SEABIRD: System for Environmental Assessment of Bird/Bat Interactions with Real-Time Detection

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ABSTRACT

A critical challenge of offshore wind energy development is ensuring the protection of birds and bats that may be susceptible to collision with turbines. For some protected birds and bats, proposed offshore wind energy projects may be required to generate collision risk models (CRMs) to assess species-specific impacts, with subsequent monitoring requirements to validate take estimates once the project is implemented. CRMs require extensive bird and bat metrics and are most sensitive to avoidance rate, which must be estimated from interactions occurring at multiple scales. The SEABIRD (System for Environmental Assessment of Bird/Bat Interactions with Real-Time Detection) project is integrating multiple sensor technologies into a common data collection and interpretation system that is capable of detecting and tracking birds and bats over multiple scales ─ meso- to macroscale biological radar, mesoscale thermal and visible-light imaging, and microscale blade-mounted structural health monitoring (SHM) sensors – and in three-dimensional (3D) space, as well as supporting identification of targets to morphology/flight-style group. This technology represents a next generation capability for improving understanding of potential interactions between wildlife and offshore wind projects and will better inform and mitigate bird and bat risk from offshore wind.

To date, a series of radar, thermal imaging, and SHM sensor validation tests have been performed with real birds and bats and surrogate targets (drones and ballistics gel projectiles). Success metrics achieved for macroscale sensing are >90% probability of target detection and 3D tracking to distances of 7 km. Field tests have also demonstrated the ability to distinguish different bird and bat morphologies based on body and wing shape, size, and flight characteristics determined from the mesoscale thermal imaging system. Laboratory-based validation studies indicate that SHM sensors can detect strikes over a variety of impact velocities and angles at multiple locations along a static wind turbine blade. These results are being used to inform numerical models that will simulate the response of operational turbine blades to impact and will help determine optimal technology use modes for bird and bat collision risk.

This multi-scale monitoring system will increase understanding and reduce uncertainties associated with potential interactions between birds and bats with offshore wind technologies, and reduce the timeline and costs associated with environmental permitting. Further, real-time, automated detection and identification information may facilitate targeted curtailments by providing the capacity to assess species presence, abundance, and behavior.

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