Annex

to the Comité Maritime International's First Questionnaire on Mobile Offshore Renewables Units

(Background and Context)

Introduction

The CMI International Working Group (IWG) on Mobile Offshore Renewable Units ("MORU") seeks to understand the laws of various countries that will regulate offshore mobile units used for offshore renewable energy projects in order to determine common ground and best practices for recommendations to be offered to the CMI. The questionnaire includes five (5) categories of Questions, arranged by subject matter. This Annex is meant to provide high-level technical and commercial background about MORUs and context for the members of your Association in relation to the questions in the Questionnaire, including descriptions of basic categories of Mobile Offshore Renewables Units, current levels of deployment and market predictions for future deployment, and actual examples of relevant issues that have already arisen in relation to MORUs.

If you have any questions about this Annex or the Questionnaire, please contact Alexander Severance at alexander.severance@dk.dlapiper.com.

Definition of a Mobile Offshore Renewables Unit

For purposes of the Questionnaire, the MORU IWG has defined a "Mobile Offshore Renewables Unit" as follows:

"Mobile Offshore Renewables Unit" or "MORU" means any non-self-propelled, floating offshore unit or facility consisting of:

(i) a ship-shaped hull, SPAR, semi-submersible, tension-leg platform, barge, or other buoyant hull concept; AND

(ii) all internal and topsides equipment permanently attached to that hull, provided that such floating offshore unit or facility:

(a) is primarily designed for the purpose of directly or indirectly generating electric power or other form(s) of renewable energy by conversion of wind, wave, tidal, or solar power, or differences in water temperatures;
OR

(b) is primarily dedicated to the conversion, transformation, conditioning, transmission, distribution, and/or temporary storage and subsequent release of any electrical power or other form of renewable energy generated by one or more MORUs described in paragraph (a) above; OR

(c) is primarily dedicated to the conversion of any electrical power or other form of renewable energy generated by one or more MORUs described in paragraph (a) above] into chemical products;
OR

(d) is a hybrid unit combining the functions of two or more of the classes of units described in any of the paragraphs (a), (b), and/or (c) above.

Please note that the definition of "MORU" (and therefore the scope of the Questionnaire) is limited to floating units and facilities which are not self-propelled.

Paragraph (i) is intended to capture the widest variety of existing and future MORU hull concepts which might be used to provide the buoyancy required to support the MORU's equipment.

Paragraph (ii) is meant to capture the MORU's equipment, whether inside the hull itself or above.[1]

Paragraph (a) of the definition of "MORU" is meant to capture MORUs which are primarily intended to generate electrical power, including: floating wind turbines; floating wave energy converters; floating tidal energy converters; floating solar energy converters; and floating ocean thermal energy converters.

Paragraph (b) of the definition of "MORU" is meant to capture a variety of floating auxiliary units and facilities which directly support the production of renewable electrical power. This includes floating units or facilities which convert renewable electrical power to higher or lower voltages or amps, manage reactive power, etc. (e.g. floating substations). It also would include floating energy storage systems which might be used to balance the supply and demand of electricity within an offshore site or in relation to an onshore electric grid (e.g. floating battery systems).

Paragraph (c) of the definition of the definition of "MORU" is meant to capture a variety of floating units and facilities which would be used to convert renewable electrical power into a chemical product such as hydrogen or ammonia.

Paragraph (d) acknowledges the possibility that some of the technologies and activities in paragraphs (a) to (c) may be co-located on a single floating unit or facility.

Background

Technology

Around the world, states are producing or planning to produce electrical power in their respective territorial seas and exclusive economic zones (EEZs) from a variety of offshore renewable energy resources. To date, almost all offshore renewable energy has been delivered by tens of thousands of permanent fixed-bottom wind turbines siting on monopile, multi-pile, jacket, gravity, or suction bucket foundations, typically in shallower waters (<60m water depth), nearer to shore. However, these *fixed-bottom* offshore wind turbines or other *fixed-bottom* facilities are subject to their own legal regimes and they are *not* the focus of this CMI Questionnaire.

Instead, the CMI's questionnaire focuses on the possible legal treatment of a variety of new *floating* offshore renewable energy technologies being developed and deployed in increasing numbers by coastal states around the world—mobile offshore renewables units. MORUs may resemble comparable mobile offshore units used in the better-known offshore oil and gas sector in some important ways, but MORUs also materially differ from floating offshore oil and gas units and platforms in other important aspects.

MORUs come in a variety of forms and purposes, and may be deployed offshore as a single unit or in smaller or larger arrays of one or more different categories of MORUs, as described below.

The majority of these floating facilities ("Floating Generation Units") are and will be used to generate electrical power from offshore winds, waves, tidal currents, solar energy, or differences in ocean water temperatures or salinity. This electrical power might then be used offshore (e.g. dispatched to adjacent fixed or floating offshore oil and gas facilities to reduce the oil and gas facility's own consumption of produced gas and Scope 1 and Scope 2 emissions), converted into something else useful offshore (e.g. dispatched to an adjacent offshore

[1] Please note that this paragraph (ii) would not include the mooring system (including anchors, anchor lines, tendons, or otherwise), import or export cable(s), or any other umbilicals which would be detached from the MORU prior to towing of the MORU). This presents certain questions in relation to classification, insofar as relevant class rules might include mooring systems within the classification of the MORU.

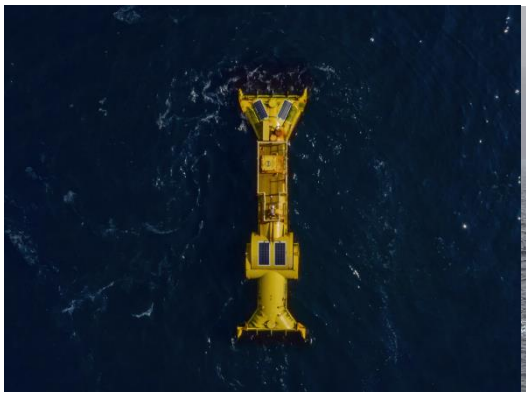
green hydrogen facility to produce green hydrogen) or dispatched to a shore-based national electricity grid via a subsea export cable system.

Floating Generation Units are the MORUs described in limb (a) of the definition of “Mobile Offshore Renewables Units” in the Questionnaire, and include:

i. floating wind turbines,

Credit (clockwise from upper left): Photo of the Kincardine Offshore Wind Farm project courtesy of Principle Power; Hywind Tampen spar floating wind turbines in harbour, courtesy of Alexander Severance; Provence Grand Large TLP floating wind farm courtesy of Ekwil/SMB Offshore; Floatgen, Floating wind turbine equipped with the BW Ideol patented Damping Pool® foundation, operating in France for 5 years - Credits BW Ideol / V. Joncheray.

ii. floating wave energy converters,



Credit: Floating wave energy converter, courtesy of Mocean

Credit: https://commons.wikimedia.org/wiki/File:Pelamis_P2_wave_energy_device_(7020981211).jpg

iii. floating tidal energy converters,

Credit: https://commons.wikimedia.org/wiki/File:Orbital_Marine_Power_-_Launch_1.jpg.wikimedia.org/wiki/File:Orbital_Marine_Power_-_Launch_1.jpg

Credit: https://commons.wikimedia.org/wiki/File:2022-07-27_PLATI_in-stream_tidal_energy_platform_-_Westport,_NS_CAN.jpg

iv. floating solar energy converters, and

Credit: Offshore floating solar energy converter, courtesy of Ocean Sun.

v. floating ocean thermal energy converters,

Credit: Global OTEC

Other floating facilities (“Floating Auxiliary Units”) provide auxiliary services to Floating Generation Units described above. These Floating Auxiliary Units are the MORUs described in limbs (b) and (c) of the definition of “Mobile Offshore Renewables Units”, and include:

i. floating substations (e.g. which convert generated electrical power to higher or lower voltages for more efficient transmission, etc.),

Credit: BW Ideol / Hitachi Energy

Credit: Fukushima Kizuna, MHI

ii. floating energy storage units (e.g. which store generated electrical power for redistribution as electric power at another time),

iii. floating green hydrogen and green ammonia production systems (e.g. which convert generated electrical power to another energy product),

In addition, hybrid facilities incorporating multiple technologies in a single floating unit (“Floating Hybrid Units”), also are being developed. The possible combination of different technologies in a single Floating Hybrid Unit

is only limited by the creativity of engineers, and could include wind/wave, wind/solar, wind/tidal, and solar/wave hybrids.

Current MORU deployment and MORU market expectations

The current maturity of MORU technologies range from full-size floating wind turbines already deployed in multi-unit arrays in hundreds of meters of water more than a hundred kilometres offshore,[2] to prototype research and development units deployed in shallow waters nearshore. In contrast to fixed-bottom wind turbines and some oil and gas platforms, to date MORUs have been built in port (either dry dock, quayside, or in sheltered waters) and when complete they have towed to the offshore site by commercial tugs. In some circumstances, MORU have also been towed from offshore site to port for repairs (and back again). Some of these tows have been greater than 100 nm and some have crossed maritime boundaries (i.e. are international tows).[3]

Credit: Alexander Severance

Floating Wind Turbines

Floating Wind Turbines are currently the most technologically and commercially advanced form of MORU. Floating Wind Turbines benefit from stronger and more reliable wind resources than comparable fixed-bottom offshore turbines nearer shore and onshore, and can become more cost effective than equivalent fixed-bottom turbines when water depths are greater than 60-70 m. Floating wind turbines' access to deeper waters greatly expands the potential useable area of some coastal states' EEZs and allows deployment adjacent to offshore oil and gas facilities further from shore in some locations.

In addition to the multi-unit arrays already deployed, coastal state governments around the world are licensing and permitting multi-unit floating arrays with nominal aggregate capacities in excess of 1,000 MWs (Giga-watt plus sized commercial arrays) to be built in their EEZs over the next decade. In the near- to mid-term, deployment of such commercial scale floating wind turbine arrays could include (but is not limited to) the waters around the United Kingdom, Ireland, France, Spain, Portugal, Italy, Greece, Norway, Sweden, China, South

[2] https://www.equinor.com/news/20230823-hywind-tampen-officially-opened

[3] https://www.offshorewind.biz/2020/12/09/first-kincardine-floating-giant-heads-to-scotland/, https://www.4coffshore.com/news/first-hywind-turbine-tow-begins-nid6137.html, https://www.4coffshore.com/news/mingyang92s-oceanx-the-largest-single-capacity-floating-wind-platform-launches-nid30167.html

Korea, Japan, the Philippines, Australia, New Zealand, the United States, Canada, Chile, Brazil, and Columbia. A map of commissioned, under development, planned, and possible floating wind projects kindly provided by Quest Floating Wind Energy is attached as Appendix 1 to this Annex.

The International Renewable Energy Association (IRENA) has identified a global pipeline of 244,000 MWs of floating wind, at various stages of development—equivalent to over 16,000 15 MW floating wind turbines (if all pipelines identified by IRENA were fully built out). For a deeper look at Floating Wind technology and the market outlook for floating wind (including key markets), the MORU IWG can recommend IRENA's Floating Offshore Wind Outlook 2024.[4]

The World Forum Offshore has projected that **global installed capacity of floating wind will be between 6,800 MWs and 11,000 MW by 2030.** The current market standard for an offshore wind turbine is approx. 15 MW capacity, with a 230+ meter rotor and a maximum blade tip height approaching 300 meters above the ocean. Based on that standard, World Forum Offshore's projection for global floating wind installed capacity in 2030 corresponds to somewhere between 450 and 730 floating wind turbines by 2030.

Predictions by other organisations for deployed floating wind turbines in 2040 and 2050 are exponentially higher but carry correspondingly greater uncertainty and have not been included here.

Other Floating Generation Units

Other categories of floating generation units currently are not as commercially or technically mature as floating wind turbines. Deployments of non-wind MORUs have varied from individual smaller R&D units to small arrays of several full size (multi-MW) units, but this could change relatively quickly as the technology improves.

A number of companies are exploring deployment of floating solar energy converters offshore, including in the waters of the Netherlands, Norway, Japan, China, and Singapore. In addition, the Netherlands has launched an offshore solar energy tender.

Floating tidal energy converters have been deployed in the waters of a number of jurisdictions, including Scotland and Canada.

Floating wave power generators have been deployed in the waters of a number of jurisdictions, including China, Portugal, Denmark, the United States, and the United Kingdom.

Floating Auxiliary Units

By their very nature, floating auxiliary units will not exist without one or more floating generation units providing electrical power to the floating auxiliary unit. For example, in a large array of 30-100 floating wind turbines there might be one or more floating substations. Similarly, one might imagine a floating green hydrogen facility drawing electrical power from a combined array of many floating wind turbines and wave energy converters.

To date, there have been a few research floating auxiliary units: floating substations, floating green hydrogen production facilities, etc., but these numbers are anticipated to increase as the size of MORU arrays increases over time.

Context of the questions in the Questionnaire

I. **Generally**

[4] https://www.irena.org/Publications/2024/Jul/Floating-offshore-wind-outlook

Mobile Offshore Renewables Units (as defined in the Questionnaire) may or may not fit within a particular jurisdiction's understanding of the term "ship", either generally or in a specific context. As a consequence, MORUs inevitably enter into the maritime bar's "ship nomenclature" debates alongside their floating oil and gas unit brethren. However, the purpose of this Questionnaire is not to determine whether, as a principle, MORUs should (or should not) be considered a "ship". Rather, it is to determine how a MORU (or MORU stakeholder) would be substantively treated in different contexts under the laws of your jurisdiction (and why).

II. Questions related to ownership and other interests in MORUs

To date, the MORU IWG has identified several floating wind turbines registered by ship registries of certain flag states: the *Unitech Zephyros (ex Hywind Demo)* has be registered by the Norwegian Ordinary Register,[5] and the five floating wind turbines of the Kincardine Offshore Wind Farm (*KIN-01* through *KIN-05*) were registered by International Registries, Inc. on behalf of the Republic of the Marshall Islands. Other such registrations of MORUs may also exist. In addition, a number of jurisdictions currently either already would allow or are contemplating the future registration of MORUs in some form or another, including but not limited to France's movement to permit registration of MORUs within a broader category of what it refers to as "multi-purpose platforms".

When registering the *Unitech Zephyros*, the Norwegian Ordinary Register also indicated that mortgage (e.g. a "ship mortgage") of such units would be possible (although to date it does not appear that the *Unitech Zephyros* has been subject to such a mortgage). The IWG is not currently aware of any current ship mortgages or hypothecations of registered MORUs, but it cannot exclude the possibility that such mortgages or hypothecations on existing MORUs already exist or would be permitted (and in fact believes such mortgages likely at some point if not inevitable).

It is worth noting that the registration of a MORU by a given jurisdiction might be registration as a "ship", "floating installation", "platform", or something else (depending on how narrowly or broadly the jurisdiction defines those terms). Conversely, some deployed MORUs may not be registered by a ship registry (or even at all).

a. Treatment of Domestic MORUs as property

The questions in this subsection of the Questionnaire are focused on how property interests (whether ownership or security interests) in locally owned or registered MORUs might be registered or addressed in your jurisdiction.

b. Treatment of Foreign MORUs as property

The questions in this subsection of the Questionnaire are focused on how property interests (whether ownership or security interests) in foreign owned or registered MORUs might be recognized or addressed in your jurisdiction.

[5] https://www.sdir.no/aktuelt/nyheter/spennende-registrering-i-nor/

III. Questions related to arrest

To date, the MORU IWG has identified one arrest of a MORU: the arrest and detention in Canada of a floating tidal turbine. Although this Canadian arrest of a MORU was ultimately effected without judicial intervention, it at least suggests that certain jurisdictions might allow the arrest of a MORU (potentially as an object in maritime law). The questions in this section relate to the potential for arrest of a MORU in your jurisdiction, and what remedies (if any) might be available to the owner of an arrested MORU.

IV. Questions related to limitations of liability

The text of the Convention on Limitations of Liability for Maritime Claims, 1976 (and by extension its Protocols) uses the term "ship" throughout but does not define that term. In addition, the MORU IWG notes that under Article 15(5)(b) of the Convention, the Convention shall not apply to a specific subset of floating facilities: "floating platforms constructed for the purpose of exploring or exploiting the natural resources of the sea-bed or the subsoil thereof".

If MORUs exploit the wind, waves, tides, and thermal energy of the sea (and not the "resources of the sea-bed or subsoil thereof"), does this mean:

(i) MORUs would fall outside the specific category of floating platform excluded by Article 15(5)(b)); and

(ii) MORUs therefore <u>are</u> covered the limitations of liability under the LLMC Convention?

The IWG would also like to know about any other similar or comparable limitations of liability under the domestic laws of your jurisdiction.

V. Questions related to innocent passage and transit

In 1991 (pre-UNCLOS), Finland instituted proceedings against Denmark in a dispute concerning passage through the Great Belt (Storebælt),[6] related to Denmark's construction of road and rail traffic infrastructure across the West and East Channels of the Great Belt. The effect of this project, and planned high-level suspension bridge over the East Channel, would have been permanently to close the Baltic for deep draught vessels of over 65 m height, thus preventing the passage of, *inter alia*, oil rigs manufactured in Finland requiring more than that clearance. One of the initial arguments presented by Denmark was that such vessels were not within the meaning of a "merchant ship" under a then relevant treaty governing free passage. This case was subsequently dismissed by the ICJ following resolution by the parties, but provides the context for the questions related to innocent passage and transit in the Questionnaire.

The modern international codification of rights of innocent passage and transit are found in UNCLOS, which largely frames freedom of the seas and rights of innocent passage and transit, and coastal state limitations on those rights, in the context of a "ship" without defining that term. Would your jurisdiction recognize a right of innocent passage and transit under UNCLOS (or domestic law) for a MORU being towed through its waters?

[6] Passage through the Great Belt (Fin. v. Den.), Provisional Measures, 1991 I.C.J. 12, (July 29) (https://www.icj-cij.org/case/86)

Question related to sovereign immunity and rights of owners or creditors to remove property from established MORU operations

In some jurisdictions, creditors may no be able to enforce their rights in property used by the sovereign state or any of its agencies, subdivisions, or contractors for a public purpose. But in some cases, the sovereign will accede to the creditors' remedies by contract in order to induce the creditors to make loans based on the asset value. In those situations, the sovereign waiver often contains limitations and conditions, such as, *inter alia,* prior notice to the sovereign, or rights of the sovereign to cure the defaults, assume the debt directly, etc.

Additional Materials

1 Selected presentations from the MORU IWG Open Workshop and CMI Annual Colloquium 2024 (Gothenborg). Available at the CMI website under the MORU tile, at: comitemaritime.org/recent-work/

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2 Martin Sandgren and Alexander Severance, *Flagging the Floating Turbine Unit: Navigating Towards a Registerable, First-Raking Security Interest in Floating Wind Turbines,* Vol. 39, No. 1 Tulane Maritime Law Journal (2014).

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3 Aldo Chircop and Peter L'Esperance, *Functional Interactions and Maritime Regulation: The Mutual Accommodation of Offshore Wind Farms and International Navigation and Shipping*, Vol. 30 Ocean Yearbook 2016.

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4 Alexander Severance, *Mare Incognitum, Part I: Do We Now Need (to at least Discuss) a Mobile Offshore Renewables Unit Convention?*, Vol. 45, No. 2, Tulane Maritime Law Journal, (2021).

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5 Alexander Severance, *Mare Incognitum, Part II: Is it Feasible to Salvage the Vancouver Draft Mobile Offshore Unit Convention by Converting It into a Mobile Offshore Renewables Unit Convention?,* Vol. 46, No. 1, Tulane Maritime Law Journal 1 (2022).

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6 Alexander Severance, *Annex to Mare Incognitum, Part II: A Draft Mobile Offshore Renewables Unit Convention,* Vol. 46, No. 2, Tulane Maritime Law Journal 245 (2022).
