A Legal Analysis of Grid Developments in the North Sea and in US Waters*, *in* ENERGY NETWORKS AND THE LAW: INNOVATIVE SOLUTIONS IN CHANGING MARKETS 180, 181-82 (Martha M. Roggenkamp et al. eds., 2012); Olivia Woolley, *Overcoming Legal Challenges for Offshore Electricity Grid Development: A Case Study of the Cobra and Kriegers Flak Projects*, *in* EUROPEAN ENERGY LAW REPORT IX 169, 169 (Martha M. Roggenkamp & Olivia Woolley eds., 2012).

network able to yield those benefits from being constructed.[54] The North Sea States have recognised this in part through their work together under the North Seas Countries Offshore Grid Initiative and the North Seas Energy forum, founded respectively through a memorandum of understanding in 2010 and a political declaration on energy cooperation in 2016.[55] The Baltic Sea States have also made a joint declaration of intent to "work together to achieve sustainable, cost-efficient and environmentally friendly deployment of offshore wind in the Baltic Sea," including by coordinating relevant planning regimes.[56] In addition, Belgium, Germany and the Netherlands have each concluded political agreements with Denmark to assess options for cooperating on the latter's energy island projects and related offshore renewable generation and transmission developments.[57] The instruments, although they do not create binding legal obligations, illustrate how the advantages of collaboration on exploiting offshore renewable resources can lead to more formal arrangements with a soft law character, which may harden in time as the advantages of collaboration become more apparent. Economic and environmental efficiency considerations also inform arguments for collaboration within U.S. waters between New England States on establishing a shared offshore grid to support their ambitions for substantial and rapid growth of offshore wind energy during the next 15 years.[58]

3. Rights to Regulate

Clarity over which States' laws will apply to offshore energy development is essential for accessing the substantial investment needed for its construction and operation. Investors need knowledge of this to assess a project's financial viability and risks associated with its conduct. It is also vital for the gradual development of multistate electricity grids.[59] For example, which State or States law would govern decision-making on a request to connect a new offshore wind farm to existing infrastructure? To what extent can coastal States obstruct the development of such a grid in waters under their jurisdiction? In addition, legal control

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[54] Olivia Woolley, *Governing a North Sea Grid Development: The Need for a Framework Treaty*, 14 COMPETITION & REGUL. IN NETWORK INDUS. 73, 91-94 (2013).
[55] *See* NORTH SEAS ENERGY COOPERATION, THE NORTH SEAS COUNTRIES' OFFSHORE GRID INITIATIVE MEMORANDUM OF UNDERSTANDING (2010); *see also* NORTH SEAS ENERGY COOPERATION, POLITICAL DECLARATION ON ENERGY COOPERATION BETWEEN THE NORTH SEAS COUNTRIES (2016).
[56] EUROPEAN COMMISSION, JOINT DECLARATION OF INTENT: BALTIC SEA OFFSHORE WIND 3 (2020).
[57] Danish Energy Agency, *supra* note 9; *see also* § 1 herein.
[58] JOHANNES PFEIFENBERGER, SAM NEWELL & WALTER GRAF, OFFSHORE TRANSMISSION IN NEW ENGLAND: THE BENEFITS OF A BETTER PLANNED GRID 14-25 (2020).
[59] Woolley, Schaumberg & St. Michel, *supra* note 53, at 189-190.

over wind farms connected to such a grid and over flows of electricity through them are vital for electricity system security. Electricity systems must keep inputs and consumption of electricity in balance, and therefore cannot countenance legal uncertainty over responsibility for controlling access for electricity to networks and input from wind farms wherever they are located.

UNCLOS provides this clarity where electricity produced by wind farms constructed in a coastal State's EEZ is transported through cables connected to the State's onshore electricity transmission system. UNCLOS confers jurisdiction on coastal States over activities that it permits them to undertake in its EEZ including the erection of installations.[60] Jurisdiction over cables from wind farms in a State's EEZ is not mentioned specifically, but it has been argued that this necessarily follows from the right to lay such cables.[61] That coastal States have control over their laying and operation is confirmed in Article 79.[62]

The ability to transport electricity directly from a power plant in a State's maritime areas to the onshore electricity system of other States is a core benefit of multistate offshore electricity grid projects such as the North Sea grid concept. It enables a pooling of renewable energy reserves among participating States so that they can be channelled to States to meet demand when renewable electricity produced in their own territories and maritime areas falls short. Offshore interconnectors linking the electricity systems of two States are already common in EU waters, and possibilities for hybrid developments combining interconnectors with offshore wind farms hubs as early contributions to the larger grid concept are being explored.[63]

As noted above, States have the right or freedom to lay such cables on other States' continental shelves and in the high seas. States with exclusive rights over the continental shelf on which cables are being laid have rights to exercise jurisdiction over them for specified reasons, including protection of the marine environment, of national plans for seabed exploitation, and of existing cables and pipelines.[64] Where UNCLOS is less clear is on which States have the right to exercise jurisdiction over the development and operation of cables transmitting electricity through the continental shelf and EEZ areas attributable to coastal States (other than the electricity producing State) or on the high seas seabed in other

[60] UNCLOS, *supra* note 11, arts. 56(1), 60(1)-(2).
[61] MÜLLER, *supra* note 48, at 33-36.
[62] UNCLOS, *supra* note 11, art. 79(4).
[63] NORTH SEAS ENERGY COOPERATION WORK PROGRAMME 2020-2023, 1-2 (2019).
[64] UNCLOS, *supra* note 11, art. 79.

respects. Rights and freedoms to lay cables on the seabed in these areas are not accompanied by direction on jurisdiction. There is no equivalent to the flag State concept for cable laying.[65] Indeed, it is hard to see how this would work with cables, such as interconnectors that have a physical connection to two different States' territories and electricity systems.

Principles of jurisdiction under public international law would support applying law to different facets of grid development and operation, such as initial construction, operation, further development, control over power production from offshore generating stations to maintain onshore electricity system balance of inputs/outputs, and prevention of harmful voltage fluctuation. Space does not allow for the full consideration of the principles and their application to scenarios that such an analysis would require. However, it is possible to conclude that it would reveal much scope for concurrent and potentially conflicting claims. This conclusion is based on the fact that offshore cables and generating stations are always in a relationship with the onshore electricity systems of States to which power is being transmitted at a point in time through physical interconnections that are only made possible by those States' consent. For example, this approach may support jurisdictional claims over:

- the development of cables by the States from which and to which electricity is to be transmitted.
- operation of an interconnector by the two States whose onshore electricity systems are connected. Legal control over electricity flows is necessary to ensure that the connected systems can be kept in balance and for market functioning.
- cables transmitting offshore electricity by the State in whose waters it was generated and by the State whose territorial system the offshore generating plant is ultimately connected to.

The potential for concurrency and conflict grows with an offshore grid concept in which multiple States' electricity systems are connected via interlinked cables to offshore generating plant in several States' maritime areas.[66] For example, multiple consumer States could have claims to exercise jurisdiction over the operation of an offshore network simultaneously where links between cables create a connection between their onshore electricity systems and wind farms producing electricity in other States' waters. The resulting

[65] Tara Davenport, *The High Seas Freedom to Lay Submarine Cables and the Protection of the Marine Environment: Challenges in High Seas Governance*, 112 AM. J. INT'L L. UNBOUND 139, 141-142 (2018); DOUGLAS R. BURNETT & LIONEL CARTER, INTERNATIONAL SUBMARINE CABLES AND BIODIVERSITY OF AREAS BEYOND NATIONAL JURISDICTION: THE CLOUD BENEATH THE SEA 1, 45 (2017).
[66] MÜLLER, *supra* note 48, at 58-62; Woolley, Schaumberg & St. Michel, *supra* note 53, at 185-89.

uncertainty is not compatible with transnational projects for which a common position on design, development and operation is needed if they are to happen in the first place and function thereafter. In view of this, new international agreements may well be needed that capture the terms of such interstate agreements and particularly where institutions are required to oversee ongoing relations between them concerning offshore energy and grid development.[67] A framework treaty of the type adopted by the United Kingdom and Norway to govern collaboration on pipeline projects linking their territories with offshore oil production under their jurisdiction exemplifies a use of law to provide clarity over rights to regulate a category of infrastructure development.[68]

4. Conflict Between Sea Uses

The introduction of offshore power production on an industrial scale to marine environments significantly increases potential for conflict between uses of the sea. The very large offshore wind farms now being constructed in farther out U.K. waters will occupy over 500 km^2 of the seabed.[69] Coastal States are permitted by UNCLOS to establish safety zones of up to 500m radius around each turbine lying in their EEZs that vessels are not permitted to enter in the interests of safe navigation.[70] This rule can render the affected areas off-limits to other sea uses including navigation and fishing in practice. It also creates potential for offshore renewable energy development to breach States' rights to undertake activities offshore in international law. Clarity is therefore desirable on where conflict in practice and in law may arise as well as thought on how this could be managed.

All States and their nationals are free in marine areas under the high seas regime (including waters lying above continental shelves extending beyond a coastal State's EEZ) to undertake activities including navigation, overflight, laying submarine cables and pipelines, the construction of artificial islands and installations, fishing, and marine scientific research.[71] Exercise of the freedoms is constrained by the duty to show due regard both 'for the interests of other States in their exercise of the freedom of the high seas' and for other States' rights with respect to activities in the Area.[72] Article 58 preserves these entitlements to an extent in

[67] Woolley, Schaumberg & St. Michel, *supra* note 53, at 192-93.
[68] Framework Agreement Concerning Cross-Border Boundary Petroleum Cooperation, Nor.-U.K., Apr. 4, 2005, Treaty Series No. 20 (2007) (U.K.); Woolley, Schaumberg & St. Michel, *supra* note 53, at 192-93.
[69] *See, e.g.*, Dogger Bank Wind Farm, *About the Project*, DOGGERBANK.COM (last visited Mar. 31, 2021).
[70] UNCLOS, *supra* note 11, arts. 60(4)-(5).
[71] *Id.* arts. 78(2), 87(1).
[72] *Id.* art. 87(2).

EEZs by allowing continued enjoyment in them for all States of freedom of navigation and overflight, and of laying cables and pipelines as well as "other internationally lawful uses of the seas related to these freedoms".[73] The coastal State and other States must have due regard to each other's rights and duties as well as respectively acting 'in a manner compatible with the Convention's provisions' and in compliance with laws and regulations adopted by the coastal State in accordance with the Convention's provisions and other rules of international law 'insofar as they are not incompatible with Part V of UNCLOS'. Article 78(2) states that the exercise of rights held by coastal States in their continental shelves "must not infringe or result in any unjustifiable interference" with navigation and other rights and freedoms of other States as provided for in UNCLOS.

In addition to these general duties, other provisions of UNCLOS require coastal States and other States to avoid obstruction of particular sea uses to a specified extent. Coastal States must respect the rights of ships under other States' flags to enjoy 'innocent passage' through their territorial seas.[74] Article 60(7) UNCLOS advises that coastal States may not erect artificial islands, structures, and installations or adopt safety zones around them "where interference may be caused to the use of recognized sea lanes essential to international navigation."[75] Article 79(5) obliges all States when laying cables to have due regard to cables and pipelines already in place including by not prejudicing possibilities for their repair.[76]

A number of questions are left unanswered by UNCLOS as to how conflicts between sea uses should be addressed. These concern the extent to which the exercise of coastal State rights in the EEZ and on continental shelves should be constrained because they would unlawfully impede navigation and the requirements to show due regard for and avoid undue interference over other States' rights and freedoms. How may offshore energy production and transmission be affected by such constraints? To what extent must other sea uses be preserved where threatened by offshore energy development?

On navigation, vessels of all States have a right to transit in innocent passage through the territorial seas of coastal States.[77] Given that the territorial sea is 12 nm in breadth and that offshore wind farms can occupy large areas, commentators have questioned the extent

[73] *Id.* art. 58(1)
[74] *Id.* art. 17.
[75] *Id.* art. 60(7).
[76] *Id.* art. 79(5).
[77] *Id.* art. 17.

renewable energy development could impede innocent passage without this becoming unlawful.[78] UNCLOS does not offer complete clarity on the position, but ships conducting innocent passage must adhere to coastal State regulations.[79] These may include requirements such as the use of sea lanes and traffic separation schemes for reasons including the safety of shipping in the vicinity of offshore installations.[80] Commentators conclude from this that States conducting innocent passage should accept a certain amount of interference by coastal States in order to exploit energy production possibilities in sovereign waters although not to the extent that this would preclude innocent passage completely or otherwise interfere with it unreasonably.[81]

In the EEZs and waters overlying the continental shelves of Coastal States, UNCLOS advises that installations and structures may not interfere with recognized sea lanes essential for international navigation but does not give guidance on compliance with the constraint.[82] There is no definition of the sea lanes concerned, and no international body is recognised as the authority for designating them.[83] Some educated guesses can be made as to the extent of the constraint this may impose. Sea lanes for which the IMO has adopted routeing schemes and traffic separation schemes are likely to fall among those that should not be interfered with.[84] IMO guidelines advise States that structures must not be erected within them or near their terminations or seriously obstruct sea approaches to and from them.[85] It is a reasonable assumption therefore that non-interference with IMO approved schemes is likely to represent a minimum requirement for respecting Article 60(7). Even so, further clarity on the provision's ramifications would be desirable in view of likely significant expansion of potential for conflict between offshore renewables and well-established sea routes.

The general due regard requirements aimed at achieving a balance of interests between States in pursuing their interests are necessarily non-prescriptive. What may amount to showing due regard depends on the particulars of cases under consideration.[86] There is an

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[78] HOSSEIN ESMAEILI, THE LEGAL REGIME OF OFFSHORE OIL RIGS IN INTERNATIONAL LAW 73 (2001); David Leary & Miguel Esteban, *Climate Change and Renewable Energy from the Oceans and Tides: Calming the Sea of Regulatory Uncertainty*, 24 INT'L J. MARINE & COASTAL L. 617, 632-33 (2009).
[79] UNCLOS, *supra* note 11, art. 21.
[80] McDonald & VanderZwaag, *supra* note 19, at 304-06; Yen-Chiang Chang, *Marine Renewable Energy: The Essential Legal Considerations*, 8 J. WORLD ENERGY L. & BUS. 26, 28-29 (2015).
[81] *Id.*; Leary & Esteban, *supra* note 78, at 632-33; Scott, *supra* note 20, at 102-03.
[82] UNCLOS, *supra* note 11, art. 60(7).
[83] Scott, *supra* note 20, at 100-01
[84] *Id.*
[85] IMO Res. A.572(14) (Nov. 20, 1985); IMO Res. A.671(16) (Oct. 19, 1989); *see* Chang, *supra* note 80, at 34-35; Scott, *supra* note 20, at 100-02.
[86] BURNETT & CARTER, *supra* note 65, at 19.

implicit expectation underlying this desire for balance that States will collaborate in order to prevent sea uses from precluding the exercise of rights and freedoms by other States.[87] Arbitral interpretation of the 'due regard' duty under Part V UNCLOS found that its discharge may involve 'elements of notice and meaningful consultation between the States involved'.[88]

Growing potential for conflict between sea uses add to the desirability of transboundary environmental impact assessment and transboundary involvement with and cooperation on marine spatial planning exercises as ways by States of observing their due regard requirements to their mutual satisfaction.[89] For example, commentators advocate the replacement of sectoral regulation of activities in areas beyond national jurisdiction (ABNJ) with 'a framework for coordinated spatial management' in view of growth in the use of ABNJ and related risks of conflict between incompatible activities and of harm to fragile marine ecosystems.[90] The prospect of offshore wind energy development in ABNJ lends further support for this argument.[91]

It also promotes exploration by relevant international organizations of how sea uses within their remit and offshore renewable energy development could be accommodated. The International Maritime Organization's (IMO) role in achieving such an accommodation with regard to navigation is noted above. As an example of its work, the IMO agreed to a request for an extension to its traffic separation scheme operating in waters surrounding the U.K.'s Land's End and Scilly Isles to accommodate the Wave Hub generating project.[92] The International Civil Aviation Organization (ICAO) has used powers under the Chicago Convention to lay down rules on marking and lighting for wind turbines if they are determined to be obstacles.[93] ICAO also advised with regard to the potential for wind turbines to affect communications between air traffic controllers and flights, and whether that initial screening should be used to determine whether reference to an engineering authority

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[87] Barnes, *supra* note 45, at 590-92.
[88] Chagos Marine Protected Area (Mauritius v. U.K.), 21 R.I.A.A. 359, 571 (Perm Ct. Arb. 2015); *see* BURNETT & CARTER, *supra* note 65, at 19.
[89] Woolley, Schaumberg & St. Michel, *supra* note 53, 192-93.
[90] Susanne Altvater, Ruth Fletcher & Cristian Passarello, *The Need for Marine Spatial Planning in Areas Beyond National Jurisdiction*, *in* MARITIME SPATIAL PLANNING: PAST, PRESENT, FUTURE 397, 398 (Jacek Zaucha & Kira Gee eds., 2019); Glen Wright et al., *Marine Spatial Planning in Areas Beyond National Jurisdiction*, MARINE POL'Y 7-10 (2019, In Press).
[91] Elsner & Suarez, *supra* note 20, at 925.
[92] Leary & Esteban, *supra* note 78, at 64-65; Glen William Wright et al., *Establishing a Legal Research Agenda for Ocean Energy*, 63 MARINE POL'Y 126, 128 (2016).
[93] McDonald & Vanderzwaag, *supra* note 19, at 312-14.

for fuller analysis is required.[94] A conclusion that a wind farm development would affect aviation communications could lead to relocation of the proposed project. Alternatively, the ICAO has a reserved right under the Chicago Convention to restrict or prohibit flights over delineated areas for reasons of public safety.[95] There is no equivalent international authority to the IMO and ICAO for cable laying and operation. The International Cable Protection Committee (ICPC), a body representing the great majority of companies operating in the offshore telecommunications and power cables sector, has sought to fill this gap.[96] It recommends that those laying new power cables should observe a default 500 m exclusion zone for existing cables.[97] It has also explored ways of observing reasonable regard for existing cables and new cable laying in relation to seabed minerals exploitation in the Area and vice versa with the International Seabed Authority.[98] Whether the ICPC's recommendations have any legal influence will depend on whether States follow them in their practices on power cable laying. A recent European Commission study records that some EU States recommend protection zones for cables, but for varying reasons and with varying extents and degrees of impact on other activities.[99]

To conclude, initial growth in offshore renewable energy is already driving thought and action on how vague international law requirements on relations between different sea uses can be given effect. Need for further steps will only increase as demand for offshore power production grows. The ramifications for this prospect are likely to be two-fold. First, we may expect further refinement and detailing of initial Statements by sectoral authorities on how due regard towards activities for which they are responsible should be shown and of circumstances that would not be viewed as showing due regard and/or which would be prohibited by specific provisions of UNCLOS, such as article 60(7). Second, we may expect growth in the conduct of State practice supporting the case for viewing conduct of marine spatial planning for all sea uses in areas covered and of strategic and environmental impact assessment as essential components of showing 'due regard' or avoiding 'undue interference' under UNCLOS.

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[94] *Id.*
[95] *Id.*
[96] INTERNATIONAL CABLE PROTECTION COMMITTEE, https://www.iscpc.org/ (last visited Mar. 28, 2021).
[97] International Cable Protection Committee Res. 13 (Nov. 2013).
[98] INTERNATIONAL SEABED AUTHORITY, SUBMARINE CABLES AND DEEP SEABED MINING: ADVANCING COMMON INTERESTS AND ADDRESSING UNCLOS "DUE REGARD" OBLIGATIONS 5 (2015).
[99] MARTA PASCUAL, SECTOR FICHE: CABLES AND PIPELINES 198 (2018).

5. Marine Environmental Protection

Massive new development of offshore renewable energy generation and transmission would have potentially significant environmental effects including by introducing energy and noise to the marine environment.[100] How may international law on protecting the marine environment affect such development?[101] Is further development of marine environmental law required to accommodate rapid and ongoing growth of this sea use? UNCLOS confers a very broad duty on all States to 'protect and preserve the marine environment'.[102] It also places more specific requirements on them for preventing, reducing, and controlling pollution of the marine environment.[103] Pollution of the marine environment is defined in Article 1 of UNCLOS as "the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities." Noise is not mentioned in the definition, but Scott makes a convincing argument that 'energy' should be understood as covering not only heat but also sound waves 'as a flow of acoustic energy'.[104] The same argument could be applied to electromagnetic fields (EMF) from cables,[105] although scientific studies have not established conclusively whether or not cable-derived-EMF is likely to harm marine species.[106]

The impacts of offshore energy may fall within UNCLOS' regime for environmental protection, but this offers little detailed guidance on what should be done. It leaves the development of regimes for addressing particular effects of sea uses to States to determine individually and in collaboration, including through regimes established to regulate uses of

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[100] Andrew B. Gill, *Offshore Renewable Energy: Ecological Implications of Generating Electricity in the Coastal Zone*, 42 J. APPLIED ECOLOGY 605 (2005); George W. Boehlert & Andrew B. Gill, *Environmental and Ecological Effects of Ocean Renewable Energy Development: A Current Synthesis*, 23 OCEANOGRAPHY 68 (2010).

[101] For an overview of international law on protecting the marine environment from the effects of offshore wind energy development, *see* Carlos Soria-Rodriguez, *The International Regulation for the Protection of the Environment in the Development of Marine Renewable Energy in the EU*, 29 REV. EUR. COMPAR. & INT'L ENV'T L. 95 (2020).

[102] UNCLOS, *supra* note 11, art. 192.

[103] *Id.* arts. 194, 207-12.

[104] Karen N. Scott, *International Regulation of Undersea Noise*, 53 INT'L & COMPAR. L.Q. 287, 292-94 (2004); *see also* JAMES HARRISON, SAVING THE OCEANS THROUGH LAW: THE INTERNATIONAL LEGAL FRAMEWORK FOR THE PROTECTION OF THE MARINE ENVIRONMENT 26-27 (2017).

[105] *Radiation: Electromagnetic Fields*, WORLD HEALTH ORG. (Aug. 4, 2016) (online).

[106] BURNETT & CARTER, *supra* note 65, at 41-42.

regional seas and to address specific sources of environmental concern.[107] To the extent that there is detailed guidance, this concerns polluting activities.

Some of the most significant effects of offshore renewable energy development, such as bird strikes and presenting barriers to wide-ranging marine mammals, are not due to pollution, but to the conduct of the authorized activity itself.[108] It is unsurprising therefore that treaty regimes concerned with the birds, bats, and migratory species for which offshore renewables specifically can pose environmental threats if incautiously sited have been proactive in developing guidance for State parties on how relevant development should be conducted and operated thereafter.[109] Resolutions concerned with planning and licensing for renewable energy development onshore and offshore have been adopted by parties to the Convention on Migratory Species, to the Agreement on the Conservation of Populations of European Bats (EUROBATS), to the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), to the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention), to the Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention), and to the Ramsar Convention on Wetlands of International Importance.[110] Resolutions that are not concerned with offshore renewables specifically, but are likely to impact them have been adopted under these regimes as well as the Convention on Biological Diversity, ACCOBAMS, ASCOBANS and the International Whaling Commission.[111] Several of these resolutions concern the cumulative effects of noise on marine species, particularly cetaceans and other species whose hearing is important for migration and feeding.[112]

Some common themes emerge from these resolutions. First, several of them advocate precaution in offshore development.[113] In doing so, they recognize that much is unknown

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[107] McDonald & VanderZwaag, *supra* note 19, at 303-04.
[108] Scott, *supra* note 20, at 104.
[109] Soria-Rodriguez, *supra* note 101, at 102-06.
[110] McDonald & VanderZwaag, *supra* note 19, at 306-12, 321-4; Scott, *supra* note 20, at 107-08; Soria-Rodriguez, *supra* note 101, at 101-05.
[111] McDonald & VanderZwaag, *supra* note 19, at 306-08, 311-12, 319-21; Scott, supra note 20, at 107-08; Soria-Rodriguez, *supra* note 101, at 99-104.
[112] Soria-Rodriguez, *supra* note 101, at 101-104.
[113] *See, e.g.*, Parties to the Agreement on the Conservation of Populations of European Bats Res. 8.4, ¶ 4 (Oct. 10, 2018) [hereinafter EUROBATS]; OSPAR COMMISSION, OSPAR GUIDELINES ON ENVIRONMENTAL CONSIDERATIONS FOR OFFSHORE WIND FARM DEVELOPMENT 11 (2008); Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals Res. 7.5, ¶ 1 (Oct. 2017) [hereinafter Convention on Migratory Species Resolution 7.5]; Parties to the Convention on the Conservation of Migratory Species of Wild Animals Res. 12-14, ¶ 16 (Oct. 28, 2017) [hereinafter Convention on Migratory Species Resolution 12-14]; Scott, *supra* note 20, at 107-08.

about how offshore development, including for energy production, may affect marine species. There is profound uncertainty over the impacts of noise to which offshore renewables will add significantly, and about how offshore wind development such as that envisaged by North Sea coastal States will affect the marine environment cumulatively.[114] In view of this, approaches to planning and conducting development are recommended that aim to reduce risks of negative impacts by avoiding environmentally sensitive areas.[115] Areas providing suitable habitats for species and for their key life stages such as mating, breeding, migrating, and moulting should be identified and development that could impact on them negatively avoided where possible. This is particularly the case where the species and habitat types concerned are endangered or rare. The identification of zones in which offshore energy development would not be problematic is also encouraged.[116] States should conduct strategic environmental assessment (SEAs) of plans for offshore development and of environmental impact assessment (EIAs) for individual developments to help avoid environmentally harmful development. SEAs and EIAs provide transparency about environments and the predicted effects of development on them.[117] This information should be made available when a plan or project is put forwards for adoption so that it can be taken into account by decision-makers. The process also enables the review of and comment on proposals by members of the public and civil society, including persons in other States, with comments received forming part of the information package that decision-makers may take into account. Assessment at the strategic stage assists with steering development away from locations where it would be harmful, hopefully reducing weight placed on EIAs at a later stage when major departure from schemes is made more difficult by time, money, and political capital having been expended in the pursuit of strategic plans. In the same vein, marine spatial planning supports rational sea uses including the implementation of policy on offshore renewables by steering them away from areas and practices which could conflict with environmental obligations and with other valued marine activities.[118]

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[114] Gill, *supra* note 100, at 612; Boehlert & Gill, *supra* note 100, at 77-78.
[115] *See, e.g.*, EUROBATS, *supra* note 113, ¶¶ 2-3; Parties to the African-Eurasian Migratory Waterbird Agreement Res. 5-16, ¶¶ 1.1-1.2 (May 18, 2012) [hereinafter AEWA]; OSPAR COMMISSION, *supra* note 113, at 4; Convention on Migratory Species Resolution 7.5, *supra* note 113, ¶ 1.
[116] OSPAR COMMISSION, *supra* note 113, at 4-5.
[117] *See, e.g.*, EUROBATS, supra note 113, ¶ 6; AEWA, *supra* note 115, ¶ 1.1; OSPAR COMMISSION, *supra* note 113, at 3-5, 9-12; Parties to the Convention on the Conservation of Migratory Species of Wild Animals Res. 11.27, ¶ 2(a) (Dec. 3, 2014); Convention on Migratory Species Resolution 12-14, *supra* note 113, ¶ 7.
[118] *See, e.g.*, AEWA, *supra* note 115, ¶ 2.3; OSPAR COMMISSION, *supra* note 113, at 4-5; Conference of the Parties to the Convention on Biological Diversity Decision X/29, U.N. Doc. UNEP/CBD/COP/ DEC/X/29, ¶¶ 15, 37, 78 (Oct. 29, 2010); Soria-Rodriguez, *supra* note 101, at 100-01.

Assessment and planning at the national level will assist with reducing risks of environmental harm. However, uncoordinated action at the national level is by itself insufficient. It is not meaningful when thinking about the effects of development to separate marine ecosystems into separate national spaces and to focus only on particular types of development.[119] Collaboration among all coastal States bordering regional seas for planning and on the assessment of plans and project proposals can address the cumulative effects of offshore energy developments in combination with other anthropogenic effects in waters subject to the jurisdiction of coastal States bordering a marine area.[120] A review of cumulative effects should include the significant effects climate change is expected to have on the functioning of marine ecosystems.

Concerns over increasing anthropogenic pressures on marine ecosystems and their biodiversity offer further justification for introducing marine spatial planning in ABNJ alongside the growing risks of conflict between sea uses referred to earlier in this chapter.[121] Legal bases for interstate planning in remote areas already exist under UNCLOS. Article 117 places a duty on States to "cooperate with each other in the conservation and management of living resources in the areas of the high seas." The duty to cooperate on marine environmental protection under Article 197 interacts with an obligation when taking measures under Part XII UNCLOS "to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life."[122] The main legal challenge with introducing marine spatial planning for ABNJ is that States lack the jurisdiction needed to create a holistic framework for regulating sea uses.[123] They would need to negotiate and adopt a treaty for this purpose that establishes an authority to oversee marine activities in areas subject to spatial planning regimes.[124] The ongoing negotiations for an international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national

[119] Olivia Woolley, *Ecological Governance for Offshore Wind Energy in United Kingdom Waters: Has an Effective Legal Framework Been Established for Preventing Ecologically Harmful Development?*, 30 INT'L J. MARINE & COASTAL L. 765, 792 (2015).
[120] *Id.*
[121] *See* § 4, *supra*.
[122] UNCLOS, *supra* note 11, art. 194(5).
[123] Altvater, Fletcher & Passarello, *supra* note 90, at 405; Wright, *supra* note 90, at 8.
[124] Altvater, Fletcher & Passarello, *supra* note 90, at 405.

jurisdiction focus on how area-based management tools such as marine spatial planning could assist with addressing global cooperation and coordination challenges in ABNJ.[125]

In summary, marine spatial planning, SEAs, and EIAs are increasingly recognized in resolutions of treaty regimes as useful tools for advancing their environmental protection goals. Growing recognition supports arguments that rules of customary international law are emerging or have become established that require that they be used to aid adherence to common duties such as the prevention of harm to the marine environment and due diligence by States in the regulation of activities subject to their jurisdiction and the pursuit of sustainable development as an aspiration held in common. The rollout of offshore energy production on an industrial scale is a major reason for using these tools. In addition, the interest of multiple States in exploiting offshore renewable energy potential promotes their use by States collaboratively in order to counter cumulative environmental effects.

5.1. Climate Change, Offshore Renewables and Marine Environmental Protection

Marine ecosystems are suffering doubly due to climate change. Global warming is already causing negative changes due in part to oceans acting as heat sinks.[126] Absorption by oceans of much of the CO_2 that humans have added to the atmosphere is simultaneously causing acidification of sea water.[127] Both phenomena impact significantly on marine species adapted to conditions that have remained relatively stable for millennia.[128] From this perspective, offshore renewable development is to be encouraged as a replacement for greenhouse gas-emitting energy sources. However, policy and law on marine environmental protection may discourage such development because of the negative impacts on ecosystems that are already deteriorating.[129] In addition, bolstering ecosystem resilience is a key aspect of climate change adaptation as conceptualized under the Paris Agreement on Climate Change.[130] How can the

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[125] *See* G. A. Res. 72/249, U.N. Doc. A/RES/72/249 (Jan. 19, 2018); *see also* G. A. Res. 69/292, U.N. Doc. A/RES/69/292 (July 6, 2015).
[126] Andrew S. Brierley & Michael J. Kingsford, *Impacts of Climate Change on Marine Organisms and Ecosystems*, 19 CURRENT BIOLOGY R602, R608-611 (2009).
[127] Andreas J. Andersson et al., *Understanding Ocean Acidification Impacts on Organismal to Ecological Scales*, 28 OCEANOGRAPHY 16, 17-18 (2015).
[128] Brierley & Kingsford, *supra* note 126, at R605-R608; Andersson, *supra* note 127, at 21.
[129] Roger Hildingsson & Bengt Johansson, *Governing Low-Carbon Energy Transitions in Sustainable Ways: Potential Synergies and Conflicts Between Climate and Environmental Policy Objectives*, 88 ENERGY POL'Y 245, 249-251 (2016); Olivia Woolley, *Climate Law and Environmental Law: Is Conflict Between Them Inevitable?*, *in* DEBATING CLIMATE LAW (Benoit Mayer & Alexander Zahar eds., forthcoming Aug. 2021).
[130] Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, 27 U.N.T.S. 7, arts. 2(1)(b), 7(2); Olivia A. Woolley, *What Would Ecological Climate Law Look Like? Developing*

push for climate change mitigation and the pull of ecosystem protection, including from climate change adaptation, be reconciled? To further complicate matters, there are significant gaps in knowledge and understanding over how offshore renewable projects may affect marine ecosystems and their component species individually (e.g. noise, benthic disturbance), cumulatively and in combination with other stressors.[131] A precautionary approach is therefore required to regulate such development.

Answering the question of how development with both positive and negative ecological impacts should be regulated in circumstances where the functioning of marine ecosystems and the combined impacts of human activities on them are poorly understood would provide a foundation for developing legal frameworks that can support socio-economic transition toward ecological sustainability. At present, legal approaches remain rooted in minimizing potential for developments to have negative impacts by using legal tools such as marine spatial planning and strategic environmental assessment to identify and avoid areas of particular environmental significance. However, there are limits to their usefulness for preventing harm to dynamic, complex, adaptive ecosystems about which so much is unknown and during a period of accelerated ecological change driven by human alteration of the planetary climate system that affects all ecosystems. The problems posed by ecosystem preservation are complex and multi-layered. Our understanding of the combined impacts of human activities are not well known and solutions are tentative.[132] Analyses in these works point to offshore renewable energy development within a context of interstate collaboration on restoring Earth's ecological capacity to support life as the necessary direction of travel.

6. Conclusion

Fixed offshore wind energy technology has moved in the short space of 20 years from a promising pre-commercialization technology to a means of producing affordable low carbon electricity at scales equivalent to output from fossil fuel generating stations. Floating offshore wind and other technologies for offshore power production are at early stages of

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a Method for Analysing the International Climate Change Regime from an Ecological Perspective, 29 REV. EUR. COMPAR. & INT'L ENVIRONMENTAL L. 76, 83-84 (2020).

[131] Woolley, *supra* note 119, at 766-67.

[132] *See generally* OLIVIA WOOLLEY, ECOLOGICAL GOVERNANCE: REAPPRAISING LAW'S ROLE IN PRESERVING ECOSYSTEM FUNCTIONALITY (2014); Olivia Woolley, *Ecological Law in the Anthropocene*, *in* FROM ENVIRONMENTAL TO ECOLOGICAL LAW (Kirsten Anker et al. eds., 2021); Woolley, *supra* note 129; and Woolley, *supra* note 130.

commercialization and have the potential to contribute significantly to decarbonization in their own right. Offshore renewable energy technologies are seen as highly desirable from the perspective of combating climate change, but their use creates practical and legal difficulties. As we have seen in this chapter, practical difficulties include transmitting electricity produced far from load centers to consumers, significant potential for conflict with other sea uses created by the very large areas that offshore wind energy can render off-limits to them, the negative impacts that renewable energy developments can have individually and cumulatively on already vulnerable marine environments, and the extreme difficulty verging on impossibility of accurate predictions of those impacts that would be required to craft effective regulations to prevent ecological harm on an informed basis.

Offshore wind's rapid rollout, together with prospects for much expanded use of other marine renewable energy technologies. makes it necessary to further detail UNCLOS' high-level rules on allocating jurisdiction over sea uses for States and particularly for transboundary electricity transmission, on balancing interests of different States in enjoying rights and freedoms to use the seas, and on marine environmental protection. They also add to pressures from other technologies considered in this volume for a reappraisal of the legal framework established by UNCLOS nearly 40 years ago.

Does the treaty provide an adequate legal framework for enabling and regulating sea use technologies that could not have been anticipated at all or at the scale they are now employed at when the treaty was adopted? Are duties of showing due regard and undue interference suited to managing offshore renewable energy's interaction with other sea uses in view of the very significant constraints this can place on their conduct? Is the concept of the high seas as an area in which all States are free to undertake activities compatible with their possible use for activities such as power generation that occupy large areas to the exclusion of others (including other renewable power producers) and that are accessible only to the most technologically advanced and wealthiest States and their corporations? In connection with this, should the high seas' resources for power production be designated in law as the common heritage of mankind, alongside those of the seabed, so that benefits from exploiting them can be shared more equitably? Finally, is the existing legal framework suited to address the serious threats presented to the functioning of marine ecosystems and the survival of their species by climate change and ocean acidification? These and other questions that this chapter identifies provide an agenda for further scholarship on the law of the sea.