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Effects of Offshore Wind Turbines on Ocean Waves NICHOLAS WIMER, University of Colorado at Boulder, MATTHEW CHURCHFIELD, National Renewable Energy Laboratory, PETER HAMLINGTON, University of Colorado at Boulder — Wakes from horizontal axis wind turbines create large downstream velocity deficits, thus reducing the available energy for downstream turbines while simultaneously increasing turbulent loading. Along with this deficit, however, comes a local increase in the velocity around the turbine rotor, resulting in increased surface wind speeds. For offshore turbines, these increased speeds can result in changes to the properties of wind-induced waves at the ocean surface. In this study, the characteristics and implications of such waves are explored by coupling a wave simulation code to the Simulator for Offshore Wind Farm Applications (SOWFA) developed by the National Renewable Energy Laboratory. The wave simulator and SOWFA are bi-directionally coupled using the surface wind field produced by an offshore wind farm to drive an ocean wave field, which is used to calculate a wave-dependent surface roughness that is fed back into SOWFA. The details of this combined framework are outlined. The potential for using the wave field created at offshore wind farms as an additional energy resource through the installation of onsite wave converters is discussed. Potential negative impacts of the turbine-induced wave field are also discussed, including increased oscillation of floating turbines.

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