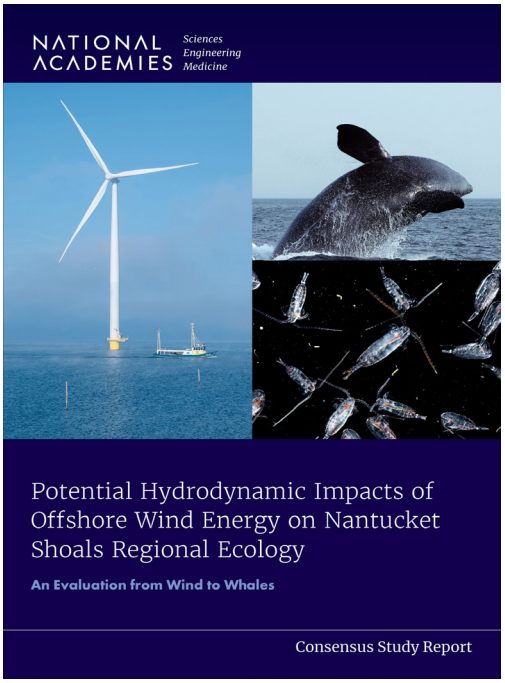
NATIONAL ACADEMIES Sciences Engineering Medicine

Potential Hydrodynamic Impacts of Offshore Wind Energy on Nantucket Shoals Regional Ecology: An Evaluation from Wind to Whales



The transition to renewable energy has spurred many efforts to scale up the U.S. portfolio of efficient clean energy resources, including the development of offshore wind farms. The Nantucket Shoals region off the coast of Massachusetts is the first large scale wind farm under development in U.S. waters.

WHY THIS REPORT? To ensure offshore wind energy installations are being planned, constructed, and developed in an environmentally responsible way, the Bureau of Ocean Energy Management (BOEM) asked the National Academies to evaluate the potential for offshore wind farms in the Nantucket Shoals region to affect oceanic physical processes, and, in turn, how those hydrodynamic alterations might affect local to regional ecosystems. Of particular interest to BOEM are the potential effects of hydrodynamic changes on zooplankton, which may affect foraging for the critically endangered North Atlantic right whale.

HOW DO WIND ENERGY INSTALLATIONS AFFECT OCEAN PROCESSES (HYDRODYNAMICS) IN THE REGION? Wind energy installations can affect ocean processes (e.g., tides, waves, and currents) that could potentially alter the dynamic ecology in the Nantucket Shoals region. Knowledge of the effects of offshore wind turbines on hydrodynamics is primarily based on modeling studies in the North Sea that have not been validated by observations, where conditions differ than in the Nantucket Shoals region. Despite this limited understanding and lack of region-specific studies, hydrodynamic effects will be difficult to isolate from the large variability introduced by natural and other anthropogenic sources (including climate change).

HOW MIGHT HYDRODYNAMIC EFFECTS ALTER NORTH ATLANTIC RIGHT WHALE PREY? Right whales forage in great numbers in the Nantucket Shoal region, likely because of the high concentration of the zooplankton that they feed on. Studies to date do not have the spatial and temporal coverage to adequately address the question of whether hydrodynamics changes could affect prey abundance or accessibility. Additionally, there are gaps in understanding, including the basic question of which zooplankton taxa right whales feed on in this region and how this prey changes seasonally.

CONCLUSION: The impacts of offshore wind projects on the North Atlantic right whale and the availability of their prey in the Nantucket Shoals will likely be difficult to distinguish from the significant impacts of climate change and other influences on the ecosystem. Further study and monitoring of the oceanography and ecology the Nantucket Shoals region is needed to fully understand the impact of future wind farms.

KEY RECOMMENDATION: While wind energy planning and development progresses, the Bureau of Ocean Energy Management, National Oceanic Atmospheric Administration, and others should promote observational studies and modeling that will advance understanding of potential hydrodynamic effects and their consequent impacts on ecology in the Nantucket Shoals region during all phases of wind energy development.

This document was prepared based on the Consensus Study Report *Potential Hydrodynamic Impacts of Offshore Wind Energy on Nantucket Shoals Regional Ecology: An Evaluation from Wind to Whales* (2023). The full report is available for download, October 13, 2023 at 11am EST at http://www.nationalacademies.org/OSB