Unmanned Aerial Systems in the Maritime Sector and the Impact of Autonomy in the Emerging Opportunities in Offshore Wind

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Agenda

- Overview.
- U.S. Jurisdictional Framework of Offshore Wind.
- Overview of Unmanned Aircraft Systems.
- Emerging Unmanned Systems Technology & Application to Offshore Wind.
- Questions.

Overview

- Unmanned aircraft systems (UAS), Unmanned Underwater Vehicles (UUVs), and Unmanned Surface Vessels (USVs) are potential cost-saving and safety-enhancing tools in the maritime and energy sectors.
- While these unmanned technologies have been in use in the military space for many years, unmanned aircraft and vessel technologies are in their infancy in the commercial context.
- In recent years, offshore wind energy technologies have gained widespread attention and experienced a rapid development because of the many advantages they offer. The wind resources in offshore sites are more abundant, stronger, and blow more consistently than those on land.
- The Global Wind Energy Council (GWEC) estimates that the total offshore wind energy capacity in the world will surge to more than 234 gigawatts (GW) by the end of 2030.
- The Biden Administration is preparing to support rapid offshore wind deployment and declaring its intention to deploy 30 gigawatts of offshore wind in the U.S. by 2030.
- The global market for drones is taking off: Various reports project double-digit growth in the drone market between 2020 and 2025. Drone Market Insights, for example, estimates the market will grow at a cumulative annual growth rate (CAGR) of 13.8% from $22.5 billion to $42.8 billion.

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U.S. Jurisdictional Framework of Offshore Wind

U.S. Jurisdictional Framework of Offshore Wind

- The physical territory of the United States extends three nautical miles (NM) from the coast.
- Beyond 3 NM, the U.S. has exercised jurisdiction pursuant to individual jurisdictional laws/proclamations, including:
  - Submerged Lands Act, 1953.
  - Outer Continental Shelf Lands Act, 1953 (OCSLA) (specifically applied the U.S. Constitution and federal law).
  - 1988 12-Mile Extension of Territorial Sea Proclamation.
  - Energy Policy Act of 2005 amending OCSLA.
- These Acts also divided waters between "state waters," or within 3 NM for most states (Florida and Texas have different limits) and "federal waters" beyond 3 NM.

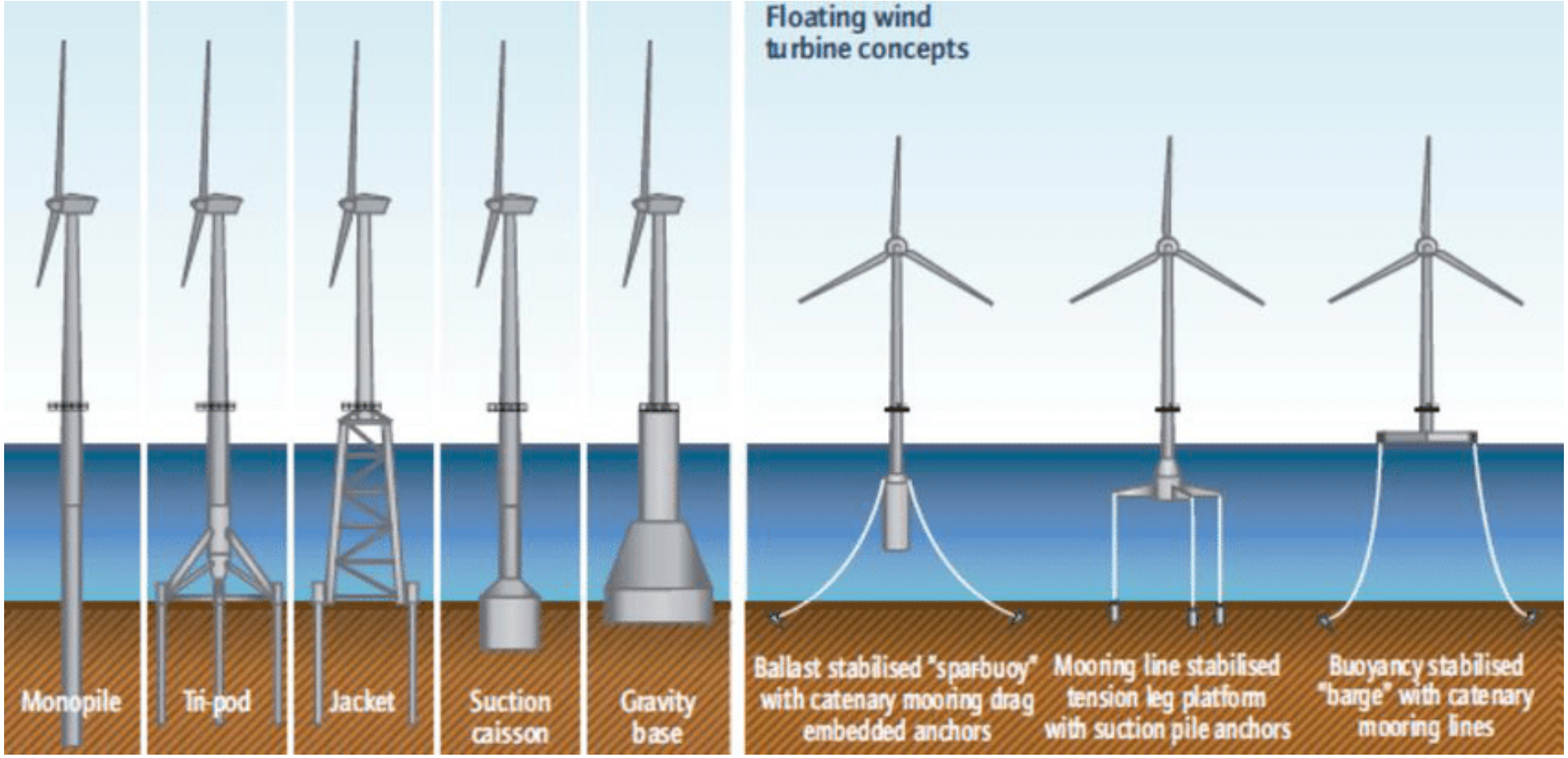
U.S. Jurisdictional Framework of Offshore Wind – cont.

- Energy Policy Act of 2005 granted the federal government for the first-time authority to lease submerged lands beyond 3 NM to 200 NM over offshore activities "other than oil and gas."
- Programmatic Impact Statement issued in 2008 and Final regulations issued in 2009.
- The National Environmental Policy Act (NEPA) is the principal US environmental law that dictates how environmental permitting and review works for offshore wind projects in US waters (federal nexus).
- Leasing authority was granted to the Bureau of Ocean Energy Management (BOEM) in the U.S. Department of Interior (DOI)– the same agency that issues oil and gas leases.
  - *E.g.* Cape Wind project was awarded the first lease in November 2010.
  - That project was never fully permitted and was abandoned in May 2018.

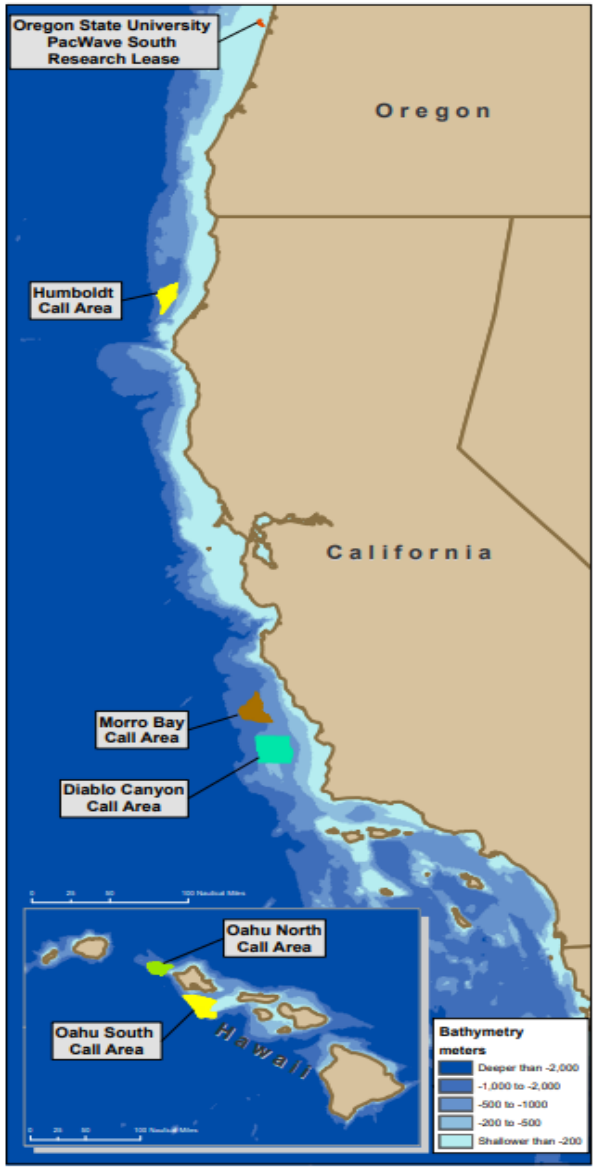
U.S. Jurisdictional Framework of Offshore Wind – cont.

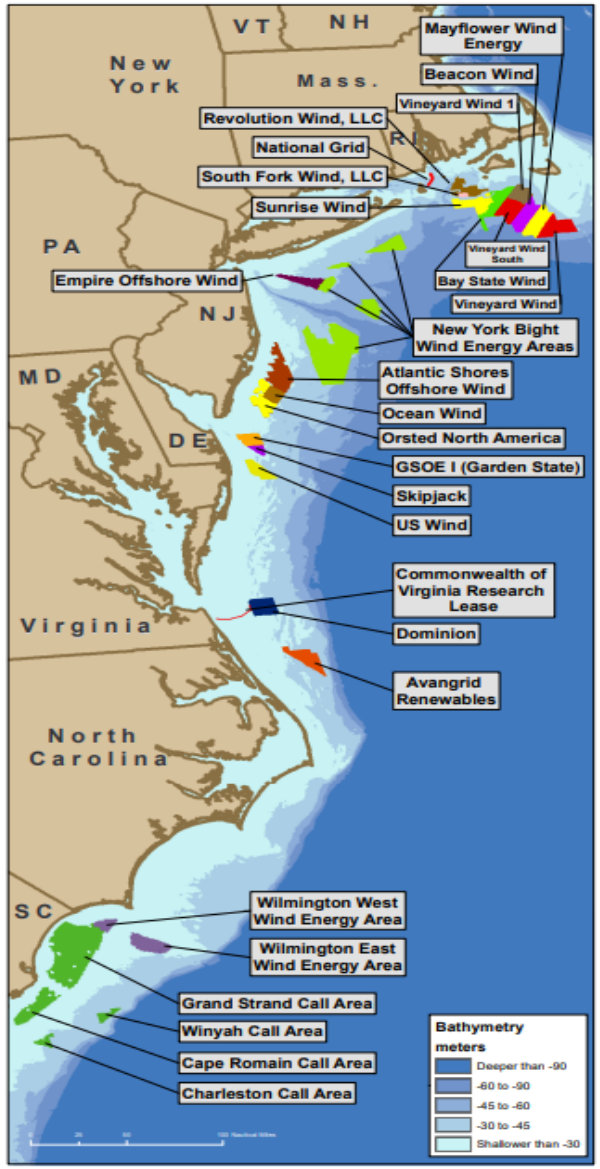
- OCSLA extends federal law offshore, including federal maritime case law, except where there is no federal law to apply, in which case adjacent state law applies.
  - A question arose as to whether "resources" encompassed offshore renewable energy since the statutes and legislative history focused on oil and gas.
  - Energy Policy Act of 2005 focused on leasing, not tidying up jurisdiction.
- Congress amended the law on January 1, 2021, organized the statutory phrases, and added "including non-mineral energy resources."
- States have the authority to lease within their waters as Rhode Island did for the Block Island.
- Customs and Border Protection (CBP) has ruled that the Jones Act applies everywhere within the 3 NM territorial limit.
- Outside the limit, the Jones Act applies to "to all artificial islands, and all installations and other devices, permanently or temporarily attached to the seabed."

U.S. Jurisdictional Framework of Offshore Wind – cont.



Source: Konstantinidis, E. & Botsaris, Pantelis. (2016). Wind turbines: current status, obstacles, trends and technologies. IOP Conference Series: Materials Science and Engineering. 161. 012079. 10.1088/1757-899X/161/1/012079.





Source: boem.gov/Renewable-Energy (Map Date: 08/02/2021)

Timeline of the U.S. Market

1991– The first offshore wind farm in the world is constructed in southern Denmark. It includes 11 wind turbines manufactured by Bonus Energy, each with a capacity of 450 kW.

2011– DOE's National Offshore Wind Strategy, a partnership project with the DOI. The goal: reduce the cost of energy through technology development and reducing deployment timelines.

2013 – A critical project: construction of the first floating offshore wind turbine connected to the grid. This was a DOE partnership with the University of Maine, deploying a 1:8 scale, 20 kw concrete-composite floating platform wind turbine--the first in the world.

2016 – The first U.S. commercial windfarm, Block Island, completed.

2018 – DOE reports (2017 data) that the U.S. has a total of 25,434 MW of offshore wind energy in the pipeline, with projects in development in New York, New Jersey, Massachusetts and Virginia.

May 11, 2021– BOEM issuesfinal approval for Vineyard Wind.

May 25, 2021 – The Biden Administration announced an effort with the State of California to advance certain areas of California's coastal waters for offshore wind farms opening up the Pacific Coast to its first commercial scale offshore clean energy projects. The development could bring up to 4.6 gigawatts of renewable energy.

August 23, 2021 – CBP issued its first Jones Act ruling relating to a floating offshore wind project on July 6, 2021, which it made publicly available on August 23, 2021. The ruling approved the mixed use of U.S. and foreign barges together with U.S. coastwise qualified tugs to transport and position a floating offshore wind turbine off the coast of Maine.

October 13, 2021 – The Biden Administration announced a plan to develop large-scale wind farms along nearly the entire coastline of the United States, the first long-term strategy from the government to produce electricity from offshore turbines.

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Overview of Unmanned Aircraft Systems

Drone Technology

- Aerial drones can broadly be categorized into three types: (a) multirotor; (b) fixed-wing; and (c) single-rotor helicopters.
  - Different designs but similar working principles.

(a) (b) (c)

- Unmanned Underwater Vehicles (UUVs)
  - 2 Categories: Remotely operated underwater vehicles (ROVs) and autonomous underwater vehicles (AUVs)
  - Already a staple of oceanographic research and military activity
  - Assess underwater infrastructure: UUVs can perform subsea cable surveys faster and more economically than ships with towed instruments.
    - Cables need to be routinely surveyed and maintained to ensure a project will continue to provide power to the grid, and revenue to the operators.
  - The largest UUVs can dive as deep as 20,000 ft.

Source: Citation: Shafiee, M.; Zhou, Z.; Mei, L.; Dinmohammadi, F.; Karama, J.; Flynn, D. Unmanned Aerial Drones for Inspection of Offshore Wind Turbines: A Mission-Critical Failure Analysis. Robotics 2021, 10, 26. https://doi.org/10.3390/ robotics10010026

Development Timeline

1930s

The term "drone" became popular primarily in military reconnaissance missions.

1970s

Drones became lighter, more advanced, and more automated.

2011

First drones developed that can inspect and fix wind turbines.

2016

Maersk, in collaboration with drone maker Xamen Technologies, recently completed its first successful delivery, a tin of cookies to a vessel.

2017

Blueye Robotics develops an underwater drone that allows offshore wind companies to perform inspection of underwater structures and power cables without the need for divers or remotely operated vehicles.

2018

Orsted and Keystone Engineering, alongside ULC Robotics Aerial Services Division complete first annual inspection of Block Island Wind Farm.

2020

In a partnership among Altera Infrastructure, DNV GL, and Scout Drone Inspection, a UAS was used to inspect a 19.4 meter-high oil tank onboard Petrojarl Varg, a floating production, storage, and offloading vessel.

2021

Drones employed in Port of Long Beach, continued successful use in Port of Antwerp

Drone Technology – Uses

- Drones are currently used in a wide range of applications, including fisheries monitoring, maritime patrol, coastline monitoring, drug traffic monitoring, high-accuracy terrain mapping, crop and harvest monitoring, road traffic monitoring and control, law enforcement, forest fire detection, and high voltage power line monitoring.
- Numerous potential and current uses in the offshore wind industry.
- Current Primary Uses:
  - Security surveillance of critical infrastructure.
  - Delivery of goods.
  - Inspections.
  - Pollution Control.
  - Marine Patrol.
  - Navigation Aid.
  - Documental Transmittal.
  - Community Relations.

Application of U.S. Law

- Drones are regulated by the Federal Aviation Administration (FAA).
- The FAA's Part 107 rule is applicable for UAS operations extending out to 12 NM (13.8 miles) from the U.S. coast. For civil UAS operations beyond the U.S. territorial sea limit an operator will need to comply with International Standards, Annex 2 Rules of the Air to the Convention on International Civil Aviation and certain provisions of 14 CFR 91, in particular 14 CFR 91.703.
  - Under Part 107, any unmanned aircraft 55 lbs. or greater must be registered with the FAA.
- After delaying its effective date from March 16, 2021 to April 21, 2021, the FAA put the Operation of Small Unmanned Aircraft Systems Over People Final Rule into effect.
  - The rule will eliminate the need for typical operations to receive individual part 107 certificate of waivers from the FAA.
  - Drone pilots operating under Part 107 may fly at night, over people and moving vehicles without a waiver as long as they meet the requirements defined in the rule.

Application of U.S . Law – cont.

- According to the FAA, as “the next incremental step towards further integration of unmanned aircraft in the National Airspace System,” this new rule targets regulations to permit routine operations of small, unmanned aircraft over people and at night under certain conditions. The idea is to meet the increased demand for flexibility in small UAS operations and allow for UAV industry growth.
- Drone Pilot Certification via the FAA Knowledge Test.
- Currently, there are no additional regulatory qualifications required for offshore wind sites.

Comparative Law

According to the Danish Air Navigation Act, two main conditions must be met for drone flight. First, the **drone operator must have acquired a drone license** . Second, **the drone must be insured (different in United States)**. For drone flights within urban areas, it is also a condition that **the drone must be registered and identifiable** .

Although one may think that rules on flying drones within urban areas are not relevant to offshore use of drones, in Denmark they are considered urban areas, just like industrial and port areas. Thus, a drone flying from a port and possibly to an offshore platform is covered by the Act.

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Emerging Autonomous Technology & Application to Offshore Wind

Potential Advantages

- Increased Personnel Safety in Offshore Wind Farms.
  - Reduce number of times personnel need to travel to and climb up the wind turbines.
  - Reduce amount of heavy lifting equipment required to carry out the dangerous inspection work.
- Efficient. Shorter down-time needed to detect defects/collect diagnostic information.
- Cost-effective. Potential to lower operation and maintenance costs.
- Access. Drones can access otherwise inaccessible areas.
  - Inspection.
  - Transportation. Spare parts that may have previously been sent via service vessel or helicopter.

Potential Risks

- Reliability.
  - Drones are at an early stage of development.
  - Reliability is defined as the probability of a system functioning without failure for a given period of time in a designed environment, is a key performance indicator for drone system.
- Privacy.
- Lack of Uniform International, Regional, and Local regulations.

Recent Developments – United States

- **January-June 2020:** Orsted, Siemens Gamesa and Esvagt collaborated on "Operative Package Deliveries by Drone" that explored how to transport small components to technicians on wind turbines using unmanned aerial vehicles.
- **October 6, 2021:** American Maritime Officers (AMO) entered into a labor agreement with Sea Machines Robotics, developer of autonomous command and control systems.
- **October 21, 2021:** Sea Machines announced completion of the world's first 1,000+ nautical miles autonomous / remotely commanded journey of a commercial vessel (Nellie Bly).
- **October 25, 2021:** Siemens Gamesa Renewable Energy announce first offshore wind turbine blade facility in the United States. This is also the first commitment by a global offshore wind turbine manufacturer in a U.S.-based supply chain.

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Questions?

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Allison N. Skopec focuses her practice on maritime, international law, and environmental law with a focus on the intersection of logistics and technology.

With regard to maritime, international, and environmental law, her practice involves:

- Commercial negotiations and dispute resolution involving charter parties, service contracts, and other transportation-related agreements, including those related to demurrage, detention, and drayage issues.
- Shipping Act claims.
- Regulatory compliance counseling related to the U.S. Coast Guard, Environmental Protection Agency, U.S. Customs and Border Protection, and Maritime Administration, among other federal and state agencies, including providing advice related to the MARPOL convention regarding ballast water and OWS recordkeeping.
- Jones Act and coastwise trade matters.
- Cybersecurity compliance, including application of Section 889 of the NDAA and CMMC certification.
- S. trade sanctions including Office of Foreign Assets Control designations.
- Identifying administrative and legislative solutions in connection with maritime matters.
- Shipbuilding contracts.
- Maritime bankruptcies and restructuring.
- Vessel secured financings and lease financings.

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