

Summary Report: Bureau of Ocean Energy Management's Offshore Wind and Maritime Industry Knowledge Exchange

March 5-6, 2018
Baltimore, MD



Offshore Wind turbine jackets for the Block Island Wind Project off Rhode Island (credit: Sid Falk, BOEM)

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I. Introduction

On March 5-6, the Bureau of Ocean Energy Management (BOEM) held the inaugural Offshore Wind and Maritime Knowledge Exchange in Baltimore, MD. The purpose of the workshop was to convene subject matter experts to discuss challenges, opportunities, and needs for improving coexistence of the offshore wind and maritime transportation industries. The workshop was open to the maritime industry, offshore wind energy stakeholders, and interested members of the public. Participants learned about the design and operation of offshore wind facilities, responsibilities of stakeholders in the development process, potential timelines for the development of offshore wind facilities in the Atlantic Ocean, and navigational safety issues associated with the transit of commercial vessels near offshore wind facilities. The event featured presentations and panel discussions, as well as interactive table top discussions and breakout groups.

Objectives of the Knowledge Exchange include:

- Share knowledge and best practices for offshore wind and marine transportation co-existence
- Explore the range of roles and responsibilities across the Bureau of Ocean Energy Management (BOEM), U.S. Coast Guard (USCG), U.S. Bureau of Safety and Environmental Enforcement (BSEE), offshore wind lessees, and maritime stakeholders
- Learn about and discuss potential offshore wind farm layouts and development timeframes
- Identify potential challenges for continued discussion

This report summarizes the presentations and discussions from the Knowledge Exchange. BOEM did not seek consensus but may use the discussions and suggestions to improve the coexistence of offshore wind and maritime transportation.

II. Presentations

A. BOEM Atlantic Coast Renewable Energy Leases

Offshore renewable energy development in federal waters includes a multi-year process with many steps from initiation to installation (see Figure 1). The timeline begins when BOEM issues a Request for Information (RFI). After this call, potential wind energy areas are identified and leasing notices are published. During this time, National Environmental Policy Act (NEPA) environmental reviews are conducted. Once areas are identified as potential wind energy areas, BOEM holds an auction and grants leases. Leased areas often can support more than one project and developers can build a project in phases. Following the lease, developers hold pre-survey meetings and submit a Site Assessment Plan (SAP) to BOEM. After BOEM reviews and approves the SAP, the developer can then conduct the assessments and surveys necessary for characterizing their leased site. The site assessments and surveys can take up to five years, after which a Construction and Operations Plan (COP) is submitted to BOEM for an environmental and technical review. The COP includes a project description (size, layout, technical details), navigation safety risk assessment, nomination of certified verification agent, preliminary safety management systems, oil spill response measures, and the decommissioning process. BOEM issued draft guidance on the “Use of a Project Design Envelope in a Construction and Operations Plan,” which allows flexibility in project design should conditions change, making alterations to the construction plan necessary. After the COP is approved, the developer submits the design and installation plan, after which installation of the wind energy facility can begin.

In spring 2018, draft lighting and marking guidelines were developed based on interagency review, specifically with the USCG and the Federal Aviation Administration (FAA). The final guidelines will address both vessel and aircraft navigation and stakeholder outreach will be conducted before finalization.

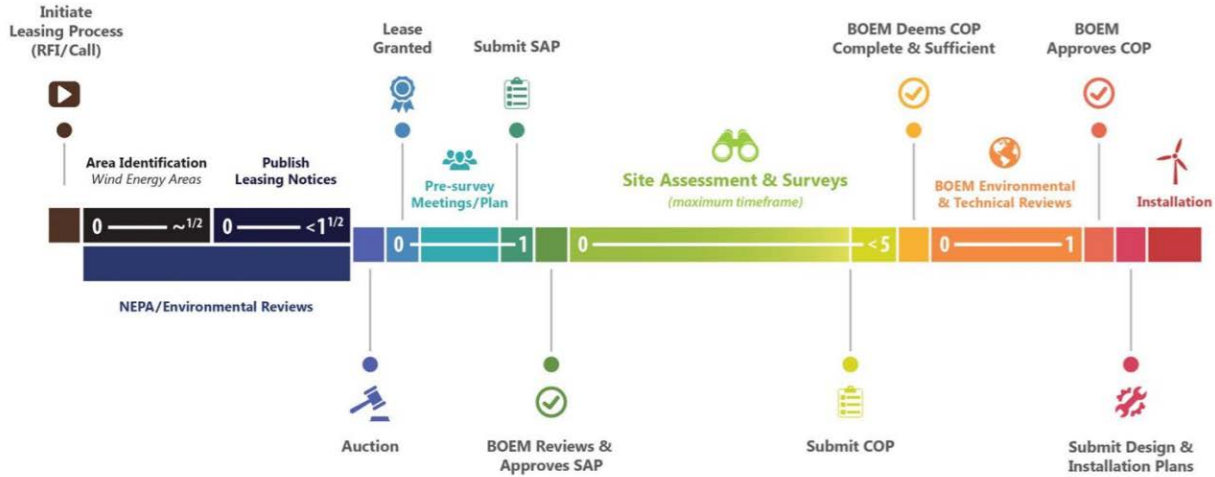


Figure 1: The BOEM Leasing Process Timeline

As of October 2018, BOEM has issued 13 commercial wind energy leases in the Atlantic since 2009, with additional lease sales in various stages of planning and commencement. Six SAPs have been approved (MA, RI, VA, MD, NJ) and another two are processing (NY, DE). BOEM is additionally processing two COPs (Vineyard Wind, Deepwater Wind South Fork). There are a number of projects in the pipeline for the Atlantic Outer Continental Shelf (OCS), see Figure 2. New York’s Master Plan calls for 2.4 GW of offshore wind energy by 2030. BOEM is evaluating four areas for possible leasing, balancing Department of Defense exclusion areas as well as concerns over navigational safety.

[The Marine Cadastre](#) is an online GIS tool developed by NOAA and BOEM. It contains publicly available data, including the data that helps BOEM plan for offshore energy. For example, the Marine Cadastre receives raw vessel Automatic Identification System (AIS) data from the United States Coast Guard and processes it into usable data points, which can then be used to make density plots. Additionally, the Cadastre team uses their trackline building tool to turn the points into individual vessel tracklines allowing decision makers to see the paths that individual vessels take.



Figure 2: Projects in the pipeline for the Atlantic OCS.

Responses to questions:

- The oil and gas draft proposed plan was not incorporated into renewable energy plans, as the draft plan will not be released until later in the year. Existing leases should not overlap with oil and gas leasing areas. Designated wind energy areas have been designated for wind alone.
- Department of Defense exclusions are part of a larger conversation regarding co-existence and ongoing communication. Areas that are proposed do not reflect specific project proposals and do not mean final.
- There is a difference between COP approval and a Record of Decision (ROD). For the agency action of approving a COP, NEPA requires that BOEM produce an Environmental Impact Statement (EIS), and that the EIS finds no significant impact as a result of COP approval. The ROD is the documentation of all considerations, both by BOEM and by other cooperating agencies, involved in the development of the EIS. The ROD and other NEPA considerations are more fully discussed in the section *Environmental Review and Compliance for Offshore Wind Projects*.
- Offshore wind development is a regional discussion and allows for collaboration on a regional level. Multiple government agencies are involved in discussions with BOEM, including conversations with USCG and at Task Force meetings.

B. What Does an Offshore Wind Energy Facility Look Like?

Wind turbines are comprised of a rotor (the blades and hub), a nacelle (contains the drive train and mechanical to electrical conversion systems), and the tower (see Figure 3). There is no standard tip clearance; however, the lowest clearance for the tip of a blade to sea level is 75-100 feet. Turbines generally rotate 7-8 times per minute. As the offshore wind energy industry grows and technology advances, so too does wind turbine size. In 2005, turbines were 2 MW (70 meter hub height and an 80 meter rotor). By 2015, turbines had grown to be 6 MW (100 meter hub height and an 150 meter rotor). By 2025, turbines are expected to be 10 MW (125 meter hub height and a 205 meter rotor)

and 15 MW turbines are on the drawing board. One advantage of larger turbines is that fewer turbines are required to meet the same MW capacity desired while allowing for wider spacing.



Figure 3: Anatomy of a wind turbine.

Internationally, there are 111 offshore wind projects with over 13 GW installed (global figures as of the end of 2016). Most (99%) of the turbines are fixed bottom support structures in shallow waters less than 50 meters. Turbine capacity ranges from 6-8 MW with 150-180 meter rotors and towers that are over 90 meters. Capacity factors are 40-50%. Operation and maintenance costs are higher than land-based wind; however, capital costs are dropping as the offshore wind energy industry gains experience, competition increases, and project risk declines with continued investment. The industry is able to learn from the experiences of mature marine industries like the offshore oil and gas and submarine cable industries. The Deepwater Wind Farm off the coast of Rhode Island was the U.S. first commercial wind farm (completed December 2016). It consists of five turbines for a total capacity of 30 MW and uses fixed bottom jacket support structures (about 26 meter water depth). The project produces electricity for 17,000 homes.

There are many different types of foundation types. Fixed bottom foundation types (see Figure 4), where the foundation is in contact with the seabed, are feasible for water depths up to 50 meters. The jacket type structures have been adapted from the oil and gas industry. Monopiles are the most commonly used fixed bottom foundation type as it uses the smallest footprint. Fixed MET masts are expensive and are being replaced by floating LIDAR buoys to measure wind speeds at the site for resource validation and power production.

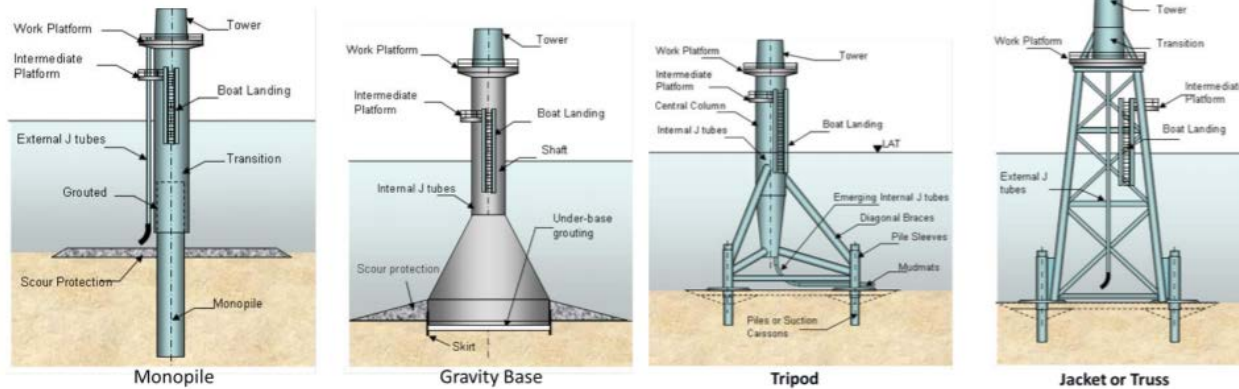


Figure 4: Fixed bottom foundation types. Monopiles have the smallest footprint and are the most commonly used foundation type.

The layout of a wind farm needs to take into effect wake effects, which can reduce the amount of wind downwind turbines receive (up to 10-12% losses) as wind moves through a project site. Rotor diameter is used to determine spacing between turbines, with eight rotor diameters being the recommended spacing. The number of diameters used for spacing depends on site area, cable length (cost), water depth, and atmospheric conditions. Well-designed spacing helps the winds regenerate, reducing the losses from wake effects. The distance between turbines increases as rotor diameter increase. Bathymetry is also a major factor in layout of a wind farm. For example, in the Massachusetts Wind Energy Area, half the water is deeper than 50 meters. For the four leasing areas in this wind energy area, the area that is shallower than 50 meters is equal for all areas and the deeper waters can be developed with different technology (e.g. floating platforms). Modeling helps developers optimize energy layout designs to minimize excess turbine loads and construction costs, maximize power output of existing facilities through advanced controls, and optimize the layout for the most efficient use of the wind energy area.

Getting the power generated from the turbines to the grid involves an array system of cables between the turbines and an export system that runs from a substation offshore to one onshore. These cables are buried about 6 feet below the seabed. Scour and subsea geology may expose the cables over time so projects include active monitoring to determine if this occurs. If cables cannot be buried, they are protected with mattresses, rock placement, and armoring techniques.

Responses to questions:

- Wake steering, a technique where turbines are turned in various direction to avoid losses, can be used to mitigate array problems. However, it has not yet been successfully implemented.
- While standardization of blade length in a wind farm is typical, mixing rotor diameters and tower heights has been discussed as a way to optimize wind farms and reduce wake effects.
- Cable burial depth is determined by hardness of the seafloor. Soft seafloors allow cable burial depths of up to 25 feet, but six feet is a general target. Geophysical surveys are used to determine what the target depth is in a specific area. Some states also have minimum depths.

New Jersey requires cables to be buried at least five feet when within three nautical miles of shore.

- The limiting factor in turbine size is cost and testing facilities. The theoretical limit for blade length has already been surpassed. Turbines are 20-30% of the cost of a wind farm. Current turbine test facilities can only test blades 90-110 meters. However, 107-meter long blades have been produced, so longer blades may appear in the near future.

C. The Importance of Maritime Commerce

The ocean is vital to the global economy. Approximately 50,000 ships move 90% of global trade via the ocean. Ship length is staying relatively the same, but ships are getting taller and deeper. Taller and deeper ships reduce the maneuverability and require deeper channels, taller bridges, and potentially feeder ships. The risk to shipping vessels increases during fishing seasons when more vessels are near port entrances. Shipping and trade is directly affected by a wide range of factors, some examples include:

- Regulatory – emission control areas and Global 2020 Sulphur Cap, greenhouse gas, ballast water, state and local regulations
- Economic/political – fuel costs, China’s changing economy, developing nations, U.S. NAFTA, national government changes in policy
- Geographic – wind energy areas, expansion of the Panama Canal, development of Arctic shipping routes, oil rigs
- Weather seasons – monsoon, hurricanes
- Environmental – whales, fishing seasons

In the presenter’s view, actions BOEM could explore to minimize the impacts of offshore wind areas during the analysis stage include taking a regional approach to planning offshore wind areas (rather than a state approach); engaging and communicating early and often with the shipping industry as well as ports, pilots, and the tug sector; and developing current and future scenarios for proper planning. The presenter also said the data portals and regional ocean plans are good resources for planning. Specifically for the New York Wind Energy Area, the one mile buffer is a small distance to be able to effectively maneuver and the presenter suggested a two mile buffer zone would be better. Shippers may switch ports if entry is complicated or expensive.

Responses to questions:

- The international experience has shown that cumulative effects should be looked at, including effects such as increased cumulative risk from weather events such as hurricanes. A regional approach to cumulative effects is something BOEM could consider. Operators will choose the ports that are the easiest and safest to approach and difficulties with port entry may reduce the amount operators visiting that port.

D. Tugboat Coastal Navigation Challenges

There are three types of towing vessels: articulated tug barge (ATB), integrated tug barge (ITB), and a tow wire tug and barge. The ATB fits into the notch of the barge and a hinged connection allows for articulated movement. The ITB is a rigid mechanical connection between the tug and barge.

There is no articulation and use of this type of barge is rare. The tow wire tug and barge is how it sounds, the tug connects to the stern of the barge via a wire/towline.

Factors to consider in marine planning include:

- historic towing routes,
- cross track error,
- the closest point of approach,
- the density of vessel traffic, and
- the sea state limitations and depth of water.

The location of towing routes varies along the coast and are based on environmental habitats, the depth of the water, and other traffic. Changing these routes will create conflicts. Cross track error is the difference between the intended and actual track due to environmental forces such as wind, current, and sea state. Reducing this error is up to the ability of the vessel operator to recognize the deviation from the intended track and take corrective action, as well as the maneuvering characteristics of the vessel (speed at which the vessel responds to the rudder and main engines). The swept path for the average tug and barge varies from $\frac{1}{4}$ to $\frac{1}{2}$ nautical miles. Tug captains are required to consider all dangers to navigation before transiting for the closest point of approach. The appropriate approach must consider weather, vessel maneuvering capability, visibility, and sea state. Under less ideal conditions, a vessel should aim for passing agreements of two nautical miles at minimum. The density of traffic determines the likelihood of vessels sharing sea space. When multiple vessels converge on the same location, additional sea space is required to maintain the appropriate closest point of approach. Additional room is required at entrances to harbors and other areas where different vessel types interact. Weather restricts vessel traffic and winds may require additional wires and depth. Confined offshore routes restrict vessels to departing during the most ideal circumstances.

Next steps for tugboat navigational challenges include disseminating information, potentially including information on towing corridors and routes in the data portals, and emphasizing the value of early communication with stakeholders. A recommendation regarding tow corridors is to have the corridors nine nautical miles wide, which would provide enough space for three vessels to pass.

E. Navigational Risk Assessments and U.S. Coast Guard Responsibilities

The U.S. Coast Guard's mission is to ensure the Nation's maritime safety, security, and stewardship. The USCG is a subject matter expert for maritime safety, security, and mobility; national defense; and protection of the marine environment. They are members of BOEM's state renewable energy task forces and collaborate on navigational safety risk assessments for evaluating specific projects. USCG is a cooperating agency for NEPA purposes, provides recommendations to BOEM, and identifies potential impacts to safety of navigation for the entire maritime community while considering traditional uses of the particular waterway and other Coast Guard missions (e.g., search and rescue).

Placing structures on the OCS increases the risk of a vessel collision, both with the new structure and with other vessels. Density of vessel traffic increases this risk due to funneling and decreased sea space to maneuver. Rerouting traffic may also increase the weather-related casualty risk to

smaller vessels engaged in coastwise shipping. Forcing smaller vessels further offshore and into deeper water affects vessel stability and forces their paths to be interspersed with deep draft vessels transiting at higher speeds.

The USCG is required to conduct a port access route study (PARS) before establishing new or adjusting existing fairways. Coordination with federal, state, foreign state agencies; maritime community representatives; environmental groups; and interested stakeholders is needed to reconcile the need for safe access routes with other reasonable waterway uses. The PARS process may be used to determine and justify if safety zones, security zones, recommended routes, regulated navigation areas, and other routing measures should be created. For the Atlantic Coast PARS, the most significant outcomes were the development of Marine Planning Guidelines (MPGs), the identification of alongshore towing vessel routes, and identification of major deep draft routes.

The Marine Planning Guidelines were developed using input from the Confederation of European Shipmasters Associate, World Shipping Council, U.K. Maritime Coastguard Agency, and the German Waterways and Shipping Directorates. The major topics included in the guidelines are the port approaches and traffic separation schemes (TSS), along shore routes, offshore deep draft routes, navigational safety corridors, contributions to risk, mitigation, and other considerations. Uses of the guidelines include assisting in initial area identification; aiding offshore developers/marine planners in evaluating navigational impacts; developing and reviewing navigational safety risk assessments; considering sea space for safe maneuvers; determining appropriate separation distances; non-regulatory uses; determining TSSs, alongshore routes, and offshore deep draft routes; and evaluating any other type of project. Alongshore towing vessel routes are identified using traditional tug and barge routes. Marine planning guidelines were identified for navigation safety corridors, and a lesser degree for deep draft traffic location and wind farm interaction. A way ahead is to consider developing a routing system along the Atlantic Coast and converting navigational corridors into shipping safety fairways or other routing measures.

Fairways, a lane or corridor in which no artificial island or structure (temporary or permanent) can be placed, is permitted so that vessels using U.S. ports have unobstructed approaches. They can also act as routing measures. The USCG creates the fairways domestically in a 2-5 year process. Routing measures created by the USCG must be approved internationally by the International Maritime Organization (IMO) as well as domestically. Routing measures are recommended, but not mandatory, and involve a 2-4 year process. These measures include areas to be avoided, no anchoring areas, precautionary areas, traffic separation schemes, traffic lanes, and separation zones or lines. For wind farms, the USCG does not anticipate restricting activities (such as fishing and sailing) in and around the farm, unless it is necessary to ensure safety of navigation, protect life and property at sea, or protect the environment. Restrictions may be necessary depending on the size of the wind farm, spacing of the turbines, axis of the turbines, size/type of vessels, cargo of vessels, volume of traffic, environmental concerns, and other factors.

The USCG reviews offshore wind project proposals to determine the impact on its search and rescue missions (SAR). Based upon these reviews, the USCG may recommend emergency shutdown procedures to aid in the SAR mission, communications capabilities, mariner information sheets, and monitoring capabilities. Marking and lighting are required for wind farms and based upon USCG requirements. A private aid to navigation request needs to be submitted, approved, and permitted

through the applicable Coast Guard District office. The developer will have to provide a plat for the farm, which NOAA uses to plot the farm on applicable charts (if possible, each turbine is identified on these charts).

The USCG is committed to supporting the maritime community by helping to identify navigation conflicts that will occur from placing structures along and in close proximity to traditional maritime routes, taking into account the maritime planning guidelines; helping to identify routing conflicts that arise from development of the call areas and adjacent leased areas (cumulative effects); helping to identify associated navigational safety risks; working with other government agencies to develop workable solutions; and evaluating additional areas that may be identified as potential areas of development.

Navigational safety requires that mariners be able to determine their position and safe course to steer, be alert to unseen dangers, determine if risk of collision exists, and take action to avoid collision. An offshore wind farm impacts navigational safety if a mariner is unable to meet those requirements. A navigational safety risk assessment (NSRA) is required from the developer of the offshore wind farm. The NSRA uses studies, standard industry practices, or guidelines from recognized sources applicable to their wind farm or waterway to assess the navigational safety risks and potential impacts to navigation safety. The USCG reviews the NSRA on behalf of BOEM and provides recommendations concerning mitigation measures.

The Coast Guard's interest in reviewing the assessment is to advocate for navigation safety and to balance that safety with stakeholder interests. The NSRA is a qualitative and objective assessment and the USCG seeks to understand the rationale put forth by the developer. The pre-application process is vital to the NSRA. This stage is the most flexible component of the entire permitting process. Identifying potential challenges and problem areas early and ensuring complete stakeholder outreach allows for frank discussions and discussions on the process going forward. The baseline for the NSRA is to ensure vessels comply with federal law and regulations, determining the worst-case scenario, comparing to the Navigation and Vessel Inspection Circulars (NVIC) 02-07 (Guidance on the Coast Guard's Role and Responsibilities for Offshore Renewable Energy Installations), determining any holes, and providing explanations/rationales for the assessment. Major hurdles for NSRA are engaging stakeholders, addressing fishing, assessing radar impacts, and determining cumulative impacts. Quality NSRAs have comprehensive data that is off-the-shelf, project-specific, and consistent; comprehensive outreach that is on the record, conducted through info sessions or open houses, and engaged federal, state, local, and tribal entities; and facts or opinions are supported with data or a record. It is recommended that lighting and marking of an offshore structure follow International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) O-130, "[Marking of Man-Made Offshore Structures](#)." Red flags for a NSRA include, but are not limited to, tip clearance measured from mean lower low water rather than mean higher high water, cable burial depths, sound signals, and unsupported statements.

Responses to questions:

- Qualitative assessments look at aspects that could have high, medium, or low impacts. There are no definitions, only descriptors, but definitions may be looked at in the future.

- Vessel spills from collisions with wind farms are not part of the navigational risk assessment. Each vessel should have their own response plan. USCG looks at risk to changing traffic patterns and the potential for spills, but vessel spills related to collisions with wind farms is not a major concern.
- There is no standard for tip clearance, but proponents need to have a justification for why that clearance was chosen.

F. Environmental Review and Compliance for Offshore Wind Projects

Environmental reviews occur at three stages during the offshore wind leasing and development process. These reviews occur during area identification and publishing the leasing notices, after a SAP is submitted, and before the approval of the COP. NEPA’s primary purpose is to help involve the public and inform the public of decisions. A NEPA analysis includes the proposed action, alternatives, cumulative impacts, routine activities, and non-routine events. Interagency cooperation occurs with agencies with jurisdiction or special expertise, federal agencies (such as the U.S. Coast Guard and the Bureau of Safety and Environmental Enforcement (BSEE)), affected states, and federally-recognized Tribes. The process from the submission of the COP to a record of decision can take two years or longer (see Figure 5).



Figure 5: Timeline of NEPA process and steps for each stage of the process.

To assist with the NEPA process, developers must submit in the COP the proposed facilities and activities, best management practices, mitigation measures, a navigation risk assessment, a lighting and marking plan, and other OCS activities. The navigational assessment conducted during the NEPA process is to characterize historic and future vessel transit routes and volumes, identify and evaluate impacts, and develop additional mitigation, if necessary. The proposed activities are also checked for federal consistency with a state’s coastal zone management program. Environmental studies (baseline and analysis) are conducted to analyze space-use conflicts; ports and infrastructure; benefits of offshore wind; and the risks, fate, and effects of chemicals. Stakeholder engagement is

conducted through intergovernmental task forces, public notices, public meetings, and stakeholder workshops.

BOEM's sister bureau, BSEE, was born out of Secretarial Order 3299. BSEE is a cooperating agency in the NEPA analyses BOEM conducts to ensure it meets BSEE needs and standards and will adopt the BOEM analysis for their decision-making, if applicable. BSEE's role is safety and environmental enforcement is to conduct inspections (compliance verification) and enforcement. BSEE inspectors will ensure the lease terms, conditions of approval, and mitigations are compliant. Enforcement actions are appropriate for the conduct detected and are aimed at changing operator behavior.

Responses to questions:

- The envelope approach gives developers flexibility in designing the wind farm. Technology is rapidly changing and is outpacing the review process. The approach gives a range of technology and ports to use and considers the most impactful aspect for each concern.
- There is no formal process for stakeholder engagement, but BOEM encourages proponents to undertake this process. Developers and federal agencies must engage in conversations early, but there is no requirement for stakeholder engagement.

III. Panels

A. Lessons Learned from Europe

A facilitated panel discussion highlighted recommendations and best practices from the European Offshore Wind Industry. These best practices included:

- Extending routing measures are a solution, but the case must be made to the International Maritime Organization.
- Assessments have led to extended routing measures. For example, the Humboldt River had 50 ships per day. The lane for deep draft vessels was 0.5 miles from a lease area. Stakeholder engagement led to a 1-mile zone, piloting of large vessels, and extension of TSS lanes. However, it took four years to achieve the lane changes.
- Engagement with stakeholders is key to finding solutions and limiting problems.
- The DNV GL's Marks model for oil and gas was modified for wind. This model relies on causal data rather than incidents. Increases in vessel density due to rerouting changes the collision frequency. Mitigation measures include piloting and AIS. Outreach was critical to identifying the most beneficial mitigation.
- AIS data has some gaps with fishing vessel data and it is difficult to assess risk with these vessels due varying track and vocal groups.
- There have only been two accidents in U.K. wind farms. One was a distracted fishing vessel and the other was a container ship that lost steering from a power failure.
- The kingfisher database helps fishermen identify cable locations. The Marine Cadastre provides this data from the North American Submarine Cable Association. The [FishSAFE](#) is a system in the U.K. that warns fishing vessels of the location of oil and gas infrastructure.

Responses to questions:

- The U.S. can have a similar experience as the U.K. and the Kingfisher database. Deference is given to the government agencies, but cables are a risk and that data is being put into portals. BOEM works closely with the North American Submarine Cable Association, which can distribute charts and data.
- There is a fault tree when assessing risk via models. These trees can model risks such as traffic density and incapacitation. The models are not specific to wind turbines or vessel class. Non-standard methods make data collection a challenge.
- Safety zones during construction have been discussed, but not implemented.
- Risk models are generally conservative than real world impacts. The value in modeling is in evaluating mitigation strategies.

B. Strategies for Mitigating Offshore Wind Impacts to Navigation

Developers explained how they mitigate navigation and safety challenges during construction and operation. These challenges included:

- Statoil (note: Statoil changed its name to Equinor in May 2018) has a simulator to model navigational risk. Day, night, and seasonal weather conditions were modeled with wave conditions. The model gave views of vessels and vessel size, as well as viewpoints from air or ship. The model was used for the Empire wind farm and is available for the fishing and navigation industries, who can provide feedback on the tool.
- Ørsted has a tool similar to Statoil's tool. Developers also completed a cumulative impact study. The Nautical and Offshore Renewable Energy Liaison (NOREL) is a forum for developers, the U.K. Coast Guard, stakeholders, technical groups, and the chamber of shipping. The group meets two to three times a year to generate guidance. NOREL has a navigation working group.
- On the Block Island Wind Farm there are 70 days of maintenance planned each year.
- Supply chain issues are a challenge for construction.
- During construction, vessels want to come out and watch. This requires coordination with the Coast Guard, fire, and police to mitigate any problems.
- One way to mitigate navigational challenges is to put up smaller 200-400 MW projects.
- A command center with long range VHF can be used to broadcast the day's activities so vessels know where other ships are at all times.

Responses to questions:

- Communication is paramount for supporting coexisting uses and assessing cumulative impacts.
- A best practice for the simulator is generating layouts and hosting marine hazard workshops. The work for navigational risk assessment will be frontloaded for layouts, then stakeholders will be targeted. There was the potential for phased development of lighting and marking as well as search and rescue demonstrations.
- The simulator can show working traffic. The parameters are being worked on currently.
- The strategy for mitigation will be to generate indicative layout, host hazard workshops, and identify top risks and concerns. It is important to focus early on what matters to each state and run risk models on the layers.

- The UK has had the same model used successfully with search and rescue helicopters. Flight simulators can be patched into the model.
- For the Block Island Wind Farm extensive outreach was conducted along the coast as the jack-up barges were trekking from the Gulf and up the East Coast. There was communication with USCG sectors and coordination for inspections of larger vessels.
- In Europe, wind farms are being moved further from shore, so service vessels are permanently on location. Helicopters are used to service and make transfers. For situations where crews are out for two weeks at a time and the farms are closer to shore, crew transfer vessels are used.
- As far as traffic within a wind farm during construction is concerned, there is generally a vessel out daily. Temporary exclusion zones might need to be put in place.
- Early engagement and early mitigation processes are different. There are advantages to both methods. Frontloading as much as possible is important.
- A lot of discussion and scenario analysis is required for lighting and marking wind farms that are close together.
- The navigational risk process for BOEM occurs when a Construction and Operations Plan is submitted. This is different than for UK farms, where frontloading is the standard process.

IV. Table Top Discussions

Participants discussed priorities and challenges identified throughout the day. These identified areas were used to help inform the breakout group discussions on Day 2 of the workshop. Areas identified in the table top discussions are impacts, navigation, risk, planning, and other. These discussions are summarized below.

A. Impacts

Regarding impacts, there were concerns about radar impacts and if that was a technical fix, how impacts affect shipping and associated costs, the best way to quantify cumulative impacts, what a reasonable foreseeable cumulative impact for NEPA and navigational risk assessment is, and who completes the assessment of cumulative impacts. Suggestions for priorities to address include addressing cumulative impacts and routing measures independently by regulators, addressing the cumulative impacts of adjacent wind energy areas, and developing guidelines that define the impact zone.

B. Navigation

Regarding navigation, there were concerns about shipping channels/lanes and buffers, safety zones for floating turbines, what navigational aids are in use and the monitoring requirements, how standard any monitoring requirements are, the non-actionable information in vessel transit studies, and the best way to look at regional impacts for navigational safety. There was also discussion about development of a more rigorous traffic system with the increased uses of ocean space. Also mentioned was the uncertainty in navigation, especially with fishing vessels, and that passing distance to wind farms depends on how comfortable mariners are with their vessels. Lighting schemes were discussed as a way to resolve some of the navigational issues. In order to lessen impacts to USCG operations, including search and rescue, turbines should be marked, lit, and placed on charts. The top lights should be FAA compliant with navigational lighting lower. Lighting and

marking should adhere to IALA standards and any deviation from the standards should be illustrated to BOEM. Wind turbines must be able to be shut down within 2 minutes of the USCG ordering it shut down. BOEM requires SMS for incidents on nacelles. Finally, pre-scoping meetings, stakeholder engagement, and the pre-application process can help inform navigation and resolve issues.

C. Risk

Regarding risk, there were concerns regarding fishing vessels acting as obstructions, the use of autopilot by fishing vessels, how emerging technologies could help reduce collision risk, the risk from heavily trafficked channels, and difficulty in mitigation for every vessel type. Risk mitigation was also discussed. Points of discussion included lighting/sound marking as a way to mitigate, knowing concerns and conflicts upfront so mitigation could be applied, and if there was a process to nominate mitigation measures and evaluate them. There was discussion regarding data that centered around AIS data not relaying the entirety of data, making it difficult to quantify fishing vessels; the need for more data on fishing boat movement vs actually fishing; and difficulty in quantifying encounters as vessels compress on approach. Suggestions for priorities to address include standardizing parts to streamline risk, developing safety management systems and guidelines, defining working hour limits for crews and technicians (including how downtime fits in), including navigating vessels carrying oil in oil spill response plans, using [IWRAP](#) for quantitative analysis of collision and grounding frequency, and clarifying BOEM vs developer responsibility regarding NEPA and navigational risk.

D. Planning

When it comes to planning for a wind farm, Regional Planning Bodies could be integrated into the BOEM and regulatory process, buffers could be based on vessel traffic/vessel size, and early involvement is key. Planning concerns include finding the best or most appropriate measures for around a wind farm (exclusionary or routing measures), defining a process to ensure stakeholders feel heard, balancing stakeholder concerns and inconsistency in the opportunities for stakeholders to give input for proposed lease areas, defining how much data is adequate for BOEM and USCG, use of AIS data for historical routes, and data for sea lanes needing to be more specific. There was also discussion over the point at which the U.S. should invest in specialized vessels and ports to support the development of renewable energy, and planning for the updating/purchasing of marine multipurpose installation vessels. The cost of updating ports is a \$100+ million investment, but public-private funding could be an option. Potential areas for action include BOEM taking the lead for task forces, as states differ in their interactions, and posting task force minutes.

E. Other

Finally, other tabletop discussions centered around who completes inspections for floating platforms and if there were Jones Act concerns with them, challenges with the Jones Act in the offshore wind context, crew fatigue and crew transfer, expanding Right Whale restrictions, and conflicts between USCG and Right Whale requirements for crew transfer vessels.

V. Breakout Group Discussions and Dot Exercise

As part of a welcome exercise, each meeting participant was given three colored, sticky dots. Large sheets of paper with various topics relating to navigation and offshore wind were hung on the wall. Participants were asked to put a dot next to the top three items they would like to see discussed. If a

topic they were interested in was not on the paper, the participant could add the topic. Similar topics were grouped in to an encompassing category. These categories became the categories for the breakout group discussions: leasing and approval, navigational safety risk assessments, Jones Act and training, USCG tools and long-term planning, operations and safety, cumulative impacts, and communications and data. The discussions are summarized below in brief synopsis of perspectives shared from participants in each breakout group.

A. Leasing and Approval

Demand drives the timeline for leasing and review. The state sets a goal and the path forward, while BOEM helps coordinate and lease. Though BOEM continues conversation with developers, the pre-COP stage is developer led. During the pre-COP stage, there may not be enough information for interagency meetings. After the COP is submitted, BOEM assesses if it is complete and sufficient. Once it is found so, the COP is released to the public for comments used to develop the EIS. The draft EIS goes to the state for review. Early engagement allows the state to provide necessary input. BOEM is looking at ways to mitigate for areas of concern once the developer provides the additional information in the COP. The developer completes the survey work, not the government, which is a key difference from the European model. Site data is proprietary. BOEM will complete an environmental assessment when initially identifying the wind energy areas, but the larger environmental analysis is done in an EIS at the COP stage.

An environmental permitting subgroup meets to get federal agencies coordinated. BSEE is involved in COP review and in enforcement of COP conditions after the COP is approved. The USCG is involved with identification of areas, but the process could be more formalized. Having agency involvement early in the process is key. Having agencies come into the processes too far down the road makes changes difficult to make.

The length of the process may make it difficult to track decisions and ensure the accuracy of the public record. Furthermore, the public does not always understand the leasing process, and the length of the process leads to fatigue. BOEM has the background on decisions and responds to comments as part of the public record. BOEM's website has good background and mailing lists can provide updates. BOEM has evaluated the state task force process to get better at documenting outreach and background. A shortened process may lead to better engagement and comment, which may lead to better and quicker decision-making. The NEPA review process takes time but will be shortened to a year to comply with administration policies. The intent of the new process is for the record of decision to take into account the NEPA cooperating agencies' decisions.

There is interest in leasing the New York Bight. Leasing will be competitive and will be used as a way to assess interest in the New York area for later leasing rounds. Massachusetts and South Carolina may have other lease areas in the pipeline. For the New York Bight, outreach was completed during a Call for Information from April through July. When it comes to jobs created by offshore wind, a regional approach may be worth looking into, as states are sharing leasing areas. If the Atlantic is opened up to oil and gas leasing, BOEM will adjust plans for renewable energy. Both in the U.S. and in Europe, the public and developers are able to comment on areas, impacts, and effects. This type of engagement allows developers to decide on potential issues with offshore wind.

There is a bond requirement for decommissioning. Leases can be released or reassigned to another company. BOEM has designed the process to keep leasing from being speculative. Developers need to submit proof that they can see the project through to the end (financial and technical assurances) and there are penalties for failing to comply with lease terms. The lease is a contract that provides developers with protections from changes in administration policies.

B. Navigation Safety Risk Assessments

USCG does not require a full conclusion in the navigational risk assessment but does require a description of the waterway at the current state and the proposal for mitigation going forward. In Europe, assessments contain a ranking of hazards based on criteria, frequency of the hazard, and consequences. USCG expects developers to address routing measures. The Marine Planning Guidelines in ACPARS specify two nautical mile buffer zones from the edges of existing traffic lanes, but developers can set farms closer as long as there is an explanation.

Buffer zones relative to TSSs and waterways for existing leases have not yet been addressed, though will be at the COP stage. Large vessels are hard to stop. Safe anchorages are another concern. These anchorages exist outside of 12 nautical miles, which is outside of USCG enforcement capability. Developers should look at reasonable foreseeable impacts for these anchorages. Comprehensive outreach should be done early to answer questions about buffer zones and routing measures. Harbor operations meetings are a good place to have dialogues regarding zones and routing measures.

BOEM and USCG can address holistic multiyear planning for OCS space use. The NSRA is solely for a project but reviewed from a regional and holistic approach. USCG is updating the Navigation and Vessel Inspection Circular (NVIC) 02-07, which describes the guidelines for NSRAs, to reflect regional space use and to develop guiding principles to address and balance users.

C. Jones Act and Training

Supply chain infrastructure needs to be looked at in order to successfully build up offshore wind in the U.S. Supply chain certainty is needed for port investments. Ports will not build or upgrade for one project but need several projects to justify the investment. For example, the Massachusetts build out yard has sat fallow since development of the offshore wind farm, despite attempts to redevelop the yard. Looking into what other industries can use these yards (ex. telecom, cables) may help encourage use. The U.S. also does not have the necessary fleet of vessels needed for offshore wind installation. For example, the 15 turbines for the Block Island wind farm was not enough to justify ship investment. European installation vessels with Jones Act complaint support vessels and lift boats were used. Ships could be repurposed to fit the needs of offshore wind. Cable ships (interarray) cannot be repurposed but jack-up barges can. Reflagging vessels is difficult, but it may be worth exploring if government subsidies can be used to build a Jones Act compliant ship for offshore wind development. Additionally, there are workforce development challenges. The U.S. workforce is not experienced with installation of offshore wind turbines. European installation crews can be used until this workforce is developed. Finally, Europe may be the source for knowledge on monopiles, but gravity base and floating turbines could be installed without a Jones Act compliant installation rig. Determining the federal and state role in port infrastructure, ship investment, renewable energy credits, power purchase agreements, etc. is important. It is also important to determine the minimum GW needed for investment in the supply chain (2 GW has been the number discussed).

Europe is 25 years into the process of building offshore wind and their experience can help inform the U.S. experience. Europe started small and has built up, but the U.S. is starting with 8 MW turbines. Europe has feed in tariffs for local developments. Bringing in European developers for the first few projects is logical until the supply chain is certain. Private industry is invested in manufacturing in Europe. It may be worth looking into the European training model for the first few offshore wind projects.

D. U.S. Coast Guard Tools and Long-Term Planning

The USCG has tools, such as WAMS/PARS, navigation corridors, MPGs, LAAs, and IMO routing measures, that can be used in planning for offshore wind development. However, there are gaps in these tools and it is important to fill them. There may be authority gaps past 12 nautical miles and it is important to know if IMO safety zones can be used outside of 12 nautical miles. Security/safety zones could be used as traffic increases due to moving parts needed for offshore development. Another tool is the Outer Continental Shelf Lands Act (OCSLA), which gives the ability for a 500-yard safety zone around offshore facilities in the Gulf. Looking at the United Nations Convention on the Law of the Sea (UNCLOS) and OCSLA will give a sense of the timeline for getting new zones approved. It is important to understand the impact of port infrastructure and how it impacts the USGC's ability to stay proactive. Assessments reflect progress in infrastructure (ex. ports) and the cumulative impacts also change as progress is furthered. NOAA will chart changes in zones and routing measures. It is also important to understand lighting/marketing authorities. There may be impacts to the fishing community from lack of anchoring or tie offs; however, recreational impacts and commercial fishing impacts are different. The USCG does not want to restrict access and there are sometimes cleats on wind turbines for emergencies. There is no USCG limit on how far offshore wind farms can be built. The deciding factor is water depth and technology, which drives cost. DOE may have a role in offshore wind development that is generally focused on research and data/information collection.

E. Operations and Safety

There should be guidelines for lighting that are more prescriptive than IALA standards. Europe has a mix of standards (Germany is prescriptive, Denmark is open, and the UK is somewhat open). There should be a clear method for marking turbines (ex. floodlights on the tops of nacelle). It is important to establish requirements early, rather than implement requirements after the fact. Fog horns may be useful on a case-by-case basis in areas of recreation. Concerning radar issues, there should be radar adjustments as vessels approach wind farms and there should be AIS transponders on all turbines. USCG will provide signal requirements in reviewing PATON applications and turbines will be plotted on NOAA charts. USCG is establishing search and rescue protocols for operation around wind turbines. One idea for lighting to aid search and rescue operations is to have the lights on the facility lowered and only light the turbine of rescue. A monitoring mechanism should also be created that helps with reporting and compliance (ex. Germany requires an annual report to authorities).

Concerning personnel operating on a wind farm, there need to be regulations on what is required. The types of workers required may include construction workers, mariners, and operation and maintenance technicians. BSEE is responsible for these regulations. There are organizations with training modules for basic safety as well as the European standard and USCG standards that can be used for these regulations. However, the European models may handicap the industry and should be adapted to fit the industry here. There should be a safety management standard template system and

another workshop focused on safety. Industry standards/regulations should be established. Additionally, there needs to be clear jurisdiction between BOEM, BSEE, OSHA, and USCG.

F. Cumulative Impacts

Defining “reasonably foreseeable” is a key for cumulative impacts. This definition may be different for BOEM, the NEPA process, USCG, navigational risk assessments, and developers. There are concerns about the scope of the definition for “reasonably foreseeable,” which could expand or restrict the potential impacts that could be analyzed. It is also important to define the geographical scope for cumulative impacts. BOEM may consider developing scenarios with probability attached to development and is considering exploring the U.K.’s process of varying levels of analysis depending on stage of the process. However, care needs to be taken to ensure projects that are expected, but do not have a COP in yet, are not disregarded when looking at impacts. Changing technology, including turbine size and increasing spacing between turbines, also affects impacts and potential mitigation. BOEM gives developers flexibility to develop mitigation or design layouts to address potential impacts. Cumulative risk assessment could include developer as well as stakeholder input, which is similar to what Anatec conducted for the Crown Estate in the U.K. Developers may not know what their competitors are doing; therefore, may not have the right perspective to understand a comprehensive cumulative assessment. Guidance on the federal perspective may help developers understand expectations. Benefits should also be included in cumulative impacts. For example, the Maryland OREC required investment into Maryland ports. Developers will mitigate cumulative impacts in creative ways that is economically feasible, but the larger picture of offshore development should be looked at holistically by BOEM.

Some navigation concerns raised during the lease stage have been deferred due to the need for more information about the site. Analyzing cumulative navigation risk independently for each lease will not provide a wholistic outlook and impacts should be looked at regionally. USCG should look at the risk assessments to ensure sufficient in terms of cumulative analysis. In particular, cumulative navigational risk assessments should look at funneling caused by adjacent wind leases, increased risk of allisions, impact to search and rescue helicopters, and safety measures developers plan to implement. During the area identification process, BOEM received input and concerns about the area. If these concerns cannot be managed, BOEM will removed these areas. For example, the Kitty Hawk lease off North Carolina had areas removed for navigation and other concerns. While USCG recommended additional navigational buffer spacing around the Statoil lease off New York, BOEM is allowing the developer, via the navigational risk assessment, to take a more in-depth review of traffic patterns, vessel needs, and potential mitigation options. USCG is updating NVIC and will provide a checklist for risk assessments.

Future offshore wind development may include larger ships making less trips but using historical routes. Fishing vessels follow the fish; therefore, future needs are less predictable. Department of Defense use is typically defined. Obstacles into ports may influence a vessel operator’s choice in port use. While onshore wind farms include operational wind farms in their impact analysis, the same concept cannot be directly applied to the maritime context. There are no roads in the ocean, but there are historical routes.

G. Communications and Data

Outreach and front-end engagement is important during the concept phase of a wind farm and should be conducted as early as possible. Stakeholders to include in this outreach and engagement include federal, state, local, and tribal entities; citizens groups; industry, including developers, operators, maritime entities; fishery groups; and pilots. Frequency of communications with these groups depends on the subset of stakeholders involved and the topics being discussed. Meetings with all stakeholders could be held on a more formal basis that is at a set frequency and advertised. Webinars and/or social media could be used to facilitate dissemination of information and project status. There was some concern with what party is responsible for identifying, contacting, and conducting outreach with stakeholders.

Having the appropriate data sets is important for preparing navigational risk assessments as well as NEPA documents. The data sets may be incomplete, hard to obtain, not attainable to support the development schedule, or not adequately validated. Therefore, environmental impacts and navigational risks may not be fully understood and adequately described. Having specified data sets that are required for specific analysis may help with assessing impacts. There may be concerns with proprietary data and shared data sets, including what entities collect, manage, and disseminate what data to and from the various portals available. It may be worthwhile codifying this information and making it available. There are concerns about the degree of ownership of the various data sets regarding collection, validation, archiving, and accessibility that may not be fully supported by the hardware/software systems. Additional concerns centered around the commitment of financial resources around the data sets, since some entities may use the data for regulatory purposes. It is important to ensure a sufficient degree of ownership and commitment by agencies/entities hosting the data, as well as adequate funding/resources to support system upgrades to collect, validate, archive, and distribute data.

Regionalizing and resolving placement issues is also important. The current model is for task forces that involve two or more states around a proposed area. In the future, it may be worthwhile exploring a regional model where all states along a seaboard are included, which would help ensure a degree of consistency with currently proposed wind farms leasing/operating requirements and future wind farms. This model may help ensure consistency and resolve placement issues.

VI. Concluding Summary/Next Steps

BOEM and the USCG recognize that ongoing information exchanges are a key ingredient to facilitate the development of offshore wind energy. The discussions and recommendations resulting from this knowledge exchange are integral to informing the process and procedures for analyzing the impacts of offshore wind and maritime industry development along the Atlantic coast.

The intent of this event was to facilitate an informed dialogue among developers, federal and state agencies and the maritime industry. It is only one event, but the lessons learned and knowledge gathered will be shared and incorporated into ongoing interaction and future engagement with the offshore renewable energy stakeholders. Some issues identified for future engagement and discussion include, but are not limited to:

- Determining the impact of a developing renewable energy supply chain on maritime traffic and impacts on port infrastructure

- Considering regional space use for navigation risk assessments and developing guiding principles to address and balance both maritime traffic and offshore wind industry needs
- Developing guidelines for marking and lighting offshore wind facilities that are consistent across the industry, while allowing some flexibility with respect to distance from shore and from other projects, and are geared to enhance safe transit as well as search and rescue operations
- Considering a more rigorous Atlantic OCS traffic management scheme, based on previous port access route studies, that incorporates federal and state agency concerns as well as public input
- Considering cumulative development impacts on a project by project basis that also includes regional concerns from already leased areas and state future renewable energy goals
- Acquiring the most up to date data about coastal and oceangoing vessel traffic movement as well as port development; providing access through public facing data portals; and demonstrating usability to affected industries, ocean users, and other stakeholders

The coastal and ocean areas of the U.S. coast are not in stasis; they are a dynamic and evolving environment from the standpoint of both the renewable energy industry and commercial maritime traffic with potential for conflict as well as mutually beneficial coexistence. Mitigation of potential conflict as well as enabling the beneficial aspects of co-development can be an outcome of ongoing and comprehensive knowledge exchange. Since the knowledge exchange, the Coast Guard has been working to update their NVIC 02-07 guidelines of NSRAs, BOEM has been developing lighting and marking guidelines, and both BOEM and the Coast Guard have been working together on reviewing plans from a regional perspective and remaining in conversation with affected stakeholders. BOEM is in the process of identifying wind energy areas following the comments received during the New York Bight Call for Information and is preparing to auction previously identified wind energy areas off the coast of Massachusetts. Thank you for all Knowledge Exchange participants who joined us in March. We look forward to continuing the conversation.

Appendix A: Agenda



BOEM’s Offshore Wind and Maritime Industry Knowledge Exchange

March 5 & 6, 2018

*Hilton BWI Baltimore Airport
Linthicum Heights, MD 21090
Meeting Room Concourse A*

Workshop Objectives

- Share knowledge and best practices for offshore wind and marine transportation co-existence
- Explore the range of roles and responsibilities across Bureau of Ocean Energy Management (BOEM), U.S. Coast Guard (USCG), U.S. Bureau of Safety and Environmental Enforcement (BSEE), offshore wind lessees, and maritime stakeholders
- Learn about and discuss potential offshore wind farm layouts and development timeframes
- Identify potential challenges for continued discussion

Day 1 Agenda: March 5, 2018

Time	Session
9:30 – 10:30 am	<i>Registration and selection of table posters</i>
10:30 – 11:00 am	<p><u>Opening Remarks</u></p> <p><i>Speakers: James Bennett, BOEM; George Detweiler, USCG; Jason Gershowitz, Facilitator, Kearns & West</i></p> <p><i>Welcome and discussion of workshop objectives</i></p> <p><i>A brief overview of workshop agenda and logistics</i></p>
11:00 – 11:30 am	<p><u>BOEM Atlantic Coast Renewable Energy Leases</u></p> <p><i>Speaker: Darryl François, BOEM</i></p> <p><i>Overview of BOEM’s mission and the status of offshore wind leases and timing of development</i></p>
11:30 am – 12:15 pm	<p><u>What Does an Offshore Energy Wind Facility Look Like?</u></p> <p><i>Speaker: Walt Musial, National Renewable Energy Laboratory</i></p> <p><i>Overview of the factors that influence the different foundations, layouts, and sizes of offshore wind farms</i></p>

<p>12:15 – 12:35 pm</p>	<p><u>Importance of Maritime Commerce</u></p> <p><i>Speaker: Sean Kline, Chamber of Shipping of America</i></p> <p><i>Overview of the importance of an efficient marine transportation system to U.S. economy</i></p> <p><i>Forecast of maritime commerce trends (e.g., volume, vessel types and sizes)</i></p>
<p>12:35 – 12:45 pm</p>	<p><u>Tugboat Coastal Navigation Challenges</u></p> <p><i>Speaker: Brian Vahey, The American Waterways Operators</i></p> <p><i>Describe the navigation needs and maneuverability challenges of tugs</i></p>
<p>12:45 – 2:00 pm</p>	<p><i>Lunch (On your own, restaurant list available at registration)</i></p>
<p>2:00 – 2:45 pm</p>	<p><u>Navigational Risk Assessments and U. S. Coast Guard Responsibilities</u></p> <p><i>Speakers: George Detweiler, USCG; Ed LeBlanc, USCG</i></p> <p><i>USCG role and responsibilities related to offshore wind</i></p> <p><i>Update to guidelines for conducting navigational risk assessments</i></p> <p><i>Potential regulatory tools (e.g., new fairway, recommended routes)</i></p>
<p>2:45 – 3:30 pm</p>	<p><u>Environmental Review and Compliance of Offshore Wind Energy Projects</u></p> <p><i>Speakers: Michelle Morin, BOEM; Glenn Degnitz, BSEE</i></p> <p><i>Overview of BOEM’s NEPA process including:</i></p> <p><i>Regulatory process</i></p> <p><i>Stakeholder opportunities for input</i></p>
<p>3:30 – 3:40 pm</p>	<p><i>Break</i></p>
<p>3:40 – 4:10 pm</p>	<p><u>Lessons Learned from Europe</u></p> <p><i>Speakers: Dennis O’Mara, DNV GL; John Beattie, Anatec</i></p> <p><i>Facilitated panel discussion highlighting recommendations and best practices from the European Offshore Wind Industry</i></p>
<p>4:10 – 4:30 pm</p>	<p><u>Table Topic Discussion</u></p> <p><i>Review potential challenges identified during registration and prioritize key questions to be addressed during the Day 2 breakout sessions and in subsequent conversations</i></p>
<p>4:30 – 4:55 pm</p>	<p><u>Summary of Priorities Identified in Table Discussion</u></p>

4:55 – 5:00 pm	<u>Wrap-up</u> <i>Speaker: Jason Gershowitz, Kearns & West</i> <i>Preview of Day 2 table topics</i>
5:00 pm	<i>Adjourn</i>

Continued on next page

Day 2 Agenda: March 6, 2018

Time	Topic / Activities
8:00 – 8:30 am	<i>Registration and Networking</i>
8:30 – 8:40 am	<p><u>Welcome</u></p> <p><i>Speaker: Jason Gershowitz, Kearns & West</i></p> <p><i>Day 1 recap and Day 2 preview</i></p> <p><i>Presentation of Table Topics</i></p>
8:40 – 9:25 am	<p><u>Strategies for Mitigating Offshore Wind Impacts to Navigation</u></p> <p><i>Speakers: John O'Keeffe, Deepwater Wind; Hywel Roberts, Ørsted; Martin Goff, Statoil</i></p> <p><i>Developers explain how they mitigate navigation and safety challenges during construction and operation</i></p>
9:25 – 10:55 am	<p><u>Breakout Groups: Table Topic Sessions</u></p> <p><i>Tables and topics to be identified according to areas of concern highlighted in Day 1 discussion</i></p>
10:55 – 11:05 am	<i>Break</i>
11:05 am – 12:00 pm	<p><u>Facilitated Discussion</u></p> <p><i>Speaker: Jason Gershowitz, Kearns & West</i></p> <p><i>Report-out from Table Topics</i></p> <p><i>Identifying potential challenges, key questions, and opportunities for future discussion</i></p>
12:00 – 12:15 pm	<p><u>Closing Remarks & Next Steps</u></p> <p><i>Speakers: Darryl Francois, BOEM and George Detweiler, USCG</i></p>
12:15 pm	<i>Adjourn</i>

Presenter Biographies

John Beattie, *Director & Principal Risk Analyst, Anatec Ltd*

John Beattie has over 20 years of experience in shipping and navigational risk assessments for the offshore renewables, oil & gas and marine industries. In offshore renewables, John has worked on numerous UK offshore wind farm Navigational Risk Assessments (NRAs) including Robin Rigg, Humber Gateway, London Array, Burbo, Walney, Firth of Forth and Hornsea. He has also participated in projects in Europe, the USA and the Far East. Projects typically comprise baseline data collection (including traffic surveys), traffic analysis, impact / risk assessment and stakeholder / regulator engagement. John also recently managed the NRA for Statoil's Hywind Scotland project, the world's first floating wind farm array, and has been heavily involved in offshore wave and tidal projects, most notably in the Pentland Firth and Orkney Waters. As well as the consenting phase, John and Anatec assist Developers in designing risk controls and discharging consent conditions such as applying for safety zones, preparing lighting and marking plans, Emergency Response Cooperation Plans and Vessel Management Plans. Anatec are also specialists in cable risk assessment, assessing the risks to export and inter-array cables from anchors and fishing gear.

James Bennett, *Program Manager, Office of Renewable Energy Programs, Bureau of Ocean Energy Management*

Jim Bennett has over 35 years of experience in the environmental and energy arenas serving in a variety of capacities in the Department and other Federal agencies. Prior to becoming the program manager for renewables, Jim led the Division of Environmental Assessment, overseeing BOEM's compliance with the NEPA and other environmental laws focusing on Federal OCS programs, including oil and gas, sand and gravel, and renewable energy. He is a graduate of the Department's Manager Development Program and has earned two Master's degrees -- one in Environmental Planning and the other in Computer Systems Management. His experience encompasses events such as the Exxon Valdez and the Deepwater Horizon oil spills, the Cape Wind energy project, and offshore renewable energy activities particularly in the Atlantic.

George Detweiler, *Marine Transportation Specialist, U.S. Coast Guard Headquarters*

George Detweiler retired from the U. S. Coast Guard with over 20 years of service. He returned to the Coast Guard as a civilian marine transportation specialist in the Marine Transportation Systems Directorate at USCG Headquarters. He is a member of the U.S. delegation to the International Maritime Organization's Subcommittee on Navigation, Communication and Search and Rescue. His major projects have included conducting the Right Whale and Atlantic Coast Port Access Route Studies, creating ships' routing measures including the first Russian

Federation – United States joint proposal on routing measures in the Bering Sea and Strait, conducting tribal consultations, and reviewing offshore renewable energy installations (OREIs) proposals. Mr. Detweiler works closely with the Coast Guard’s Navigation Safety Advisory Council (NAVSAC) on safety of navigation issues, including COLREGS and the Inland Navigation Rules and the development of Best Practices for Unmanned Maritime Systems (UMS).

Glenn Degnitz, *Lead Environmental Protection Specialist, Environmental Compliance Division, Bureau of Safety and Environmental Enforcement*

Glenn Degnitz has 20 years’ experience establishing and managing environmental compliance and enforcement programs both within the United States and internationally. Mr. Degnitz currently serves as the BSEE Lead Environmental Protection Specialist and Deputy Chief for the Environmental Compliance Division, and has been in this position since the summer of 2014. In this role Mr. Degnitz ensures the Environmental Compliance Division promotes environmental stewardship through integrated prevention, compliance, and preparedness activities. Mr. Degnitz has an M.S. in Environmental Policy and Management.

Darryl François, *Chief, Engineering and Technical Review Branch, Office of Renewable Energy Programs, Bureau of Ocean Energy Management*

Darryl François is responsible for managing the regulatory framework that governs the development of renewable energy projects on public lands of the U.S. outer continental shelf. His responsibilities include policy development and management oversight of the review of technical and engineering design aspects of project plans and offshore survey activities and compliance with terms and conditions related to safe project deployment and operations. In addition to the Bureau of Ocean Energy Management, Mr. François’ 37 year career with the U.S. Department of the Interior includes service with the U.S. Geological Survey, Minerals Management Service and Indian Affairs in the analysis of energy, environmental, technology, and economic development issues across the Department’s spectrum of public land management. He received his B.S. in Physics from Bradley University and his M.S. in Geophysics from the Pennsylvania State University.

Martin Goff, *Environment & Permitting Manager, Statoil Empire Wind*

Martin Goff has worked in permitting, project development and environmental & social impacts on offshore wind projects for Statoil since 2012. As a Chartered Marine Scientist, Martin has an MSc in Applied Physical Oceanography from the University of Wales, Bangor, with over 10-years experience in the field of marine science and working offshore prior to joining Statoil. In his position with Statoil, Martin was responsible for impact assessments, maritime issues and permitting on the Dogger Bank Teesside offshore wind farms in the UK, securing permits for up

to 2.4GW of projects. Martin has also worked on the Statoil operated 402MW Dudgeon Offshore Wind Farm project during construction, Statoil's site development work for floating wind in California, and advises on new prospects in the US and rest of the world. Martin's current role on Statoil's Empire Wind offshore wind project, New York, includes environmental, maritime and permitting responsibilities.

Cheri Hunter, *Renewable Energy Program Coordinator, Bureau of Safety and Environmental Enforcement*

Cheri Hunter serves as BSEE's principle liaison with Federal and state agencies and other stakeholders involved in the development of wind projects on the Federal OCS. She is responsible for ensuring that programmatic and policy decisions related to safety and environmental oversight and enforcement functions for renewable energy activities are incorporated into guidance documents, standard operating procedures, and program communications. Ms. Hunter has over 30 years of experience with BSEE and its predecessor agency.

Sean Kline, *Director of Maritime Affairs, Chamber of Shipping*

Sean Kline has sailed as a deck officer on various types of ships worldwide and after coming ashore, held positions as Director of Marine Safety and Standards at Maersk Line, Limited; Manager of Security and Audits at the Liberian Registry; and Regulatory Development Manager for the U.S. Coast Guard. Sean is a graduate of the U.S. Merchant Marine Academy at Kings Point and holds active Merchant Mariner licenses and various Lead Auditor certifications. He was appointed to the USCG Navigation Safety Advisory Committee (NAVSAC) and serves on the National Fire Protection Agency's Committee on Gas Hazards. He also sits on the international industry Roundtable cyber security working group that developed the "The Guidelines on Cyber Security Onboard Ships" and previously served on the Maritime Security Advisory Committee at U.S. State Department and as Chairman of the National Safety Council's Waterborne Transport Group.

Ed LeBlanc, *Chief, Waterways Management Division, U.S. Coast Guard Sector Southeastern New England*

Ed LeBlanc is the Coast Guard's primary project officer for several offshore renewable energy proposals in southeastern New England, including the Cape Wind (Nantucket Sound) project, the Block Island Wind Farm project, and several potential wind farms south of Martha's Vineyard. Mr. LeBlanc served for 28 years on active duty with the Coast Guard, serving on Coast Guard cutters and a Navy warship, and in various shore-side assignments in Washington, D.C., and Boston, Massachusetts. He retired from active duty at the rank of Commander in July of 2003.

Michelle Morin, *Chief, Environment Branch for Renewable Energy, Office of Renewable Energy Programs, Bureau of Ocean Energy Management*

Michelle Morin has been with BOEM for over 22 years and has coordinated dozens of environmental impact statements and assessments for BOEM's oil and gas and renewable energy programs. As the Chief of BOEM's Environment Branch for Renewable Energy, she manages an interdisciplinary team responsible for environmental assessments, consultations, and studies related to renewable energy leasing and development on the Atlantic OCS.

Walt Musial, *Manager of Offshore Wind, National Wind Technology Center, National Renewable Energy Laboratory, U.S. Department of Energy*

Walt Musial is a principal engineer and the manager of Offshore Wind at the National Renewable Energy Laboratory (NREL) where he has worked for 29 years. In 2003 he initiated the offshore wind energy research program at NREL which he now leads. Walt also developed and ran NREL's full scale blade and drivetrain testing facilities for 15 years. Earlier, Walt spent five years in the commercial wind energy industry in California. He studied Mechanical Engineering at the University of Massachusetts at Amherst, where he earned his Bachelor's and Master's Degrees, specializing in energy conversion with a focus on wind energy. He has over 70 publications and two patents.

Nick Napoli, *Ocean Planning Director, Northeast Regional Ocean Council and Northeast Regional Planning Body Project Manager, Mid-Atlantic Ocean Data Portal*

As Ocean Planning Director, Nick Napoli is responsible for managing the implementation of the 2016 Northeast Ocean Plan on behalf of the Northeast Regional Planning Body, including the continued development of the Northeast Ocean Data Portal. As Project Manager for the Mid-Atlantic Ocean Data Portal, Nick coordinates the team developing the Portal on behalf of the Mid-Atlantic Regional Council on the Ocean. Nick and team members from both regions will be demonstrating the Portals and draft data products that are currently in review. This includes updated vessel traffic maps using 2015-2016 data from the Automatic Identification System (AIS), which was made possible through a collaboration with the U.S. Coast Guard and the Marine Cadastre.

John O'Keeffe, *Manager, Operations & Maintenance and Marine Affairs, Deepwater Wind*

Prior to joining Deepwater Wind, John O'Keeffe sailed worldwide for over a decade as a professional mariner, deck officer, teacher and captain. He worked for several organizations including Sea Education Association (S.E.A.) based in Woods Hole, MA and the Bermuda

Institute of Ocean Sciences (BIOS) based in St George's, Bermuda. John currently holds a 1600 ton USCG Ocean Master's license for sail & steam and earned his BS in Environmental Studies from Southern Vermont College and a graduate degree from University of Rhode Island's Marine Affairs program. John is also an 8-year veteran of the U.S. Army where he served as a sergeant in armored reconnaissance.

Dennis O'Mara, *Principal Consultant, DNV GL*

Dennis O' Mara is a Principal Consultant with DNV GL in Houston, Texas, working in Risk Advisory Services. He is a former US Coast Guard officer with experience in marine navigation, waterways management, aids to navigation, vessel inspections and, marine casualty investigations. His work at DNV GL includes implementation of the DNV GL navigation risk model: Marine Accident Risk Calculation System (MARCS), which has been used and endorsed globally for several years. Dennis, and his team at DNV GL, have recently adapted the MARCS model for use in assessing navigation risk related to offshore wind farms.

Hywel Roberts, *Lead Environment and Consents Specialist, Ørsted*

After 10 years spent working with a range of offshore oil and gas consultants' and operators', Hywel Roberts switched tracks to the offshore wind industry, joining Ørsted's Environment and Consents team in 2012. While working with Ørsted, Hywel has managed the interface with other sea-users, including mariners, fishermen, and the UK's Maritime & Coastguard Agency. Hywel has overseen the Navigational Risk Assessments process associated with the four UK wind farms constructed, or under construction, in UK waters over the course of the last 6 years. These four wind farms comprise a total of 384 wind turbines and have a combined generating capacity of 2.7GW. Hywel is also responsible for representing UK offshore wind farm developers at the Nautical and Offshore Renewables Energy Liaison forum.

Brian Vahey, *Senior Manager – Atlantic Region, The American Waterways Operators*

Brian Vahey is Senior Manager for the Atlantic Region for the American Waterways Operators, the national trade association for the tugboat, towboat, and barge industry. AWO has over 250 carrier members operating on waterways across the United States. Brian has worked for AWO since 2008, and as Atlantic Region manager, he covers territory all along the Atlantic Coast, from Maine to Florida. Before joining AWO, Brian worked in DC for an association aimed at improving emergency communication between a wide-array of responders, including the Coast Guard and other maritime interests.