

# Empire/Boardwalk Wind Farm Layouts Consultations

September 2019



Indicative Offshore Wind Farm: Equinor constructed and operated Dudgeon, UK

## Who We Are

In 2017 Equinor Wind US, LLC was awarded the lease to study and develop OCS-A 0512, the area now known as Empire/Boardwalk Wind, in the New York Bight (see map). The lease area starts about 14 miles south of Jones Inlet, Long Island and 17 miles east of Sea Bright, New Jersey. It extends approximately 22 nautical miles (nm) to the southeast, in water depths of between 60-130 feet (10-22 fathoms). The lease area has the potential to support a generating capacity in excess of 2GW of electricity, which equates to over 1 million New York households.

On July 18, 2019, New York Governor Andrew M. Cuomo awarded Equinor Wind a contract to supply 816 MW of renewable offshore wind power to New York from the Empire Wind project within OCS-A 0512. This project will be able to power over 500,000 New York homes, with an expected operations date of 2024.

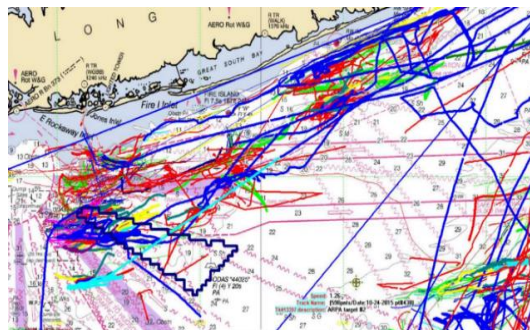
Equinor Wind is committed to successfully coexisting with commercial and recreational fishing and aims to achieve this by proactively avoiding or minimizing impacts on fishing throughout all phases of the project lifecycle. This brochure focuses on the operational phase, where thoughtful spatial planning is a key factor in minimizing impacts, for example through continued safe access to traditional fishing grounds. Equinor Wind plans to consult with stakeholders on these layout principles in the coming months.

## Inputs from fishermen

Since lease award, Equinor Wind has been engaging with the fishing industry to identify the spatial and temporal distribution of fishing, the target species and gear types, the key concerns fishermen have with operating in offshore wind farms and the recommendations offered for avoiding or minimizing impacts. Consultations and feedback with fishermen from Massachusetts to New Jersey generally indicate, and are not limited to:

- Fishermen want assured access to offshore wind areas with layouts and cable installation that support safe, effective fishing and transit;
- Fishermen using trawls and dredges prefer straight rows of turbines for towing access;
- Typical tows may be made in any direction depending on catch, depth, seabed, wind and tide, but in many cases, fishermen prefer to tow along consistent depth contours (see Figure 5);
- Align turbine rows for compatibility with traditional practices that facilitate coexistence;
- Bury electrical cables deeper than gear penetration and avoid the use of concrete mattresses;
- Space wind turbines as far apart as possible. Requests have ranged from 1 nm to 4 nm;
- Align turbines in a manner that reduces impacts on vessel navigation equipment (e.g. radars);
- Avoid building on Cholera Bank;
- Maintain Search & Rescue capabilities;

Other inputs to layout planning came from various sources including squid trawler plotter tracks, VMS data from portals, AIS tracks from trawlers and dredgers and direct observations.



Example plotter data: Note fishing tracks do not represent all the fishing activity in the area.

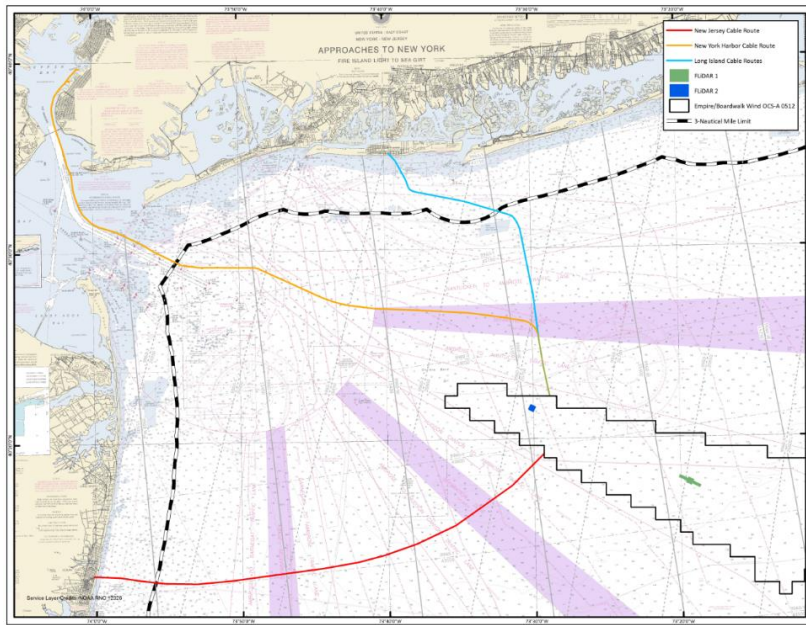


Figure 1: Empire Wind/Boardwalk Wind and export cable corridors (OCS-A 0512)

## Site investigation

To make meaningful commitments to wind farm layouts, it is important to understand the geological and environmental conditions of the Lease Area to ensure all factors are taken into consideration. Equinor Wind has invested in surveys to help inform this process, that include:

- Full geophysical survey coverage of the entire project area – to inform on seabed characteristics for habitats, cable burial and preliminary foundation suitability.
- Geotechnical sampling across the project area – to inform cable burial and seabed geology for foundation suitability.
- Boreholes at varied locations across the project area – to inform feasibility of foundation types and their installation.
- Benthic surveys across the full project area – to identify sensitive habitats that may require avoidance.

While the surveys to date help inform design decisions, they do not 'lock in' a design. Foundation specific boreholes may be required in spring 2020 and therefore flexibility remains in turbine positioning.

Fishermen representatives (OFLRs) are onboard Equinor's survey vessels to help avoid possible conflicts with fishing during surveys and to provide information on fishing observed offshore.

## Project Design Envelope

Equinor Wind is adopting an extensive project design envelope (PDE) to maintain flexibility to adapt to advancements in technology and consultation feedback. The PDE includes:

- Foundations that include Gravity Base Structures (GBS), Monopiles, and Jackets (both pile driven and suction anchor).
- Wind turbines ranging from approximately 10MW to 18MW generating capacity.
- Up to a maximum of 240 wind turbines (based on smallest size wind turbines).
- Up to 3 offshore substations

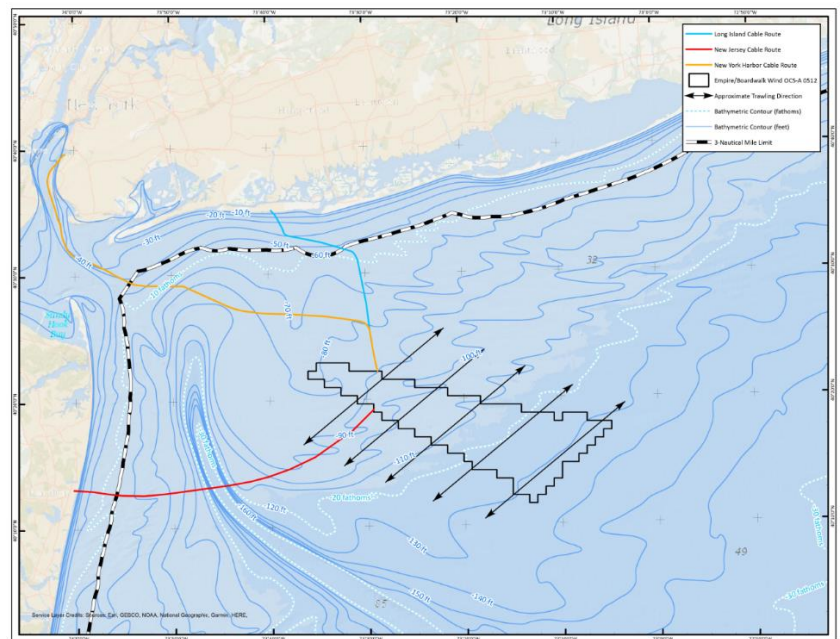


Figure 2: Trawling directions consistent with bathymetric contour

## Next steps

Equinor Wind will be working closely with fisheries representatives, commercial and recreational fishing organizations, and individual fishermen where appropriate to arrange meetings to solicit feedback on the Layout Rules and indicative layouts. Larger scale charts will be brought to these meetings along with Equinor's Wind's 3D wind farm simulation. Feedback can also be given via:

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# Draft Layout Rules

The fishing industry and maritime communities have expressed concern about layouts where design envelopes and timing of projects leave uncertainty. Therefore, Equinor Wind has established draft "Layout Rules," to apply when designing wind farm layouts. The draft layout rules are summarized below and shown in Figure 3.

**Rule 1 - Layout Pattern and Regularity:** The position of all wind turbines and substation platforms shall, as far as practicable, be arranged in straight and easily understandable patterns.

**Value to fisheries:** Supports existing fishing practices where tows are predominantly in straight lines, reduces the risk of collisions with structures, and facilitates transiting on one fixed heading.

**Rule 2 - Perimeters:** The position of all wind turbines forming the perimeter around a wind farm area shall, as far as practicable, be arranged in straight or gently curved lines in an easily understandable pattern.

**Value to fisheries:** Consistent, easily recognizable perimeters at and around the wind farms benefit the wider maritime community that use the adjacent waters and the existing Traffic Separation Schemes (TSS). Clearly distinguishable perimeter of the wind farms by reducing the risk of disorientation to fishing vessels which may start trawl tows outside the wind farm and finish inside, or finish outside the other end.

**Rule 3 - Layout Clarity:** Any changes in wind turbine size and separation distance within the Lease Area will be introduced to minimize potential visual confusion for any vessel navigating through the wind farm. For example, should the Lease Area be built out as individual wind farms in phases, a future wind farm with larger wind turbines should be designed to be distinguishable from, but not significantly different in orientation as to earlier wind farms with smaller turbines.

**Value to fisheries:** Supports consistency and minimizes potential disorientation to fishermen in later phases of development. For example, if a fisherman gets accustomed to towing in a set heading in the first phase of the wind farm, the same tow heading will apply for the subsequent phase wind farms within the Lease Area.

**Rule 4 - Boundary Clarity:** Opposing site boundaries of individual wind farms within the Lease Area shall be aligned broadly parallel with one another and appropriately marked and lit to distinguish between the separate wind farms, for example an early phase wind farm followed by a later phase wind farm.

**Value to fisheries:** Supports safer navigation of fishing vessels within the wind farm areas, by allowing an increased understanding of which charted wind farm they are in, and the associated spacing considerations of that wind farm.

**Rule 5 - Proximity to Project Boundaries:** All wind farm surface and sub-surface structures, including rotor swept areas, will be located wholly within the permitted wind farm or Lease Area boundaries.

**Value to fisheries:** Provides fishermen with the assurance that there will be no uncharted or unassessed hazards related to the wind farm development outside of the prescribed project limits.

**Rule 6 - Turbine Spacing:** Wind turbine spacing should be consistent in one orientation and as far apart as feasible to support fishing practices and wind development. Minimum spacing in any direction to not be below 0.65 nm.

**Value to fisheries:** To ensure the space between wind turbine rows facilitates continued fishing opportunities within the offshore wind farm area.

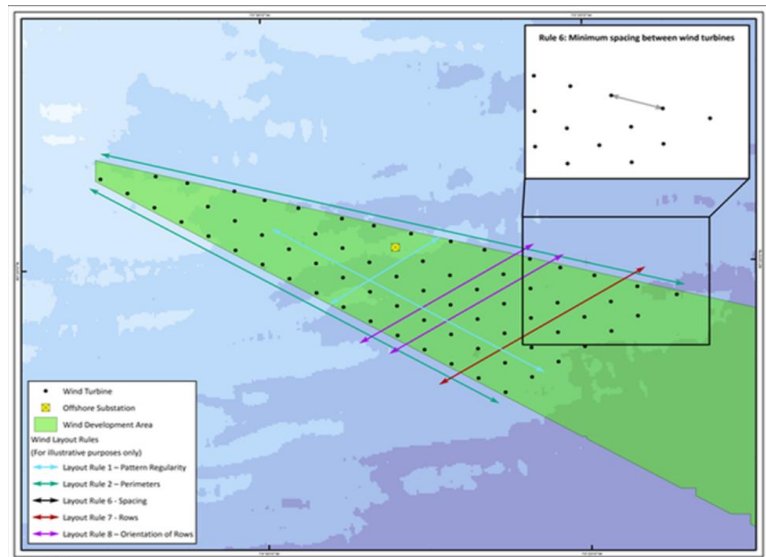


Figure 3: Indicative Layout Principles

**The Rule 7 - Rows:** There should be at least one line of orientation of rows of turbines with a clear line of sight (assuming good visibility) and heading from one entrance at the perimeter to an exit and the opposite perimeter.

**Value to fisheries:** Facilitates existing mobile fishing practices with the ability to maintain a fixed heading from start to finish of trawl tows.

**Rule 8 - Orientation of Rows:** Where feasible, align turbines oriented in rows that are sympathetic to the dominant trawl directions of most active and potentially affected fisheries. For example, for the Lease Area, a southwest to northeast orientation in line with bathymetry.

**Value to fisheries:** Reduces the need for mobile fishermen to modify existing practices.

## Draft Wind Farm Layouts for Consultation

As described in this brochure, Equinor Wind has developed layout principles and indicative turbine layouts for consultation with the fishing community. It is acknowledged that consultation may be limited to these principles at this stage and that layouts may continue to evolve based on consultations, the permitting process and technological developments. The examples provided in this brochure demonstrate several possible scenarios considering the following:

1. Potential phased development of up to three (3) wind farms of approximately 800MW each at different stages within the Lease Area;
2. Different wind turbine sizes and associated spacing and numbers ranging from 10 MW (earliest phase) to 18MW (later phase) wind turbines;
3. Turbine alignment as close as feasible to straight rows following the bathymetric curves of the area, consistent with

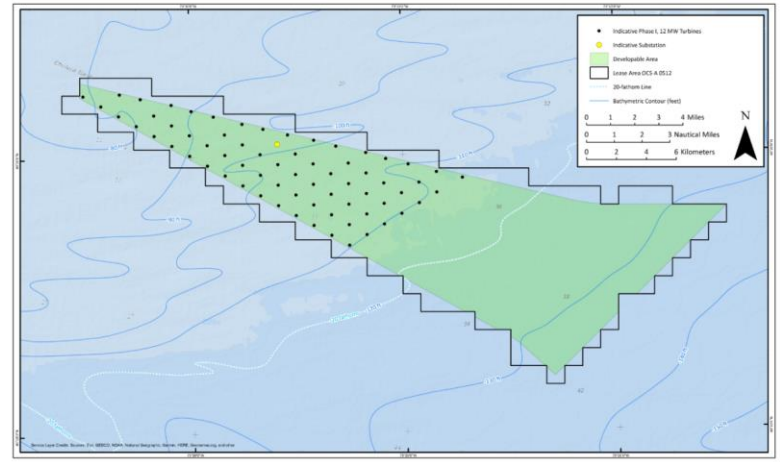


Figure 4: Indicative 'Phase 1' approximately 800MW wind farm, with 68 x 12MW wind turbines, 1 substation. Potential Empire Wind scenario.

## Empire Wind Fisheries Mitigation Plan

Equinor Wind has developed a Fisheries Mitigation Plan for the Empire Wind project as part of its application to supply offshore renewable energy certificates to New York. Equinor Wind will consult on the plan with the New York Fisheries Technical Working Group (F-TWG) and wider fishing industry.

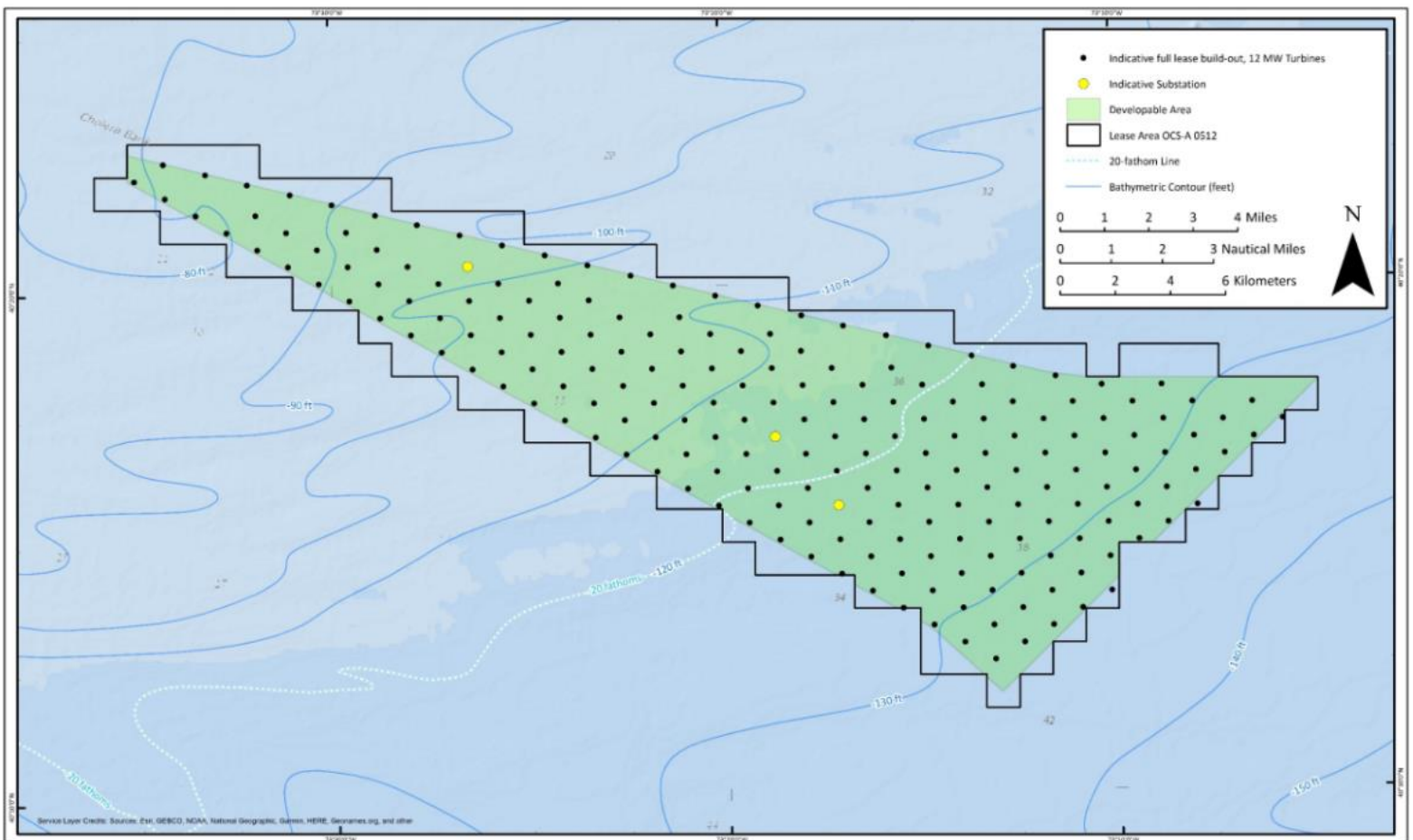


Figure 5: Indicative full Lease Area build out, three individual phases totalling 200 x 12MW wind turbines, minimum spacing 0.71 nm