Deep Water Wind: The Legal Challenges with Harnessing Ocean Wind Potential Through Floating Wind Turbines

As yet, the wind is an untamed, and unharnessed force; and quite possibly one of the greatest discoveries hereafter to be made, will be the taming, and harnessing of the wind.

- Abraham Lincoln

ABSTRACT

Wind energy technology has undergone continuous advancement, most recently with its expansion into ocean wind harvesting through offshore floating wind technology. As this industry expands, the international legal community has the unique opportunity to proactively establish a comprehensive legal framework for its sustainable and equitable development. Therefore, this note urges the international community to address the foreseeable environmental, political, administrative, and national security issues related to offshore floating wind technology.

Offshore floating wind technology should be encouraged as an exciting new renewable energy development. However, it presents legal issues that demand attention. For example, various issues, such as environmental concerns about the potential impacts on marine ecosystems and safety concerns due to conflicts with other high seas uses, highlight the need for a comprehensive and tailored legal framework for offshore floating wind technology.

Moreover, the possibility of multi-state energy projects and jurisdictional disputes over wind farm placement underscore the critical need for a legal framework that effectively addresses these political considerations and fosters international cooperation. Lastly, while advancing renewable energy initiatives is commendable, one must prioritize safeguarding critical infrastructure, as energy security and national security are connected.

Existing legal frameworks, such as the United Nations Convention on the Law of the Sea (UNCLOS), are insufficient in addressing these challenges and are unlikely to be adequately revised. As such, the international community should explore soft law mechanisms and prioritize the establishment of separate agreements as viable solutions. Additionally, the innovative concept of "friendshoring" should be implemented to enhance international collaboration while simultaneously addressing energy security concerns.

By addressing the concerns related to offshore floating wind technology before they come to fruition, the international legal community can promote the sustainable and equitable development and implementation of offshore floating wind technology.

I. INTRODUCTION

The Law is largely unable to be proactive rather than reactive when it comes to emerging technology. This is not entirely surprising, as most modern technologies do not neatly align with existing legal frameworks. For instance, when lawmakers first crafted privacy laws, they could not anticipate the rise of the Internet. As the Internet gained prominence, legislators had to adapt existing privacy regulations and create entirely new laws to address these novel challenges.[1] In many cases, this resulted in attempting to fit a square peg into a round hole, leaving legal interpretations uncertain and paving the way for future litigation. This has been a recurring theme in the realm of new technologies. One could argue that offshore wind power technology will likely follow a similar trajectory, with legislators responding reactively to the legal complexities posed by its development.

However, offshore floating wind technology is still largely in its infancy. Consequently, it presents distinct opportunities for legal systems to adopt a proactive rather than reactive approach. At present, the existing legal framework proves inadequate in addressing the issues associated with floating wind technology. Therefore, lawmakers should cast their gaze forward, identify forthcoming challenges and proactively craft legislation tailored to address these issues. This approach is more effective than attempting to shoehorn offshore wind technology into preexisting, and inadequate, legal structures.

The most suitable organization to establish and enforce an effective framework for deep water floating wind technology is the United Nations Convention on the Laws of the Sea (UNCLOS).[2] However, in its current state, UNCLOS is ill-equipped to offer comprehensive solutions for this emerging sector. Thus, the global community must unite to overhaul the existing legal framework or establish an entirely new section specifically tailored to address the unique challenges of offshore wind energy.

While an updated version of UNCLOS could potentially offer a superior long-term solution, the practicality of achieving this is in question. Considering the speed with which this sector is evolving, a temporary organization and subsequent agreement may prove more effective. Regardless of the approach taken, the creation of a proactive legal system is imperative to ensure a sustainable and equitable future for offshore floating wind technology.

---

1 Debra A. Valentine, *Privacy on the Internet: The Evolving Legal Landscape*, FED. TRADE COMM'N (Feb. 11, 2000), https://www.ftc.gov/news-events/news/speeches/privacy-internet-evolving-legal-landscape.

2 U.N. Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

II. A BRIEF HISTORY OF WIND POWER

Utilizing technology to harness the power of the wind is not a recent innovation. As far back as 5000 B.C., wind energy was employed "to [propel] ships along the Nile," and by 600 B.C., the Persians had harnessed wind power to drive basic devices for water pumping and grain milling.[3] Nonetheless, it was not until 1887 that Scottish Engineer and Professor, James Blyth, made history by creating the first electricity-generating wind turbine by erecting a series of "wind [sails] in his back garden to power the lights in his cottage."[4] Unfortunately, his local community viewed this technology with suspicion, associating it with the Devil, and, consequently, wind turbine energy production failed to gain traction in his region.[5]

During this same period, wind turbines were also emerging in the United States. However, unlike in Scotland, they rapidly gained popularity, and "by the 19th century, there were over one million" turbines across the United States.[6] Nevertheless, their utilization remained largely limited to remote areas, as they were not deemed a feasible means of supplying power to towns and cities.[7] As such, for a time, wind technology primarily served rural communities.

In the 1970s, oil shortages triggered a surge of interest in exploring "alternative energy sources, such as wind energy, to generate electricity."[8] For instance, the United States government actively "supported research and development of large wind turbines," leading to the installation of thousands of turbines "in the early 1980s."[9] This emphasis on wind energy was not exclusive to the United States; Europe and China also made significant investments in the development of wind energy.[10]

The U.S. Energy Information Administration says that the five significant renewable sources of energy include solar energy, geothermal energy, wind energy, biomass, and hydropower.[11] The use of these renewable energy sources is not a recent development, as throughout

---

3 Janet Richardson, *The History of Wind Turbines*, THE RENEWABLE ENERGY HUB, https://www.renewableenergyhub.co.uk/main/wind-turbines/history-of-wind-turbines/ (last updated Apr. 21, 2023).

4 *Id.*

5 *Id.*

6 Audrey Carleton, *The Rise of Wind Energy in the U.S.*, ARCADIA (Nov. 20, 2019), https://perma.cc/Z93L-V2NJ.

7 Richardson, *supra* note 3.

8 *Wind Explained: History of Wind Power*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/wind/history-of-wind-power.php (last updated Apr. 20, 2023).

9 *Id.*

10 *Id.*

11 *What is Energy: Sources of Energy*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/what-is-energy/sources-of-energy.php (last updated Aug. 16, 2023).

history, it served as the primary source of energy for humans.[12] For example, people used biomass from plants to burn for heat, and "to feed the animals . . . [they] used for transportation and plowing."[13] However, over time, non-renewable sources gradually supplanted most renewable energy options, leading to the diverse environmental challenges we confront today.

Many nations are currently engaged in a concerted effort to shift back to renewable energy sources "to reduce and avoid carbon dioxide emission.[14] Accordingly, the transition to renewable energy can be seen as a return to our historical reliance on sustainable energy sources. However, with modern technology, we are now able to capture this renewable energy more efficiently.

For instance, Earth's surface is more than seventy percent covered by oceans,[15] which, for much of human history, remained an underutilized resource for renewable energy.[16] However, the emergence of offshore wind technology has opened broader access to this vast, previously untapped expanse, offering a promising avenue to help the world achieve its renewable energy objectives.

The transition to renewable energy is ongoing, with offshore wind turbines emerging as a potential source of renewable energy.[17] Professor William E. Heronemus at the University of Massachusetts Amherst played a founding role in introducing the concept of offshore floating wind farms in the 1970s.[18] However, it was not until the early 1990s that the first offshore wind farm debuted.[19] For several decades, the primary focus of wind technology has been on advancing land-based wind technology, which has enjoyed significant success and widespread adoption. In fact, onshore wind turbines can be found in diverse locations, spanning "from the tropics to the Arctic."[20]

---

12 *Id.*

13 *Id.*

14 *Id.*

15 *How Much Water is in the Ocean?*, NOAA'S NAT'L OCEAN SERV., https://oceanservice.noaa.gov/facts/oceanwater.html (last updated June 5, 2023).

16 Joe McCarthy, *Putting Wind Farms in the Ocean Could Power All of Humanity, Study Shows*, GLOB. CITIZEN (Oct. 11, 2017), https://www.globalcitizen.org/en/content/ocean-wind-farms-energy-for-all-humanity/.

17 *Id.*

18 *Early Offshore Wind Research*, UNIV. OF MASS. AMHERST WIND ENERGY CTR., https://www.umass.edu/windenergy/about/history/earlyresearch (last visited Mar. 20, 2023).

19 *Winds of Change: Celebrating 30 Years of Offshore Wind Energy*, THE GUARDIAN LABS (Mar. 9, 2022), https://www.theguardian.com/power-of-green/2022/mar/09/30-years-of-offshore-wind-energy (Note: This article was paid for by Orsted, an offshore wind power company).

20 Jason Deign, *So, What Exactly is Floating Offshore Wind?*, GREENTECH MEDIA (Oct. 19, 2020), https://www.greentechmedia.com/articles/read/so-what-exactly-floating-offshore-wind.

Nevertheless, a compelling trend is emerging as the industry shifts its gaze towards offshore locations to harness the vast wind potential of the seas. Globally, "offshore wind now accounts for around 50 GW of energy," marking an astounding tenfold increase from 2010 to 2020.[21] This surge is largely motivated by the fact that "marine winds are more abundant, stronger, and blow more consistently than land winds."[22]

Offshore wind technology has been developing for some time. It initially started with the deployment of wind turbines affixed to the seabed. For example, the inaugural offshore wind farm in Denmark, Windby ("Vindeby"), was assembled in water only a few meters deep.[23] However, this fixed-foundation approach is constrained to relatively coastal waters, where the turbines can be anchored to the seabed. Consequently, this approach fails to capture most of the ocean wind potential, which is located in deep waters. Activities, like ocean wind farming, are considered deep water activities when they occur "in offshore areas where water depths exceed approximately 600 feet,"[24] which constitutes roughly ninety percent of the total ocean volume.[25]

Recently, technological advancements have eliminated the need for fixed structures, allowing turbines to float on the water's surface and access these deep-water zones. The first prototype "offshore [floating] wind turbine was set in 2008 by Blue H Technologies," off the coast of Italy.[26] Soon after, floating wind turbines became operational, and "the world's first operational [floating] offshore wind turbine, Hywind," was launched in 2009 off the coast of Norway.[27] Since then, this technology has continued to advance, leading to a notable milestone in 2021, where a total of 162 offshore wind farms worldwide were actively generating electricity.[28]

The next step for floating offshore wind is to scale up operations by deploying additional turbines, thereby establishing expansive and high-

21 *Winds of Change: Celebrating 30 Years of Offshore Wind Energy*, *supra* note 19.

22 Lucie Rollini, *Development of Wind Farms on the High Seas: A New Challenge for the International Law of the Sea*, CLIM'BLOG (Feb. 19, 2018), https://studentclimates.wordpress.com/2018/02/19/wind-farms-high-seas-new-challenge-for-international-law-sea/.

23 Tom Ewing, *Offshore Wind – A Brief History*, MARINE TECH. NEWS (June 16, 2019), https://www.marinetechnologynews.com/news/offshore-brief-history-590397.

24 *Deepwater Play*, SCHLUMBERGER LTD., https://glossary.slb.com/en/terms/d/deepwater_play (last visited Mar. 23, 2023).

25 Windows Team, *Temperature of Ocean Water*, UNIV. CORP. FOR ATMOSPHERIC RSCH. WINDOWS TO THE UNIVERSE (Aug. 31, 2001), https://perma.cc/49FD-MBUQ?type=image.

26 Sajna Soman, *Offshore Floating Wind Turbines to Reap Green Electricity*, ELEC. ENG'G PORTAL (Apr. 21, 2014), https://electrical-engineering-portal.com/offshore-floating-wind-turbines-to-reap-green-electricity.

27 *Id.*

28 Adrijana Buljan, *162 Offshore Wind Farms Up and Running Worldwide, 26 More Under Construction*, OFFSHOREWIND.BIZ (Feb. 9, 2021), https://www.offshorewind.biz/2021/02/09/162-offshore-wind-farms-up-and-running-worldwide-26-more-under-construction/.

capacity wind farms. Moreover, there is a concerted effort to position these turbines farther from shore. However, even as this wind technology advances, the legal challenges surrounding offshore wind turbines are ripening, and unfortunately the existing legal framework is ill-equipped to effectively address these emerging issues. Establishing a comprehensive system to tackle these legal matters is essential for facilitating the transition to renewable energy and is imperative for ensuring a sustainable and equitable future for floating wind technology.

III. UNDERSTANDING THE TECHNOLOGY OF FLOATING WIND TURBINES

As previously mentioned, offshore wind technology has been developing for approximately three decades, with the first offshore wind turbines being installed in 1991 in the windfarm Vindeby in Denmark.[29] However, the wind industry has embarked on a new endeavor: putting turbines on floating platforms in the water, as opposed to using fixed foundations. A floating wind turbine can be defined as an "offshore wind turbine . . . mounted on a floating structure," allowing it to "generate electricity in water depths where fixed-foundation turbines are not feasible."[30] This technological development has led to the expansion of the offshore wind energy industry, transitioning from "turbines mounted on [fixed] foundations . . . in less than 60 m of water," to developing floating turbines deployed in "~1,000 m of water."[31] While this advancement is remarkable, the technology for fixed foundation and floating offshore turbines is essentially the same. What distinguishes them, however, is their "placement, size, scale, and method of transferring the electricity they produce."[32] These distinctions render floating wind turbines one of the most pivotal and promising segments within the field of renewable energy.[33]

A floating wind turbine operates on the same basic principles as conventional wind turbines: "wind pushes on the blades, causing the rotor to turn, which drives a generator that creates electricity."[34] However, floating wind turbines incorporate mooring lines to both anchor the

29 ØRSTED, MAKING GREEN ENERGY AFFORDABLE: HOW THE OFFSHORE WIND ENERGY INDUSTRY MATURED – AND WHAT WE CAN LEARN FROM IT 8 (2019), https://orsted.com/-/media/WWW/Docs/Corp/COM/explore/Making-green-energy-affordable-June-2019.pdf.

30 *What Are Floating Wind Turbines?*, STANFORD MAGNETS, https://www.stanfordmagnets.com/what-are-floating-wind-turbines.html (last visited Mar. 20, 2023).

31 Haley Farr et al., *Potential Environmental Effects of Deepwater Floating Offshore Wind Energy Facilities*, 207 OCEAN & COASTAL MGMT., June 15, 2021, at 1, 1.

32 *What Are Floating Wind Turbines?*, *supra* note 30.

33 Deign, *supra* note 20.

34 Matthew Lackner, *Floating Wind Farms Offshore Could Boost California's Power Supply – Here's How They Work*, PBS: NEWS HOUR (July 15, 2021, 11:11 AM), https://www.pbs.org/newshour/science/floating-wind-farms-offshore-could-boost-californias-power-supply-heres-how-they-work.

turbine in place and maintain its connection to the cable that transmits the electricity to shore.[35] Moreover, rather than relying on a fixed foundation, floating wind turbines remain stable and afloat using "the iceberg principle" where the majority of their mass is submerged underwater.[36] For example, at Hywind Scotland, presently the world's only commercial floating wind farm, each turbine boasts a "mass of around 350 tons" and is supported by a foundation consisting of "6,060 tons of solid ballast," resulting in a total displacement of "13,230 tons."[37]

Currently, there are three main types of platforms in use. One of these is the spar buoy platform, characterized by its "long hollow cylinder that extends downwards from the turbine tower."[38] This design allows it to "float[] vertically in deep water," and it has a history of successful use in the offshore operations of the oil and gas industry.[39] Another option is the semi-submersible platform, which features "large floating hulls that spread out from the tower."[40] The third option, tension leg platforms, employ "smaller platforms" directly tethered to the seabed by taut lines.[41] While these platforms are relatively lighter, they tend to be more susceptible to earthquakes and tsunamis due to their heavier reliance "on the mooring lines and anchors for stability."[42]

Platform technologies will continue to evolve and improve in the coming years. Already, the world has made significant progress, transitioning from the deployment of individual wind turbines to the establishment of entire floating windfarms.[43] Several noteworthy windfarms serve as examples. One such example is Hywind Scotland, "the world's first floating wind farm, . . . [which] has been in operation since 2017."[44] Positioned 25 km offshore, it has the capacity to supply electricity to around 20,000 households.[45] Remarkably, Hywind's structure allows it to function in "water depths up to 800m, thus opening up areas that so far have been inaccessible for offshore wind."[46] Another noteworthy

35 *Id.*

36 Deign, *supra* note 20.

37 *Id.*

38 Lackner, *supra* note 34.

39 *Id.*

40 *Id.*

41 *Id.*

42 *Id.*

43 William Booth, *Most of the World's Wind is Over Deep Water. Floating Machines Can Harvest It.*, WASH. POST (Sept. 26, 2023, 1:16 PM), https://www.washingtonpost.com/climate-solutions/2023/09/25/floating-offshore-wind-energy-norway/.

44 *Hywind Scotland*, EQUINOR, https://www.equinor.com/energy/hywind-scotland (last visited Mar. 20, 2023).

45 *World's First Floating Wind Farm Delivers Electricity to Grid*, THE ENG'R (Oct. 18, 2017), https://www.theengineer.co.uk/content/news/world-s-first-floating-wind-farm-delivers-electricity-to-grid.

46 *Id.*

project, WindFloat Atlantic, has been in operation since January 2020, and is situated "20km off the coast of Viana do Castelo, Portugal."[47] Additionally, Kincardine Offshore Wind Farm, also in the UK, completed construction in August 2021.[48] While Kincardine is currently the world's largest floating wind farm, it likely will not hold this title forever, as wind farms generally have the potential for further expansion.[49] This expansion potential underscores the ongoing growth and development within this promising sector.

As the technology continues to advance, the "global capacity of large-scale wind farms" is projected to undergo a remarkable tenfold increase, surging from "34 GW in 2020 to 330 GW [by] 2030, and spread throughout 24 countries."[50] For example, the United States, under the Biden administration, unveiled its Floating Offshore Wind Shot in 2022, with the ambitious goal to "'reduce the costs of floating [wind] technologies by more than 70 percent by 2035, to $45 per megawatt-hour' and increase capacity to 15 GW by 2035, enough to power 5 million homes."[51] Furthermore, in a notable development, "[e]ight European Union countries bordering the Baltic Sea . . . agreed to increase offshore wind power generation capacity sevenfold by 2030."[52] Additionally, Chaozhou, a City in South China, plans to create a wind farm that will surpass all of "Norway's power plants combined."[53] In fact, China surpassed both the EU and the UK in terms of installed offshore wind capacity at the end of 2022, underlining the rapid global expansion of this sector.[54] This heightened demand for wind energy is poised to channel an estimated "$1 trillion . . . into the offshore wind industry over the next decade."[55]

As the international community continues to prioritize the development of wind technology, floating wind turbines will have "access [to] deeper waters, which means more potential project sites and . . . more

47 *Windfloat Atlantic Project*, POWERTECH. (Feb. 6, 2020), https://www.power-technology.com/projects/windfloat-atlantic-project/.

48 Adnan Durakovic, *Largest Floating Offshore Wind Farm Stands Complete*, OFFSHOREWIND.BIZ (Aug. 24, 2021), https://www.offshorewind.biz/2021/08/24/largest-floating-offshore-wind-farm-stands-complete/.

49 Kate Whiting, *Explainer: What is Offshore Wind and What Does Its Future Look Like?*, WORLD ECON. F. (Nov. 22, 2022), https://www.weforum.org/agenda/2022/11/offshore-wind-farms-future-renewables/.

50 *Id.*

51 *Id.*

52 Jacob Gronholt-Pedersen, *Group of EU Countries Agree on Boost to Offshore Wind Power Capacity*, REUTERS (Angus MacSwan ed., Aug. 30, 2022, 10:56 AM), https://www.reuters.com/business/energy/group-eu-countries-agree-boost-offshore-wind-power-capacity-2022-08-30.

53 Whiting, *supra* note 49.

54 Howard Mustoe, *China Overtakes Europe as World's Largest Offshore Wind Provider*, TELEGRAPH (Aug. 29, 2023, 8:32 AM), https://www.telegraph.co.uk/business/2023/08/29/europe-loses-position-worlds-top-offshore-wind-provider/.

55 Whiting, *supra* note 49.

potential capacity."[56] This progression carries numerous advantages but also presents unique challenges and raises legal questions. Given the predictability of some of these issues, there is a compelling case for the international community to craft a new treaty or adapt an existing one to provide guidance in addressing these emerging concerns. Once again, the legal industry has a unique opportunity to take a proactive stance rather than a reactive one in shaping the future of offshore wind energy regulation.

IV. WHERE TURBINES ARE LOCATED AND WHY IT MATTERS

As floating wind turbine technology evolves to allow turbines to be positioned farther out at sea, a host of distinct legal considerations come into play. One critical factor is the physical location of a turbine.[57] In the realm of onshore wind turbines, the turbine's specific location determines which governing authority has jurisdiction over it. Similarly, in the context of offshore wind, the precise location of a wind turbine in the ocean carries legal implications.

The UNCLOS treaty, which establishes a framework for the regulation of "the world's oceans and seas,"[58] delineates these water bodies into five primary zones: internal waters, territorial sea, contiguous zone, exclusive economic zone, and the high seas.[59] Depending on the specific section of the ocean where a floating wind turbine is situated, varying legal consequences and regulations come into effect.

The territorial sea extends "[twelve] nautical miles from the baseline" of a coastal state's coast, and within this zone, the coastal state wields "unlimited jurisdiction over all . . . activities" within this zone unless legal restrictions have been imposed.[60] Fixed foundation offshore wind turbines are typically situated within the territorial sea, thereby falling under the jurisdiction of the coastal state. Beyond the territorial sea lies the EEZ, stretching a maximum of 200 nautical miles from the coast.[61] Within the EEZ, "the coastal state retains exclusive sovereignty over exploring, exploiting and conserving all natural resources."[62] Although the EEZ is not considered part of the coastal state's territory, it retains

56 Deign, *supra* note 20.

57 Deign, *supra* note 20.

58 *United Nations Convention on the Law of the Sea of 10 December 1982 Overview and Full Text*, U.N., https://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm (last updated July 21, 2023).

59 *See generally* U.N. Convention on the Law of the Sea, *supra* note 2.

60 Simon O. Williams, *Law of the Sea Mechanisms: Examining UNCLOS Maritime Zones*, MAR. EXEC. (Dec. 1, 2014, 10:02 AM), https://maritime-executive.com/article/Law-of-the-Sea-Mechanisms-Examining-UNCLOS-Maritime-Zones-2014-12-01.

61 Elsner & Suarez, *infra* note 65, at 920. Williams, *supra* note 60.

62 Williams, *supra* note 60.

exclusive jurisdiction and control over activities related to the generation of wind energy, such as the construction, authorization, and regulation of offshore wind structures.[63] Consequently, within this zone, the coastal state can prevent third-party encroachment of its economic assets, including wind farming.[64] Presently, "[a]ll current offshore wind energy projects . . . are located within the territorial sea or within the exclusive economic zone (EEZ) of a coastal state," rendering them entirely subject to that coastal state's jurisdiction and command.[65] However, as technology advances and available space within territorial waters and EEZ's becomes limited, states are expected to explore the high seas for potential wind farm locations.

The high seas, located "beyond 200 nautical miles from shore," are intended to remain freely accessible to all nations, guided by "the principle of equal rights for all."[66] So, "[o]n the High Seas, no state can act or interfere with justified and equal interests of other states."[67] Given that all states possess equal rights to wind energy resources on the high seas, legal issues are likely to arise in the future. Therefore, prior to the deployment of floating wind turbines on the high seas, the international community should endeavor to address the concerns outlined later in this paper to preemptively tackle potential disputes and challenges.

V. THE BENEFITS OF HARNESSING FLOATING OFFSHORE WIND

As highlighted earlier, the development of offshore wind energy, particularly through floating offshore wind turbines, presents a multitude of compelling reasons that underscore its desirability. These rationales include financial, sustainability, and other additional benefits. The multitude of benefits associated with floating wind energy has prompted numerous countries to prioritize the expansion of their floating wind energy capacity.

A. Financial and Economic Benefits

The primary driving force behind the development of floating wind turbines lies in their unique ability to provide access to deep waters, a factor that could directly translate to increased profitability. This capability is of paramount significance due to the inherent advantages

63 U.N. Convention on the Law of the Sea, *supra* note 2.

64 Williams, *supra* note 60.

65 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, 920 (2019).

66 Williams, *supra* note 60.

67 *Id.*

associated with deeper waters—more powerful winds—resulting in heightened energy generation potential for wind turbines.[68] The more energy generated, the higher the profits that energy companies can attain. In fact, in 2019, the International Energy Agency (IEA) reported that the global potential for offshore wind power "could be 18 times the current global power demand - with the majority" of this new energy capacity coming from areas "where water[] [is] deeper than 60m," areas which are ideally suited for the development of floating wind turbines.[69] Therefore, accessing these deeper waters enhances energy generation and may significantly bolster profitability.

The IEA's report about deep water wind's energy potential is not surprising given that "the ocean space beyond the reach of conventional [fixed foundation] offshore turbines makes up 80 percent of the world's maritime waters . . . ."[70] In specific geographic contexts, such as the United States, approximately 60 percent of offshore wind locations are infeasible for fixed foundation turbines, "including practically the whole of the West Coast."[71] Similarly, in Japan, a country with "deeper coastal waters,"[72] utilization of floating foundations is "critical for the development of an offshore wind sector that could offer 500 gigawatts of capacity."[73] Conversely, many parts of Europe boast abundant shallow coastal waters, well suited for fixed-foundation turbines.[74] However, wind generated by floating offshore turbines "could deliver an extra 4 terawatts over and above the continent's already leading level of bottom-fixed capacity."[75] Therefore floating wind farms have the capacity to not only significantly expand global wind energy capacity but also capitalize on stronger and more consistent winds, thereby increasing energy generation, and, in turn, profits.

Another compelling financial advantage of advancing offshore floating wind technology is the potential collaboration with oil and gas companies, which possess extensive expertise in ocean resource extraction

---

68 Paul Hockenos, *Is Wind Power's Future in Deep Water?*, BBC (Oct. 14, 2020), https://www.bbc.com/future/article/20201013-is-wind-powers-future-in-deep-water.

69 Whiting, *supra* note 49.

70 Paul Hockenos, *Will Floating Turbines Usher in a New Wave of Offshore Wind?*, YALE ENV'T360 (May 26, 2020), https://e360.yale.edu/features/will-floating-turbines-usher-in-a-new-wave-of-offshore-wind.

71 Deign, *supra* note 20.

72 Anmar Frangoul, *Japan Targets Floating Wind Farms for Its Deep Coastal Waters*, CNBC (Aug. 24, 2021, 10:02 AM), https://www.cnbc.com/2021/08/24/japan-targets-floating-wind-farms-for-its-deep-coastal-waters.html.

73 Deign, *supra* note 20.

74 Stanley Reed, *Energy Change Sweeps the North Sea*, N.Y. TIMES (July 3, 2023), https://www.nytimes.com/2023/06/24/business/energy-environment/north-sea-green-energy-wind.html.

75 Deign, *supra* note 20.

and substantial financial resources. By forging partnerships with these industry giants, floating wind turbines could leverage the oil and gas industry's wealth of experience and resources to expedite their own development. For example, Exxon Mobil Corp. has been actively "researching how it can use floating wind turbines to enhance offshore oil production."[76] If companies of this caliber can successfully harness offshore wind energy to support fossil fuel extraction processes, it has the potential to expedite the development of offshore wind, particularly floating offshore wind.[77]

This collaboration stands to benefit both industries, as they "share [certain] components of their supply chain" and operate within a similar "federal regulatory framework," at least in the United States.[78] For instance, the "'WIN WIN'" research project conducted in conjunction with Exxon is centered on identifying ways offshore wind can be made "an essential offshore oil production process so that oil companies would become familiar with renewable energy technologies and eventually embrace and support them and help fight climate change."[79]

Integrating the offshore oil and gas industry and the offshore wind industry revolves around "finding an aspect of the offshore oil production process that could be powered by offshore wind."[80] At the moment, this aspect could be using "water injection for enhanced oil recovery," since that process "requires a lot of power to be generated in remote [locations] such as the North Sea."[81] Floating wind turbines have the potential to fulfill this energy demand, and the intermittent nature of wind energy production aligns with the variable power requirements of water injection.[82] The engagement of the oil and gas industry in the floating wind energy market not only signifies a potential financial catalyst for the development and deployment of floating wind energy, but also underscores the capacity of these industries to collaborate in pursuit of sustainable energy solutions.

Finally, the expansion of offshore wind power contributes to net employment growth and generates significant economic advantages. Governments worldwide have the opportunity to harness these

76 Bobby Magill, *Oil Industry Eyed as Catalyst for Floating Offshore Wind*, BLOOMBERG L. (June 13, 2019, 5:00 AM), https://news.bloomberglaw.com/environment-and-energy/oil-industry-eyed-as-catalyst-for-floating-offshore-wind.

77 *Id.*

78 *Id.*

79 *Id.*

80 *Id.*

81 *Id.*

82 *Id.*

socioeconomic benefits by simplifying the permit process for wind projects.[83] For instance, the Global Wind Energy Council forecasted the creation of "3.3 million new jobs . . . over the next five years" within both onshore and offshore wind sectors.[84] Moreover, as a general rule, "[e]very dollar of investment in renewables creates three times more jobs than in the fossil fuel industry."[85] Consequently, investing in offshore wind energy is highly advantageous due to its potential to create a substantial number of new jobs.

B. Sustainability Benefits

One of the most apparent advantages of wind energy lies in its pivotal role in mitigating climate change. In recent decades, climate change and population growth has shown that fossil fuel use needs to decrease.[86] The rising demand for electrical energy, along with growing concerns about the repercussions of climate change have prompted governments worldwide to establish ambitious goals "to reduce greenhouse gas emissions and increase the proportion of their energy portfolios produced from renewable energy sources such as solar and wind."[87] The efficacy of renewable energy in combating climate change stems from that fact that these energy sources are abundantly available, naturally replenished, and "emit little to no greenhouse gases or pollutants into the air."[88] And while all renewable energy sources are beneficial, wind energy possesses the distinct advantage of being accessible across virtually every corner of the planet. This accessibility not only contributes to diminishing energy imports but also fosters local economic development and job creation, thereby enhancing wealth at the community level.[89]

Another significant advantage of deploying floating wind turbines lies in the array of environmental benefits that are expected to emerge from their installation. Notably, the foundations of wind turbines have the potential to serve as "artificial reefs," offering a substrate to which various marine organisms can attach.[90] So, "[t]he cold metal bases of

---

83 *Wind Can Power 3.3 Million New Jobs Worldwide over Next Five Years*, GLOB. WIND ENERGY COUNCIL (Apr. 29, 2021), https://gwec.net/wind-can-power-3-3-million-new-jobs-worldwide-over-next-five-years/.

84 *Id.*

85 *Renewable Energy - Powering a Safer Future*, U.N., https://www.un.org/en/climatechange/raising-ambition/renewable-energy (last visited Mar. 20, 2023).

86 Rollini, *supra* note 22.

87 Farr et al., *supra* note 31, at 1.

88 *Renewable Energy – Powering a Safer Future*, *supra* note 85.

89 *Wind Energy*, ACCIONA, https://www.acciona.com/renewable-energy/wind-energy/?_adin=02021864894 (last visited Mar. 20, 2023).

90 Helen Bailey et al., *Assessing Environmental Impacts of Offshore Wind Farms: Lessons Learned and Recommendations for the Future*, 10 AQUATIC BIOSYSTEMS, 2014, at 1.

turbines [may] soon be decorated in mussels, algae, anemones, starfish sponges and even oysters, all of which then attract larger species such as fish and seabirds, creating a mini hub of biodiversity."[91] Furthermore, the deployment of floating wind turbines can yield a sheltering effect, creating a protective buffer around turbines. This zone, by design or circumstance, can function as "a de-facto marine reserve," discouraging boat traffic and reducing disturbances commonly associated with shipping lanes.[92] Additionally, the "exclusion of some or all types of fishing" activities around floating wind farms has the potential to bolster local prey populations "for top predators," while concurrently "reducing the risk of bycatch."[93] Evidently, the environmental benefits associated with the deployment of offshore wind turbines are substantial and encompass a wide range of positive outcomes, potentially extending beyond those mentioned here.

C. Other Additional Benefits

Beyond the ability to capture vast untapped energy resources, floating offshore wind can also enhance a nation's energy security. This has significant national security implications. Recent events have underscored the critical importance of secure and stable energy supplies. For example, "[t]he war in Ukraine has jolted energy markets – driving oil and gas prices to their highest levels in over a decade and leaving governments scrambling to secure energy supplies."[94] The Russian invasion of Ukraine has served as a stark reminder to policymakers that "energy policy" is intrinsically linked to "security policy."[95] Accordingly, there has been a mounting drive to "end[] the EU's dependence on Russian fossil fuels, which [is] used as an economic and political weapon," and invest in more renewable energy.[96] Notably, the head of the UN weather agency has even posited that the war on Ukraine "'may be seen as a blessing'" from a climate perspective as the war-related fuel shortages have led to an acceleration in green energies promoted.[97] This realization

91 Neve McCracken-Heywood, *Are Offshore Wind Farms a Friend or Foe of Marine Life?*, BIG BLUE OCEAN CLEANUP (Feb. 16, 2022), https://www.bigblueoceancleanup.org/news/2022/2/16/are-offshore-wind-farms-a-friend-or-foe-of-marine-life.

92 Bailey et al., *supra* note 90, at 2.

93 *Id.*

94 Ariel Cohen, *China's Wind Power Push Threatens US Strategic Interests*, FORBES (May 23, 2022, 10:00 AM), https://www.forbes.com/sites/arielcohen/2022/05/23/windy-times-in-american-energy-policy/?sh=282e763b1350.

95 *Id.*

96 *REPowerEU: A Plan to Rapidly Reduce Dependence on Russian Fossil Fuels and Fast Forward the Green Transition*, EUR. COMM'N (May 18, 2022), https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131.

97 Angela Symons & Jamey Keaten, *Energy Crisis: Fuel Shortages Could be a 'Blessing' for the Climate, Says UN Weather Chief*, EURONEWS.GREEN (Dec. 10, 2022), https://www.euronews.com/gr

reflects the broader understanding that investing in renewables, which includes floating wind technology, "is not only good for the environment, jobs, [and] GDP," but also contributes to enhancing national security by bolstering energy independence and reducing reliance on volatile energy sources.[98]

Lastly, offshore floating wind turbines can provide solutions to issues related to fixed foundation turbines. For example, the use of floating offshore wind can reduce "visual pollution," which "refers to things that obstruct or detract from natural and man-made landscapes."[99] Although this may appear to be a relatively minor concern, visual pollution has emerged as a persistent issue linked to fixed foundation wind turbines, particularly those visible from the shoreline. For example, former President of the United States, Donald Trump "battled unsuccessfully in court" to halt a major North Sea wind power development project that "would spoil the view from his golf course in Menie."[100] Similarly, in the Jersey Shore region, there are apprehensions that the development of fixed foundation offshore wind farms will negatively impact the views from the beach, potentially jeopardizing tourism and property values in the surrounding areas.[101] Further, "in Europe, . . . the [high] density of onshore and near-shore wind turbines," has triggered growing resistance to new projects.[102] Thus, a distinct benefit of floating wind turbines lies in their ability to be situated farther from shorelines and out-of-sight of coastal residents, effectively mitigating visual pollution along the coast.

The development of offshore floating wind technology offers a multitude of compelling benefits. Its serves as a vital tool in mitigating the impacts of climate change by providing an additional source of renewable energy, enabling the harnessing of more potent ocean winds, delivering a range of environmental benefits, bolstering national security through energy independence, capitalizing on the knowledge and resources of the oil and gas industry to expedite development, and fostering the creation of new industries and job opportunities. However, despite these diverse advantages, the field of offshore floating wind technology

---

een/2022/10/12/energy-crisis-fuel-shortages-could-be-a-blessing-for-the-climate-says-un-weather-chief.

98 *Id.*

99 *Visual Pollution and the Preservation of Aesthetic Places*, SCENIC AM. (Mar. 31, 2022), https://www.scenic.org/blog/visual-pollution-and-the-preservation-of-aesthetic-places/.

100 *Scottish Government Wins Donald Trump Wind Power Legal Costs*, BBC (Feb. 28, 2019), https://www.bbc.com/news/uk-scotland-north-east-orkney-shetland-47400641.

101 Michael Sol Warren, *Will Visible Offshore Wind Farms Sink Jersey Shore Tourism? The Debate Churns on*, NJ.COM (Apr. 25, 2021, 2:38 PM), https://www.nj.com/news/2021/04/will-visible-offshore-wind-farms-sink-jersey-shore-tourism-the-debate-churns-on.html.

102 Hockenos, *supra* note 70.

also confronts significant challenges that necessitate careful consideration and proactive solutions.

V. THE CHALLENGES FACING OFFSHORE FLOATING WIND

A. UNCLOS is Insufficient for Providing Guidance for Floating Wind Turbines

One of the primary challenges in the development of floating offshore wind turbines is the inadequacy of international law to address the evolving issues and questions that will inevitably arise over time. Specifically, UNCLOS falls short in providing comprehensive guidance for the development of floating offshore wind turbines.[103] UNCLOS's inadequacy "is not surprising," considering that UNCLOS was established in 1982, a period well before floating wind turbines became a feasible means of harnessing the sea's energy potential.[104]

UNCLOS holds a pivotal status, often referred to as the "'constitution [of] the oceans,' as it provides the fundamental legal framework for the rights, uses, and obligations of States with respect to the oceans, its resources and the marine environment."[105] It is worth noting that while "[t]reaties bind only those States that have expressed their consent to be bound by them," [106] it is widely considered that much of UNCLOS has attained customary international law status.[107] Customary international law encompasses rules grounded in "'general practice accepted as law'" and exists independent of treaty law.[108] Consequently, even nations that are not party to UNCLOS may be subject to its customary provisions. This is important, since "15 United Nations Member States," including the United States, "have not signed or ratified UNCLOS."[109]

Given that UNCLOS is customary international law, its treaty terms will influence the development of offshore floating wind energy. For example, UNCLOS designates that "the high seas are open to all States, whether coastal or land-locked," so long as they adhere to the conditions

---

103 *See* U.N. Convention on the Law of the Sea, *supra* note 2.

104 Rollini, *supra* note 22.

105 Elsner & Suarez, *supra* note 65, at 19 (quoting Tommy T.B. Koh, A Constitution for the Oceans, Remarks by Tommy T.B. Koh, President of the Third United Nations Conference on the Law of the Sea (Dec. 6-11, 1982)) (Koh was President of the Third U.N. Conference on the Law of the Sea).

106 *Customary Law*, INT'L COMM. OF THE RED CROSS, https://www.icrc.org/en/war-and-law/treaties-customary-law/customary-law (last visited Feb. 3, 2024).

107 Craig H. Allen, *The International Law of the Sea: A Treaty for Thee; Customary Law for Me?*, OPINIO JURIS (June 14, 2012), https://opiniojuris.org/2012/06/14/the-international-law-of-the-sea-a-treaty-for-thee-customary-law-for-me/.

108 *Id.*

109 *UNCLOS*, CURTIS, MALLET-PREVOST, COLT & MOSLE, LLP, https://www.curtis.com/glossary/public-international-law/unclos (last visited Nov. 14, 2023).

prescribed by the rules of international law.[110] Thus, all nations enjoy certain freedoms on the high seas, including the freedom of navigation, the freedom to construct and operate artificial islands, installations and structures, and the freedom of fishing.[111] While the generation of wind energy is not explicitly mentioned as a high seas freedom, it can be inferred that "exploitation of wind by States is free" as either the freedom of navigation or the freedom to construct and operate artificial islands, installations and structures on the high seas.[112] Thus, all nations likely have a right to exploit high seas wind energy potential. However, the fact that wind energy exploitation is open to all nations raises several issues.

One potential issue is the risk of developed states appropriating this resource at the expense of less-developed states. Specifically, developed states may essentially claim large portions of the ocean for their wind farms. This situation could raise doubts about the principle of non-appropriation of the high seas by states, which asserts that "[n]o State may validly purport to subject any part of the high seas to its sovereignty."[113] It is arguable that constructing and deploying floating wind turbines in a particular area of the high seas might amount to subjecting that area to a State's sovereignty, as wind farms require substantial space to operate. For instance, the Morro Bay offshore wind farm in California covers an expansive area of 399 mi^2.[114] Consequently, the development of a floating wind farm in the high seas could be viewed as a form of "creeping appropriation," which refers to the gradual encroachment or assertion of control over a particular location.[115] Given that currently only developed nations possess the capacity to develop floating wind turbines and farms, they may be able to exploit high seas wind resources and monopolize areas to the disadvantage of less-developed nations. While wind itself is an unlimited resource accessible to any state, the physical space required to harness this resource is finite.[116] Unfortunately, UNCLOS does not provide adequate guidance for addressing this potential appropriation of high seas space.

Another issue with UNCLOS pertains to its effectiveness as a mechanism for dispute resolution. In particular, the enforcement and dispute resolution provisions of UNCLOS have come under scrutiny "in the wake

110 U.N. Convention on the Law of the Sea, *supra* note 2, art. 87, ¶¶ 1, 2.

111 *Id.*

112 Rollini, *supra* note 22.

113 U.N. Convention on the Law of the Sea, *supra* note 2, art. 89.

114 *Areas of Industrial Wind Facilities*, AWEO, http://www.aweo.org/windarea.html#notes (last visited Mar. 21, 2023).

115 Rollini, *supra* note 22.

116 *Id.*

of rising tension in the South China Sea."[117] For example, despite being a party to UNCLOS, "China has refused to accept a major ruling by the Permanent Court of Arbitration in the Hague."[118] This ruling should have been considered "final and legally binding [for] all parties," but "due to [a] lack of an[y] enforcement mechanism," China has continued its activities in the region without a legal basis to do so.[119] Given that the UNCLOS dispute resolution mechanism is already failing, there is a potential risk that it may prove ineffective in addressing disputes related to floating wind turbines. Without a well-defined and robust legal system capable of safeguarding the rights of individuals and states, the development and implementation of floating wind energy could become a lawless endeavor.

Furthermore, the lack of enforcement and punitive measures is particularly concerning due to the potential negative consequences associated with floating wind turbines, which include, "increased noise levels, risk of collisions, changes to benthic and pelagic habitats, alterations to food webs, and pollution from increased vessel traffic or release of contaminants from seabed sediments."[120] Without a clear and enforceable legal framework to govern responsible development and hold parties accountable for harm caused, addressing these concerns and mitigating potential damages becomes significantly more challenging.

Regrettably, the environmental repercussions of these adverse effects will disproportionately affect small island nations, who are already grappling with the substantial impacts of climate change. These "small island states are [already] on the frontlines of climate change," and shoulder a considerable burden when it comes to advocating for climate legislation.[121] For example, the Caribbean nation of Antigua and Barbuda and the Pacific nation of Tuvalu have taken a significant step by establishing a new commission in collaboration with the United Nations. This initiative opens up the possibility of pursuing "damages from major polluting countries through judicial means, such as the UN's International Tribunal for the Law of the Sea."[122] While this endeavor does not directly address the concerns related to floating wind turbines, it underscores the

117 Brian Gicheru Kinyua, *Is It Time to Amend the Law of the Sea?*, MAR. EXEC. (Feb. 4, 2022, 3:21 PM), https://maritime-executive.com/editorials/is-it-time-to-amend-the-law-of-the-sea.

118 *Id.*

119 *Id. See also* BEN DOLVEN ET AL., *infra* note 130, at 1.

120 Bailey et al., *supra* note 90, at 1-3.

121 *On the Frontlines of Climate Change, Small Island States Can Lead in Resilience*, WORLD BANK (Apr. 11, 2022), https://www.worldbank.org/en/news/feature/2022/04/11/on-the-frontlines-of-climate-change-small-island-states-can-lead-in-resilience.

122 Roxana Saberi, *Island Nations Seek a Way to Sue Big Polluters over Climate Change that Could Leave Some Underwater*, CBS NEWS (Nov. 3, 2021, 2:19 PM), https://www.cbsnews.com/news/climate-change-antigua-barbuda-tuvalu-lawsuit-polluters/.

pressing need for international mechanisms for enforcement and retribution within the global environmental context.

B. Countries May Use Floating Wind Turbines to Exact Political Advantages

Another significant issue arises when there is no comprehensive legal framework in place, as some nations may seek to consolidate their power within the floating wind energy supply chain to gain political advantage over others. One method employed by states to secure a political advantage is by dominating the manufacturing market. For example, China's goal is "to become [the] Saudi Arabia of renewables."[123] As such, for Chinese companies, which are state-supported, "wind power is not just a growth market; it is a political project."[124] "For years, Beijing has been comprehensively investing in wind power, attempting to corner the market" for wind turbine technology, much like "they did [with] photo-voltaic panels."[125] Photo-voltaic panels are used to convert sunlight into electrical energy and China's dominance in this market has led them to "own[] the vast majority of the world's solar panel supply chain, controlling at least 75% of every single key stage of photovoltaic panel manufacturing and processing."[126] As a result, China has effectively gained control over many nations' solar energy supply chains.

President Xi Jinping has championed an "'energy revolution'" in the realm of wind energy, reshaping not only domestic production, but also "foreign trade policy, investment, and influence."[127] Consequently, China has swiftly become a global leader in offshore wind energy. In 2021 alone, "China built more offshore wind turbines . . . than every other country did in the past five years."[128] Further, "[i]n only three years, Chinese turbine makers . . . more than doubled their exported wind capacity; included in those exports [was] Italy's first offshore wind farm in the Mediterranean."[129] China's increasing dominance in the wind turbine market raises concerns because it confers significant political advantages as the rest of the world becomes reliant on China for manufacturing the components crucial for maintaining their wind energy supply.

---

123 Cohen, *supra* note 94.

124 *Id.*

125 *Id.*

126 Niccolo Conte, *Visualizing China's Dominance in the Solar Panel Supply Chain*, VISUAL CAPITALIST (Aug. 30, 2022), https://www.visualcapitalist.com/visualizing-chinas-dominance-in-the-solar-panel-supply-chain/.

127 Cohen, *supra* note 94.

128 *Id.*

129 *Id.*

The ongoing Ukraine-Russia conflict, as discussed above, serves as a stark reminder that dependency on another country for energy supply can have severe consequences.

Furthermore, China's substantial investment into wind energy not only serves to dominate the manufacturing market but may also be used to further its territorial disputes in the South China Sea. China's EEZ in the South China Sea overlaps the EEZs of several other nations.[130] In pursuit of exclusive jurisdiction and sovereignty over the region, China has consistently made "sweeping claims of sovereignty" over the South China Sea, which has created tensions with other claimant nations such as "Brunei, Indonesia, Malaysia, the Philippines, Taiwan, and Vietnam."[131] Further, as mentioned above, China has even disregarded arbitration orders to cease its attempts to aggrandize territory in the South China Sea.

As such, China could potentially escalate its territorial ambitions and assert dominance in the South China Sea by deploying floating wind turbines or farms in the region, which would be akin to appropriation of the shared EEZ.[132] Such a move would not only exacerbate political, security, and economic concerns in the area but, as mentioned above, could also be utilized as a means of gaining political advantages.[133] Without a comprehensive legal agreement to provide guidance on the manufacturing processes and deployment of wind turbines, there is a risk of significant international political consequences, as nations like China may exploit floating wind technology for their strategic interests.

C. Safety Concerns as Wind Turbines Conflict with Other High Seas Uses

Another legal issue with floating wind turbines is the potential for conflicts with other activities on the high seas, including navigation and shipping. Issues arise because offshore wind farms occupy significant space on the high seas for extended periods, which may affect maritime traffic and navigation.[134] Without clear and comprehensive regulations, these wind farms are likely to interfere with existing high seas uses.

Currently, "[t]here is no obligation for developers of floating wind farms on the high seas to establish safety zones or other safety measures

130 BEN DOLVEN ET AL., CONG. RSCH. SERV. IF10607, CHINA PRIMER: SOUTH CHINA SEA DISPUTES 1-3 (2023).

131 Center for Preventive Action, *Territorial Disputes in the South China Sea*, COUNCIL ON FOREIGN RELS. (Dec. 19, 2023), https://www.cfr.org/global-conflict-tracker/conflict/territorial-disputes-south-china-sea.

132 Cohen, *supra* note 94.

133 Center for Preventive Action, *supra* note 131.

134 Elsner & Suarez, *supra* note 65.

around installations."[135] This is a cause for concern, as "[o]ffshore wind farms can interfere with navigational radar used by ships and smaller vessels to avoid collisions."[136] Accordingly, the maritime community is apprehensive about the potential navigational challenges in shipping channels if offshore wind farms are located nearby.[137]

An easy solution would be to apply the safety regime already in place for the offshore oil and gas industry. However, adopting the safety measures of oil platforms, which typically establish a "500m-safety zone," may be inadequate for floating wind farms, since wind turbines occupy considerably "more space than oilrigs."[138] Therefore, developing safety regulations specific to floating wind farms will help ensure the safe coexistence of wind energy projects with other high seas activities, while mitigating potential conflicts and hazards.

D. Issues with the Permit Process

Another pressing issue associated with the expansion of wind energy is the cumbersome permitting process. Despite the strong enthusiasm for wind energy, bureaucratic hurdles related to permits are impeding its swift implementation. The inefficiency in the permitting process stems from the fact that "the permitting process for renewable energy projects is multi-layered, and the exact type and number of permits for a particular project depends on its size, geography, technology and jurisdiction."[139]

For example, in the United States, a substantial portion of planned wind energy projects remains stalled in the permitting phase, "with just 21% of planned projects currently under construction."[140] In fact, "Republicans and Democrats generally agree that the federal permitting process requires reform, and various efforts were made under Presidents Obama, Trump, and now Biden," to address these inadequacies.[141] However, even with improvements at the federal level, many projects still necessitate approvals from local, state, and interstate authorities, indicating that obstacles to the permitting process likely remain.[142] In Europe,

135 Rollini, *supra* note 22.

136 WorkBoat Staff, *Offshore Wind Farms Can Interfere with Ship Radar and Navigation, Report Says*, WORKBOAT (Mar. 9, 2023), https://www.workboat.com/wind/offshore-wind-farms-can-interfere-with-ship-radar-and-navigation-report-says.

137 *Id.*

138 Rollini, *supra* note 22.

139 Rayan Sud & Sanjay Patnaik, *How Does Permitting for Clean Energy Infrastructure Work?*, BROOKINGS INST. (Sept. 28, 2022), https://www.brookings.edu/articles/how-does-permitting-for-clean-energy-infrastructure-work/.

140 *Id.*

141 *Id.*

142 *Id.*

experts argue that "Europe must 'get real' about solving the insufficient permitting of new wind farms."[143] These permitting procedures, whether for establishing new facilities or re-powering existing ones, "are too drawn-out and complicated, easily taking up to five years or more."[144] As the world races to adopt cleaner energy sources, the presence of administrative and procedural obstacles hampers progress. Developing more efficient permitting systems is crucial to overcome these challenges and expediting the deployment of wind energy projects.

Efforts have indeed been made to address these inefficiencies; however, the progress achieved thus far remains inadequate. An illustrative example is the recent development at COP27, a climate change conference, where nine new countries – Belgium, Colombia, Germany, Ireland, Japan, the Netherlands, Norway, the UK, and the United States – joined the Global Offshore Wind Alliance (GOWA).[145] The alliance, with the mission of leveraging wind power to confront the climate, energy, and security challenges, "aims to 'lift the barriers' to developing offshore [wind energy]."[146] GOWA was "initiated by the International Renewable Energy Agency (IRENA), Denmark and the Global Wind Energy Council."[147] The Alliance's measures are explicitly aimed at expediting the approval of wind farm projects "stuck in . . . administrative pipeline[s]."[148]

Furthermore, the European Commission has introduced a temporary new emergency regulation, REPowerEU, designed to accelerate the energy transition and end the EU's dependence on Russian gas.[149] Specifically, REPowerEU has "proposed measures to address the lengthy and complex administrative procedures" that have hindered "the speed and scale of investment in renewables and related infrastructure." The intention behind these measures is to streamline the administrative processes that have impeded the progress of renewable energy projects.[150]

Lastly, another measure involves designating renewable energy projects as projects of "overriding public interest."[151] Such a designation

143 Paul Bartlett, *Permit Process for Offshore Wind Farms Holding Sector Back*, SEATRADE MAR. NEWS (Apr. 1, 2022), https://www.seatrade-maritime.com/offshore/permit-process-offshore-wind-farms-holding-sector-back.

144 *Id.*

145 Joshua Askew, *COP27: European Countries Join International Alliance to Boost Offshore Wind Power*, EURONEWS.GREEN (Sept. 11, 2022), https://www.euronews.com/green/2022/11/09/cop27-european-countries-join-international-alliance-to-boost-offshore-wind-power.

146 *Id.*

147 *Id.*

148 *Id.*

149 *Proposal for a Council Regulation Laying Down a Framework to Accelerate the Deployment of Renewable Energy*, COM (2022) 591final (Sept. 11, 2022).

150 European Commission Press Release IP/22/6657, REPowerEU: Commission Steps up Green Transition Away from Russian Gas by Accelerating Renewables Permitting (Nov. 9, 2022) [hereinafter REPowerEU].

151 *Id.*

would expedite these projects by allowing them to benefit from a "simplified assessment" process specified in EU environmental legislation aimed at accelerating approvals for projects that clearly serve the public good.[152] Further, to "eliminate [potential] bottlenecks in the permitgranting process for certain renewable energy projects" the proposal defines the scope of how specific foreseen rules in the EU Birds[153] and Habitats[154] directives will be employed.[155]

Despite the various measures taken to minimize inefficiencies in the permitting process, wind projects continue to face protracted approval timelines that span several years. It is evident that additional efforts are imperative to further streamline this process, facilitating the development and maturation of floating wind energy as a dependable and sustainable resource for the global community.

The international community must confront numerous challenges to facilitate the development of floating offshore wind energy. Concerns revolving around UNCLOS's inadequacy, the potential for the aggrandizement of political power, safety issues, and the inefficiencies inherent in the permitting process should all be addressed proactively before floating wind turbines are deployed en masse on the high seas. Taking these steps will contribute to a seamless transition in the development and implementation of floating wind technology.

VI. LEGAL QUESTIONS REGARDING OFFSHORE FLOATING WIND

In addition to the challenges faced by floating offshore wind turbines, several legal questions currently remain unanswered. The resolution of these questions will carry significant legal implications. Therefore, addressing these questions proactively, rather than reacting to them in the future, can prevent confusion and costly litigation.

A. Are Floating Wind Turbines Vessels?

A crucial unanswered question regarding floating wind turbines pertains to their classification as either a "'vessel' under applicable maritime law" or as an installation/structure.[156] This classification holds significant

152 *Id.*

153 *Id.* Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the Conservation of Wild Birds, art. 8-9, 2009 O.J. (L 20).

154 Council Directive 92/43 EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora, art. 6, 1992 O.J. (L 206) (May 21, 1992), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0043.

155 REPowerEU, *supra* note 150.

156 Keith Billotti & Hoyoon Nam, *Are Floating Offshore Wind Turbines "Vessels" Under Maritime Law*?, MAR. EXEC. (Dec. 15, 2021, 5:35 PM) https://maritime-executive.com/features/are-floating-offshore-wind-turbines-vessels-under-maritime-law.

legal implications, as it determines whether floating wind turbines fall under the purview of UNCLOS's freedom of navigation or the freedom to construct and operate artificial islands, installations, and structures.[157]

While this distinction might appear semantic, it carries real-world consequences. The classification as a vessel or artificial structure can entail various "regulatory, environmental and tax law implications."[158] For example, if floating wind turbines are categorized as vessels, they may become subject to the UNCLOS provisions applicable to ships, such as the duty to render assistance on the high seas.[159] This would be problematic, as wind turbines are likely incapable of rendering adequate assistance to other ships in crisis.

One might assume that since turbines do not transport goods or people, they should not be considered vessels. However, UNCLOS lacks a precise definition of the term "vessel."[160] So, even though wind turbines are not typically associated with transportation, the uncertainty regarding their classification remains. Notably, mobile offshore drilling units, though not modes of transportation, are registered and regulated as vessels due to their mobility.[161] Given that floating wind turbines can relocate as needed for renewable power generation, there exists the potential for them to be categorized as vessels rather than installations.[162]

Therefore, a significant legal question remains unanswered: whether floating offshore wind turbines will be deemed vessels or installations/structures. The resolution of this question will carry substantial legal consequences and implications.

B. Are Floating Wind Turbines Subject to Patent Laws?

Another issue that needs to be addressed is whether patent law is applicable to high seas floating wind turbines, and if so, which patent laws should be considered? The determination of whether patent law applies appears to hinge on the concept of attachment to the continental shelf.

For instance, in the United States, a federal court recently ruled that wind turbines affixed to the "outer continental shelf are 'within the

157 U.N. Convention on the Law of the Sea, *supra* note 2, art. 87, ¶ 1.

158 Billotti & Nam, *supra* note 156.

159 U.N. Convention on the Law of the Sea, *supra* note 2, art. 98, ¶ 1.

160 Sabrina Hasan, *Analysing the Definition of "Ship" to Facilitate Marine Autonomous Surface Ships as Ship Under the Law of the Sea*, 15 AUSTL. J. MAR. & OCEAN AFFS. 268, 268 (2023).

161 *Mobile Offshore Drilling Unit (MODU)*, INT'L ASS'N OF DRILLING CONTRACTORS LEXICON, https://iadclexicon.org/mobile-offshore-drilling-unit/ (last visited Mar. 21, 2023).

162 *Developing Mobile Offshore Wind for Micro-Grid Applications*, MAR. EXEC. (June 18, 2021, 4:45 PM), https://maritime-executive.com/article/developing-mobile-offshore-wind-for-micro-grid-applications.

United States' for the purposes of US patent law."[163] Similarly, in the realm of oil and gas exploration, companies have grappled with analogous questions regarding patent law's scope, particularly in the context of deep water drilling. These cases often revolve around the distinction between devices "attached to the outer continental shelf" and those "floating in the waters above."[164]

To illustrate, a Southern District of Texas judge dealt with allegations of "patent infringement by vessels conducting seismic readings in the Chukchi Sea," near Alaska, and concluded that these alleged infringements "occurred outside US territory and [emphasized] that the vessels weren't attached to the seabed."[165] This application of patent law to the outer continental shelf is not unique to the United States. For example, "courts in both the UK and South Africa have similarly found patent infringement with respect to installations on the shelf near their shores."[166]

Therefore, it is evident that patent laws apply to fixed foundation turbines attached to the continental shelf and are subject to a nation's patent laws. However, it remains unclear whether patent laws apply to floating wind turbines, as they are not attached to the continental shelf. It is imperative to clarify this issue, as the absence of a clear jurisdiction designation might encourage knowing violations of patent laws, since some may presume that no jurisdiction has authority over infringement in such cases.

C. Do Landlocked States Have Rights to Access Floating Wind Energy Potential?

Globally, "there are 44 landlocked states," and "16 of [them] are in Africa."[167] These states "cannot access the ocean since the nearest coast is in another [state]." Thus, they have to rely on neighboring countries for passage through their territories to the oceans.[168] In essence, "[l]andlocked states need access to the sea by means of transit through one or more neighboring coastal states."[169] Consequently, they depend on the

163 Matthew Bultman, *Offshore Turbines Pose Patent Risks as US Pushes Wind Power*, BLOOMBERG L. (June 9, 2022, 4:20 AM), https://news.bloomberglaw.com/ip-law/offshore-turbines-pose-patent-risks-as-us-pushes-wind-power.

164 *Id.*

165 *Id.*

166 *Id.*

167 Ernesta Swanepoel, *The Law of the Sea and Landlocked States*, S. AFR. INST. INT'L AFFS., Aug. 2020, at 2.

168 *Landlocked Countries*, *in* JEAN-PAUL RODRIGUE, THE GEOGRAPHY OF TRANSPORT SYSTEMS (5th ed. 2020), https://transportgeography.org/contents/chapter5/maritime-transportation/landlocked-countries/.

169 Swanepoel, *supra* note 167, at 2.

goodwill of coastal states to access the sea, which poses unique challenges for landlocked nations.

Fortunately, landlocked states' right of access to and from the sea is recognized through the principles of "freedom of transit through the territory of transit States by all means of transport."[170] To exercise this freedom, landlocked and transit states "must enter into bilateral, sub-regional, or regional agreements."[171] These agreements are crucial because they enable landlocked states to realize their rights as stipulated in UNCLOS.[172]

However, the success of such agreements hinges on factors like "political will and mutual benefits."[173] A practical example is the successful agreement between Ethiopia and Djibouti in 2002 to create the Djibouti-Addis Ababa transport corridor, facilitating "port utilisation and transit of goods towards Ethiopia."[174] Both nations agreed to this arrangement because of its reciprocal benefits: Ethiopia gained "safe and competitive access to the sea," while Djibouti derived substantial income from transit traffic, "contributing 70% of the port's income."[175]

As mentioned above, UNCLOS already provides various rights to landlocked states regarding the use of the seas—the right to be treated as equally as "other foreign ships in maritime ports,"[176] "innocent passage through the territorial sea,"[177] and freedom of navigation in EEZs[178] and the high seas.[179] However, these are not enough to ensure the equitable utilization of ocean wind energy. Therefore, to ensure landlocked nations can effectively access ocean wind energy, the international community must promptly recognize additional rights concerning ocean wind energy for landlocked nations. Specifically, the international community should acknowledge additional rights to assist landlocked nations in securing agreements for accessing ocean wind energy, especially given the potential challenges that may arise in the future. Coastal states may perceive that allowing landlocked nations to exploit wind energy off their shore will limit their own wind energy potential. As mentioned before, wind farms occupy considerable space and permitting landlocked states access to ocean areas off the coast may leave less room for coastal states to establish their own farms. In this limited area scenario, without

170 U.N. Convention on the Law of the Sea, *supra* note 2, art. 125, ¶ 1.
171 Swanepoel, *supra* note 167, at 3.
172 *Id.* at 3, 7.
173 *Id.* at 6.
174 *Id.*
175 *Id.*
176 U.N. Convention on the Law of the Sea, *supra* note 2, art. 131.
177 *Id.* art. 17.
178 *Id.* art. 87, ¶ 1; *Id.* art. 58, ¶ 1.
179 U.N. Convention on the Law of the Sea, *supra* note 2, arts. 87, ¶ 1. *Id.* art. 90.

guaranteed access for land-locked states, coastal states may refuse to make agreements with landlocked states to access ocean wind.

Furthermore, even if landlocked states obtain agreements to deploy floating wind farms, collecting that energy will be a hurdle. Currently, "floating wind turbines . . . require dynamic, high-capacity submarine cable systems to collect and export the power generated."[180] This is because "the force of the wind turns the blades and the wind turbine converts the kinetic energy into electricity, which is transported by underwater cables to an offshore substation and from there to an onshore substation on the coast . . . ."[181] Therefore, landlocked states would also need infrastructure on other nations' coasts to collect their generated wind energy. Coastal nations might view this as an unwarranted imposition on their territory, potentially discouraging them from entering agreements to facilitate landlocked states' access to ocean wind energy.

Hence, although landlocked states possess the same rights as coastal states to access the seas and harness high seas wind potential, ensuring the equitable utilization of ocean wind resources may be complex. Recognizing additional rights for landlocked states to access ocean wind energy and creating guidelines or incentives for coastal states to engage in agreements for cable systems to connect and store energy may be necessary.

As demonstrated, several legal questions arise as floating offshore wind technology develops. Unfortunately, there is presently no legal body or treaty adequately equipped to address these questions comprehensively. Therefore, to avoid these issues escalating and coming to fruition, a proactive solution should be devised to answer these questions.

VIII. PROPOSED SOLUTIONS TO THE CHALLENGES AND LEGAL QUESTIONS FLOATING OFFSHORE WIND FACES

A. Using Soft Law to Provide Structure

As demonstrated, current international law is ill-equipped to effectively address the unique challenges and legal questions posed by the development of floating offshore wind energy. One potential avenue for addressing most of these challenges is to revise UNCLOS, tailoring the revisions to incorporate the specific needs of offshore wind energy.[182]

180 Maxime Toulotte, *New Cable Designs Are Critical for Floating Wind Turbines*, WINDPOWER ENG'G & DEV. (Dec. 28, 2020), https://www.windpowerengineering.com/new-cable-designs-are-critical-for-floating-wind-turbines/.

181 *Floating Offshore Wind Power: A Milestone to Boost Renewables Through Innovation*, IBERDROLA, https://www.iberdrola.com/innovation/floating-offshore-wind (last visited Mar. 21, 2023).

182 Rollini, *supra* note 22.

However, it is crucial to recognize that the process of amending or creating international agreements is notoriously protracted, with "the negotiation process . . . [taking] several years . . . ."[183]

Given these time constraints, some scholars recommend using "soft law by developing standards and guidelines through appropriate international organi[z]ations" to reach desirable regulations and standards.[184] Soft law is "'a convenient description for a variety of non-binding normatively worded instruments used in contemporary international relations by States and international organizations.'"[185] Soft law instruments encompass various instruments such as "recommendations, guidelines, codes of conduct, non-binding resolutions, and standards."[186]

Opting for soft law mechanisms is generally regarded as a more practical solution than attempting to amend UNCLOS, as UNCLOS has never been amended.[187] This does not mean UNCLOS cannot be amended. It can through a procedure laid out in UNCLOS Article 313.[188] However, this amendment process is vulnerable to obstruction by a single party, as, under Article 313(2), "if . . . a State Party objects to the proposed amendment or to the proposal for its adoption by the simplified procedure, the amendment shall be considered rejected."[189] This means that a single state's objection can effectively thwart any proposed changes to UNCLOS, making substantial updates to the convention exceptionally challenging to achieve.

UNCLOS provides only one other method to amendment, which involves convening of a diplomatic conference as specified under Article 312.[190] This approach, while potentially more viable than Article 313, as diplomatic conferences have been convened in the past, presents its own set of challenges. For example, the last conference, the Third United Nations Conference on the Law of the Sea, took nine years to come to consensus on sensitive maritime issues, such as banning the use of nuclear weapons on the seabed.[191] Therefore, any proposed amendments

183 *International Agreements*, U.S. DEP'T OF HEALTH & HUM. SERVS. (Feb. 15, 2018), https://www.phe.gov/s3/law/Pages/International.aspx.

184 Rollini, *supra* note 22.

185 Giulia Bosi, *Overcoming the "Soft vs Hard Law" Debate in the Development of New Global Health Instruments*, OPINIO JURIS (Nov. 30, 2021), https://opiniojuris.org/2021/11/30/overcoming-the-soft-vs-hard-law-debate-in-the-development-of-new-global-health-instruments/.

186 *Id.*

187 Chris Whomersley, *How to Amend UNCLOS and Why It Has Never Been Done*, 9 KOREAN J. INT'L & COMPAR. L. 72 (2021).

188 Raul Pedrozo, *Is it Time for the United States to Join the Law of the Sea Convention*, 41 J. MAR. L. & COM. 151, 164 (2010).

189 *Id.*

190 U.N. Convention on the Law of the Sea, *supra* note 2, art. 312.

191 *The United Nations Convention on the Law of the Sea (a Historical Perspective)*, U.N., https://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm (last visited Feb. 5, 2024).

pertaining to floating wind turbines within the Convention would likely encounter similar challenges and painstaking scrutiny.[192]

In contrast, soft law mechanisms are "generally developed and adopted relatively quickly."[193] This efficiency is particularly appealing given the imminent needs of the floating wind turbine industry. Moreover, it is worth noting that using soft law to update UNCLOS is not an uncommon practice. Recognizing the difficulties inherent in the amendment process, states have chosen to maintain UNCLOS as a "living instrument" by endorsing "updated rules" through other international organizations, such as the "International Maritime Organi[z]ation and the International Labor Organi[z]ation."[194] As such, the continued use of soft law, along with the creation of guidelines tailored to floating wind turbines, appears to be the most pragmatic solution to address the shortcoming of UNCLOS.

These recommendations, guidelines, and standards can also help solve the issues of safety concerns, the permit process, the status of floating wind turbines as vessels, its patent issues, and the access of landlocked states. The floating offshore wind industry clearly requires a structured framework to address these questions and navigate the complexities of its legal landscape. Given the formidable challenges associated with amending UNCLOS, using soft law mechanisms to establish regulations and standards for offshore wind energy may offer a more flexible and feasible approach to institute much-needed guidelines for the emerging industry.

B. Friendshoring to Combat Political Advantages

While soft law can serve as a foundational framework for the emerging floating wind market, it may not effectively address the concerns of nations exploiting floating wind energy for potential political advantage. To counteract this, countries could employ a strategy known as "friendshoring" to mitigate the political advantages that other nations might gain from the development and deployment of floating offshore wind. Friendshoring is "shorthand for the practice of relocating supply chains to countries where the risk of disruption from political chaos is low."[195]

Friendshoring offers several significant benefits. For one, by adopting friendshoring practices, nations can reduce their dependence on authoritarian states, such as Russia with petroleum, and work towards

192 Pedrozo, *supra* note 188.

193 Bosi, *supra* note 185.

194 Whomersley, *supra* note 187.

195 Sarah Kessler, *What is 'Friendshoring'*, N.Y. TIMES (Jan. 3, 2023), https://www.nytimes.com/2022/11/18/business/friendshoring-jargon-business.html.

"build[ing] a more sustainable future."[196] This approach also "prevent[s] nations like China and Russia from leveraging" their dominant positions in key industries, such as energy, to disrupt the economies of other nations.[197] Furthermore, friendshoring can lead to the relocation of manufacturing plants, job opportunities, and investments to countries "deemed sufficiently trustworthy."[198] As a result, global supply chains would become more diversified geographically, enhancing resilience against "external shocks like war, famine, political change or the next pandemic."[199]

However, it is essential to acknowledge that widespread friendshoring could potentially lead to a long-term reduction in global gross domestic product, estimated at around a five percent loss, as the global economy fragments into distinct blocs.[200] Thus, the adoption of friendshoring could result in a "significantly poorer and less productive planet," overall.[201]

The Russia-Ukraine crisis, as discussed earlier, has highlighted the repercussions of an insecure energy supply, emphasizing the importance of promoting secure energy partnerships and achieving overall energy independence. Further, China's dominance of photo-voltaic panels in solar energy demonstrate how nations can exert control over renewable energy through the manufacturing process. Thus, the advantages of friendshoring, such as increased security and resilience, outweigh the potential drawbacks of reduced market efficiency.

CONCLUSION

The global commitment to investing in renewable resources, such as wind energy, remains essential. Ocean wind, particularly in high seas areas, represents a largely untapped renewable resource capable of significantly contributing to the world's renewable energy objectives. Moreover, as wind turbine technology continues to advance, the accessibility of this resource becomes increasingly attainable. However, as we approach the prospect of high seas floating wind farms, several challenges emerge. These include the inadequacy of existing international agreements, concerns about equitable resource allocation, conflicts with other of the high seas uses, potential patent disputes, issues of inaccessibility

196 Cohen, *supra* note 94.

197 Bryce Baschuk, *What 'Friend-Shoring' Means for the Future of Trade*, BLOOMBERG (Sept. 11, 2023, 1:49 PM), https://www.bloomberg.com/news/articles/2022-06-22/what-friend-shoring-means-for-the-future-of-trade-quicktake.

198 *Id.*

199 *Id.*

200 *Id.*

201 *Id.*

for landlocked states, and considerations related to strategic control over supply chains.

These challenges are unlikely to resolve themselves, and the current structure of UNCLOS falls short in providing effective solutions. Therefore, the international community should prioritize the establishment of a legal framework for floating wind turbines, leaning towards a soft law approach rather than the complex process of amending UNCLOS. Soft law is a more pragmatic solution, especially considering the growing complexities involved in altering or updating international agreements. Furthermore, nations should actively promote the concept of friendshoring to counter any strategic and political advantages that might arise from control over the energy supply chain. By proactively creating soft law mechanisms to address foreseeable issues and promoting the use of friendshoring, the international community can facilitate the development of a sustainable and equitable future for offshore floating wind technology.

Natalie Clarke*

* Natalie Clarke is an Associate Staff Editor at Washington University Global Studies Law Review and a J.D. Candidate at Washington University School of Law (Class of 2024). Special thanks to the editing staff of the *Global Studies Law Review* for their invaluable assistance and support throughout the writing process. Gratitude is also extended to Jenalee Dickson, a friend and Electrical Engineer, for inspiring the concept behind this piece. Lastly, heartfelt thanks to my mother, Christine Clarke, for her unwavering encouragement and support.