# Stakeholder Workshop: Guidance Document for Deploying Automated Radio Telemetry Stations on Offshore Wind Turbines and Buoys

Workshop Summary
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# Disclaimer

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# Additional Information

This workshop is part of a broader effort among U.S. Fish & Wildlife Service Migratory Bird Program, Biodiversity Research Institute, University of Rhode Island, and Birds Canada to develop guidance for how best to integrate automated radio telemetry into pre- and post-construction monitoring plans for offshore wind farms. A pdf of presentations from the workshop and more information on the project are available at https://briwildlife.org/wildlife-and-renewable-energy-program/wildlife-and-renewable-energy-directory/developing-plans-to-track-animals-offshore/.

# Preferred Citation

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# Background

There are information gaps on the offshore movements of volant (i.e. flying) wildlife due to technological limitations and logistical challenges of offshore monitoring. The study "Development of Monitoring Protocols for Automated Radio Telemetry Studies at Offshore Wind Farms," funded by NYSERDA in 2019, is developing standardized guidelines to inform the use of coordinated radio telemetry to monitor individual movements of volant wildlife to quantify species-specific exposure to offshore wind energy development at site specific and regional scales. Use of automated radio telemetry will build off the Motus Wildlife Tracking System[1], an international network of receiving stations ('Motus stations') and studies using digitally-coded radio transmitters ('Motus tags') operating on shared frequencies. Detailed protocols will enable the offshore wind industry to use standardized approaches to monitor a wide range of avian and bat taxa, including threatened and endangered species, and improve our understanding of how these species use offshore environments. The team of collaborators involved in this project include Pamela Loring and Scott Johnston from U.S. Fish & Wildlife Service, Kate Williams, Andrew Gilbert, Evan Adams, Julia Gulka, and Edward Jenkins from the Biodiversity Research Institute, Peter Paton, Doug Gobeille, Erik Carlson, and Rob Deluca from the University of Rhode Island, and Stuart Mackenzie from Birds Canada. The project is funded by the New York Energy Research and Development Authority, and project managers are Kate McClellan Press and Greg Lampman.

The overall aims of the project are to develop standardized protocols for study design, monitoring methodologies, and data coordination in the U.S. Atlantic for implementation of automated radio telemetry in pre- and post-construction monitoring at offshore wind projects. Project components include:

- Monitoring framework – strategic framework and guide for using Motus technology to monitor wildlife in relation to offshore wind energy development;
- Guidance document – detailed guidance for setting up and operating receiving stations on offshore wind turbines and other structures *(focus of this workshop)*;
- Online study design tool – interactive tool to help structure arrays of receivers to optimize site-specific study designs at offshore wind projects and map detection coverage of offshore receiving stations;
- Simulation study – modeling study using animal movement data to inform estimates of detection and uncertainty using Motus technology;
- Motus Data Framework – centralized framework and portal to coordinate data from the Motus Wildlife Tracking System from all birds and bats detected by stations on offshore wind turbines, monitoring buoys, and receiving towers along the Atlantic coast and Outer Continental Shelf (OCS).

The above components are being developed with strong input from stakeholders via a series of workshops with offshore wind developers, environmental non-governmental organizations (eNGOs), regulators, resource managers, and researchers with expertise using the Motus Wildlife Tracking System and other technologies. Strong stakeholder guidance is key in providing the best possible protocols to end-users.

# Workshop Summary

This workshop was held virtually on January 12, 2021, and included 80 participants (Appendix A). Workshop objectives included: 1) introducing draft components of the guidance document for setting up

[1] https://motus.org/

and operating receiving stations in offshore environments; 2) question and answer periods (Q&A) and group discussion; 3) breakout groups to obtain input on specific topics; and 4) identification of next steps. See Appendix B for workshop agenda.

## Overview of Guidance Document

Pam Loring (U.S. Fish & Wildlife Service) provided an overview of the automated radio telemetry guidance document, which includes 1) technical specifications of offshore receiving stations; 2) optimal configuration of equipment; 3) best practices to optimize detection, 4) workflow for maintenance and calibration of equipment; and 5) minimum data processing standards. She also noted that collaborators are working to test 434 MHz technology first on land (Winter 2021) as well as offshore on and near the Block Island Wind Farm (Spring/Summer 2021, with two land-based stations and one station mounted on a wind turbine). Part of this work is to ground-truth detection ranges by flying test tags from kites behind boats, and develop a standardized calibration protocol for estimating detection ranges of receiving stations at offshore locations. The project team also expects to field-test double-tagging of gulls with GPS and Motus tags.

### *Q&A and Discussion*

There was an informative group Q&A and discussion covering topics ranging from waterproofing gear for the marine environment to integration of systems. Key discussion areas included:

- **Exposure of equipment to the marine environment** – The guidance document (still in development) has information on periodic equipment checks, checking and addressing corrosion, and other potential maintenance needs related to harsh marine environmental conditions.
- **Differences between land- and marine-based systems** – It is important to optimize configuration of equipment on offshore structures where space is limited.
- **Importance of working with wind turbine manufactures to incorporate this technology into turbine designs** – It is important to consider both initial design and retrofitting needs.
- **Testing detection ranges** – There is existing work on ground-truthing the 166 MHz frequency, so current efforts will focus on 434 MHz where we have less information.
- **Types of questions automated radio telemetry is good at answering** – This technology is really good at providing presence information for species moving through sites that have receivers, as long as you know the detection range and coverage. It can provide information for offshore wind monitoring for continuous coverage within a focal area and for tagging small-bodied species for which other tags (e.g., GPS, satellite) are not suitable.
- **Antenna placement on turbines** – The turbine platform has some space and is easier to access for mounting equipment than other parts of turbine structures.
- **Guidance on array designs** – Part of this project is to develop an online study design tool to help identify optimal number and locations of receiving stations within an offshore wind farm.
- **Triangulation from multiple detections** – Overlapping detections from multiple stations can allow for additional triangulation of tag location; this generally represents an ideal scenario.
- **Time of year for system operation** – Ideally, receiving stations will operate year-round, given the many different species that may be passing through the Atlantic OCS at different times.
- **Tag and receiving station battery life** – The receiving station should be continuously powered. Transmitters automatically compensate output power based on battery voltage, and altering frequency of transmission (e.g., how often transmitters attempt communication with receiving stations) affects battery life. More frequent transmissions require more power but also have the advantage of higher likelihood of detection.

## Breakout Group Discussions

Workshop participants split into five breakout groups for further discussion. Key takeaways from these discussions are outlined below.

### *Optimizing Technology*

- Human safety concerns regarding the use of Yagis on turbines. Consider consulting the Occupational Safety and Health Administration (OSHA) to understand potential limitations.
- Comparing 166 vs 434 MHz frequencies and the value of using a consistent frequency; in the longer-term consider the use of protected frequency.
- Potential for radio frequency interference (RFI) in urban environments.

### *Coordination of guidance into monitoring plans*

- Different approaches for federal and state agencies for adopting guidance and recommendations (e.g., federal requirements, permits, guidance documents, state environmental mitigation plans). Regional wildlife science entity may also adopt guidance.
- Importance of data and methods standardization to answer broader-scale regional questions.
- Given that the guidance document is a living document, it is important to be clear in how updating will occur.
- Monitoring should be geared towards answering questions – identify key questions, reduce uncertainty around impacts, tailor technology approaches and methods to fit questions.
- Consider a broader regional monitoring plan (e.g., expanding the network where there is no offshore wind development).

### *Integrating systems into design of offshore structures*

- Consider power conduit and potentially receiver location.
- Mounting versus integrating technology on platforms versus turbines. Key is early discussions with manufacturers, where they are provided all of the specifications/needs for the system to aid in integration. There may be benefits to an integrated turbine design with a designated place for receiving stations even if not used on all turbines.
- It would be beneficial to develop a one-page distilled version of the guidance document that outlines system requirements for manufacturers, operations & maintenance, and others. It should include information on physical requirements/power, labor requirements, calibration, etc.
- Mounting – location and arrangement of antennas is key.
- In guidance document, include two scenarios: 1) turbine integration, 2) retrofitting on existing turbines.

### *Ground-truthing automated radio telemetry systems*

- Data types needed to ground truth automated telemetry systems include coordinates at X, Y, and Z, as well as size and orientation of receiving antennas to not introduce extra variability.
- Best to have multiple antennas calibrating with overlapping beams to determine side lobe detection.

- Importance of testing tags at different flight heights and with different behaviors, and different types of weather to understand additional sources of variation in detection.
- Reduce error by ensuring alignment of time stamps between recording devices and receivers.
- Methods for collecting calibration data include kites, drones, balloons, and double-tagging birds.
- Obtaining accurate altitude data from GPS can be challenging. Solutions may include GPS tags with built-in altimeter/barometer and accelerometers.

### *Metadata standards and best practices for recording data*

- Consider using Motus standards for sites, receivers, and antenna as the starting point.
- Metadata should include: 1) site metadata – type, location, 2) receiver information – type, how long on for, how to access, 3) antenna information – Yagi/omni, frequency, etc., and 4) turbine or platform type - ID within an area, type of structure.
- How to quantify coverage area – volume of space covered and what is in that volume (e.g., how many turbines, islands, other features that may influence coverage).
- Difficulty in measurements and accounting for uncertainty. Bearing can be difficult to measure, need to ensure realized angles are measured and any changes over time are documented.
- Dynamic metadata that would need to be consistently reevaluated to ensure any changes are being accounted for. Temporal drift can be difficult and cause problems for data analysis.
- Enforcing data standards – we can request information, but how do we ensure we are getting all of that information? Consider positive and negative incentive, as well as automation, where possible.

## Next Steps

The next steps for development of the guidance document are to incorporate stakeholder input from this workshop and continue document development. If any workshop participants are not on the Project Advisory Committee (PAC) and are interested in being more involved, they are asked to please email workshop organizers (pamela_loring@fws.gov; kate.williams@briloon.org).

Additional efforts will include field tests at Block Island Wind Farm and offshore buoys in spring/summer 2021. Following these field tests and calibration efforts, the draft guidance document will be produced for review in fall 2021 (there will be another webinar on this topic later this year).

### *Project Timeline*

This was the first of a series of stakeholder workshops planned for 2021 to inform the development of standardized protocols for deploying automated radio telemetry to study birds and bats at offshore wind farms. Additional workshops are being planned for fall/winter 2021 after testing at Block Island is complete. Final products for this project are anticipated in spring/summer 2022. However, interim products are available for stakeholders to review and contribute to upon request.

# Appendix A: Workshop Participants

Workshop participants are listed in alphabetical order by first name.

| Name | Affiliation |
|---|---|
| Adrienne Leppold | Maine Dept. of Inland Fisheries & Wildlife |
| Alicia Berlin | U.S. Geological Survey |
| Andrew Gilbert | Biodiversity Research Institute |
| Andy McGann | Cellular Tracking Technologies |
| Antje Seebens-Hoyer | NABU |
| Aonghais Cook | British Trust for Ornithology |
| Bart Noort | Wageningen University & Research |
| Brita Woeck | Ørsted |
| Caleb Spiegel | U.S. Fish & Wildlife Service |
| Carolyn Mostello | Massachusetts Division of Fisheries & Wildlife |
| Casey Halverson | Cellular Tracking Technologies |
| Cheryl Horton | U.S. Geological Survey |
| Christie Paterson | Scottish Power |
| Cris Hein | National Renewable Energy Laboratory |
| Daniel Deng | Pacific Northwest National Laboratory |
| Dave Phillips | Equinor |
| David Bigger | Bureau of Ocean Energy Management |
| David Mizrahi | New Jersey Audubon |
| David Pereksta | Bureau of Ocean Energy Management |
| Debi Palka | National Oceanic and Atmospheric Administration |
| Don Lyons | National Audubon Society |
| Doug Gobeille | University of Rhode Island |
| Ed Jenkins | Biodiversity Research Institute |
| Elizabeth Craig | Shoals Marine Lab / University of New Hampshire |
| Emily Argo | U.S. Fish & Wildlife Service |
| Emily Cohen | University of Maryland |
| Emily Heiser | New Jersey Dept. of Environmental Protection |
| Erik Carlson | University of Rhode Island |
| Erik Johnson | National Audubon Society |
| Evan Adams | Biodiversity Research Institute |
| Garry George | National Audubon Society |
| Greg Forcey | Normandeau Associates |
| Henrik Pommeranz | NABU |
| Holly Goyert | CSS Inc. on contract to NOAA |
| Holly Niederriter | Delaware Fish and Wildlife |
| Jeff Clerc | Normandeau Associates |
| Jennifer Stucker | WEST Inc. |
| Joel Merriman | American Bird Conservancy |
| Julia Gulka | Biodiversity Research Institute |
| Julia Robinson-Willmott | Normandeau Associates |
| Julie Miller | Marine Science Scotland |
| Kate Press | NYSERDA |
| Kate Williams | Biodiversity Research Institute |

| Name | Affiliation |
|---|---|
| Kevin Powers | Retired |
| Kim Peters | DNV GL |
| Kyra Harvey | U.S. Geological Survey |
| Linda Welch | U.S. Fish & Wildlife Service |
| Louis Brzuzy | Shell New Energies |
| MacKenzie Hall | New Jersey Division of Fish & Wildlife |
| Mao Lin | Tetra Tech |
| Marcus Cross | Avangrid Renewables |
| Martin Scott | HiDef Aerial Surveying |
| Meaghan McCormack | New York Natural Heritage Program |
| Michael Evans | Ørsted |
| Michael Schirmacher | Bat Conservation International |
| Mike van den Tillaart | Lotek Telemetry |
| Pam Loring | U.S. Fish & Wildlife Service |
| Paul Phifer | Atlantic Shores |
| Paul Smith | Environment and Climate Change Canada |
| Peter Hong | NOAA Stellwagen Bank National Marine Sanctuary |
| Peter Paton | University of Rhode Island |
| Petra Bach | Bach - Freilandforschung |
| Rick Reynolds | Virginia Dept. of Wildlife Resources |
| Rob DeLuca | University of Rhode Island |
| Ruth Boettcher | Virginia Dept. of Wildlife Resources |
| Ryan Reynolds | Siemens Gamesa Renewable Energy |
| Sander Lagerveld | Wageningen University |
| Saskia Wischnewski | Royal Society for the Protection of Birds |
| Scott Johnston | U.S. Fish & Wildlife Service |
| Shilo Felton | National Audubon Society |
| Stephen O'Malley | Offshore Turbine Services |
| Stuart Mackenzie | Birds Canada |
| Taber Allison | American Wind Wildlife Institute |
| Tammy Silva | NOAA Stellwagen Bank National Marine Sanctuary |
| Todd Alleger | WCT; Northeast Motus Collaboration |
| Todd Sumner | U.S. Wind |
| Trevor Peterson | Stantec |
| Vera Brust | Institut für Vogelforschung |
| Wendy Walsh | U.S. Fish & Wildlife Service |
| Wing Goodale | Biodiversity Research Institute |

# Appendix B: Workshop Agenda

## Automated Radio Telemetry Workshop Agenda: Guidance Document

**Tuesday, 12 January 2021**

**11:00 AM – 1:00 PM (EST)**

**Introductions (11:00 – 11:10) - Kate Williams, BRI**

**Overview of guidance document and Q&A (11:10-11:40) - Pam Loring, USFWS**

**Introduce breakout groups (11:40 – 11:45) - Kate Williams, BRI**

**Break (11:45 – 11:50) - participants self-assign to a breakout group by topic**

**Breakout groups (11:50 – 12:10)**

1. Optimizing technology
    - Goal: Identify recommendations for configuring stations on offshore structures to optimize detection range and data quality
    - Target participants: Electrical engineers, automated radio telemetry practitioners
    - Facilitator: Doug Gobeille, Univ of RI
2. Coordination of guidance into monitoring plans
    - Goal: Discuss coordination among stakeholders for implementing guidance into offshore wind monitoring programs
    - Target participants: representatives from agencies, NGOs, industry
    - Facilitator: Kate Williams, BRI
3. Integrating systems
    - Goal: identify a process to integrate automated radio telemetry systems into design phase of offshore wind turbines, buoys, and/or substations
    - Target participants: Offshore wind energy engineering and industry representatives
    - Facilitator: Andrew Gilbert, BRI
4. Ground-truthing automated radio telemetry systems
    - Goal: Brainstorm recommendations for ground-truthing the detection range and coverage of offshore systems
    - Target participants: automated radio telemetry practitioners, engineers, researchers
    - Facilitator: Pam Loring, USFWS
5. Metadata standards
    - Goal: Brainstorm best practices for station metadata and system health data that could be applied to developing minimum data standards for this effort
    - Target participants: environmental consultants, data scientists, Motus collaborators
    - Facilitator: Evan Adams, BRI

**Report out from breakout groups (12:10 – 12:50)**

- Project co-leads facilitate report-out:
    1. Optimizing technology – Doug Gobeille,
    2. Coordination of guidance into monitoring plans – Kate Williams
    3. Integrating systems – Andrew Gilbert
    4. Ground truthing – Pam Loring
    5. Metadata standards – Evan Adams
- Moderated discussion with chat

**Next steps and workshops (12:50-13:00) - Pam Loring, USFWS**

- Guidance document
- Field testing equipment - Block Island Wind Farm, offshore buoys
- Upcoming workshops: Study Design Tool (13 January 2021), Monitoring Framework and Motus workshops (Spring/Summer 2021)