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TITLE: Minimizing wildlife impacts for offshore wind energy development: Winning tradeoffs for seabirds in space and cetaceans in time

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ABSTRACT:

Although offshore wind energy development (OWED) offers a much-needed renewable energy alternative to fossil fuels, holistic and effective methods for evaluating environmental impacts on wildlife in both space and time have been lacking. The lengthy environmental compliance process, estimated to incur a 7-10 year permitting timeline [1], has been identified as a significant impediment to offshore energy development in U.S. waters. During operation, seabirds can collide and be displaced by turbines. During episodic pre-operation phases, cetaceans are most heavily impacted acoustically by pile driving (and similarly seismic air gun surveys for oil and gas exploration). The varying nature of impacts in space and time leads us to conclude that sites should be selected in space to minimize long-term operational impacts on seabirds, and timing of surveying and construction activities to be conducted in times of the year when sensitive migratory marine mammals are least present. We developed a novel spatiotemporal decision support framework that interactively visualizes tradeoffs between OWED industry profits and wildlife sensitivities, in both space and time. The framework highlights sites on a map that are the most profitable and least sensitive to seabirds. Within the U.S. Mid-Atlantic study area, the New York Call Areas are particularly well optimized for minimal impact on seabirds with maximal profits to OWED. For a given site, pre-operational activities (e.g. pile driving and seismic air gun surveying) are advised by cetacean sensitivity across months of the year that minimize impacts on migratory cetaceans, particularly those of highest conservation concern such as the North Atlantic right whale (Eubalaena Glacialis). For instance, within optimal sites for the New York Call Area the least impacting months are May and June. Other taxa are certainly affected by OWED and should be incorporated into this framework, but data on their distributions and/or sensitivities is currently less well known. Built with open-source software made publicly available, the authors hope this framework will be extended even more comprehensively into the future as our knowledge on species distributions and OWED sensitivities expands for streamlining environmental compliance.

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