HUTCHINSON®

Self Powered Bat Echo Jammer

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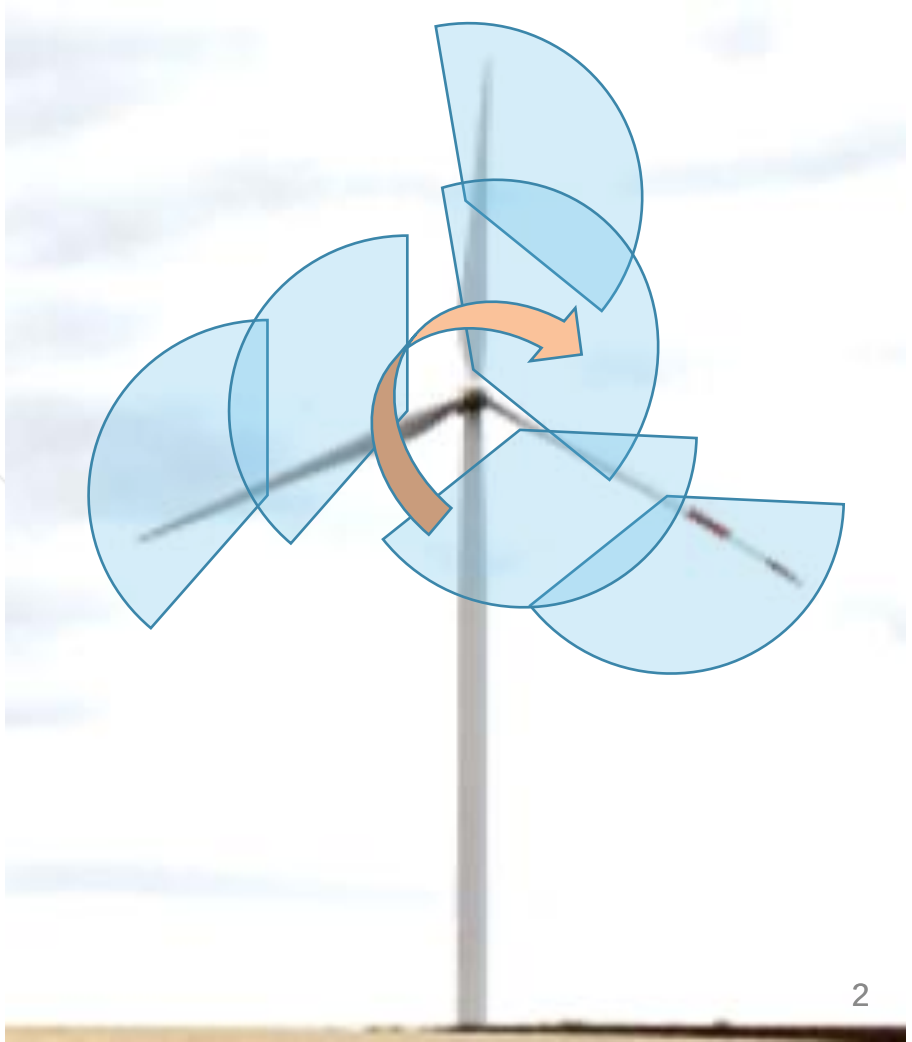
Project Outline

- Ultrasound deterrents have been proven effective for many bat species in wind turbine application.
- State-of-the-art solutions are placed either on towers or nacelles.
- Our idea is to utilize the piezoelectric actuators for ultrasound generation positioned directly on the blades.

Benefits to blade mounting:
Put a sensor with range that is limited by physics (i.e. ultrasound dissipates quickly) as close to the point at which collision takes place (i.e. blade)

It might be necessary to have multiple devices along the blades to ensure universal field strength.

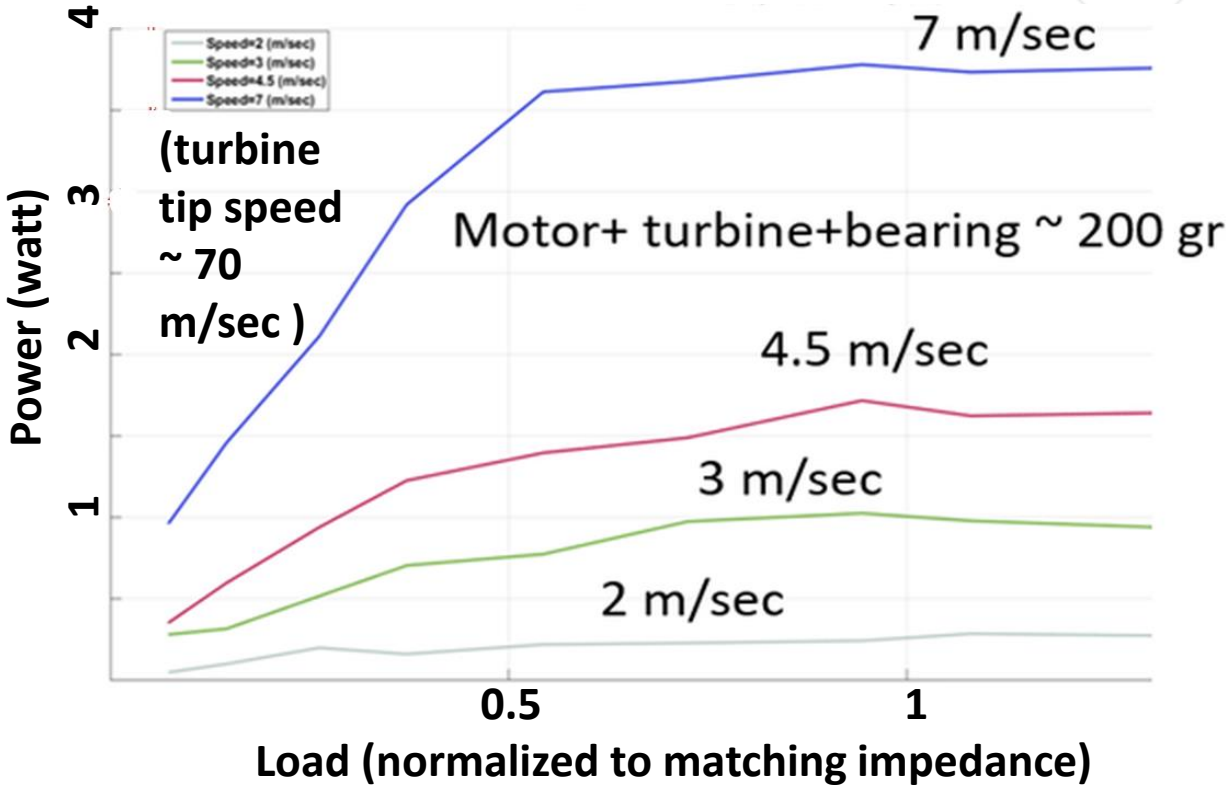
Challenges:
How do we secure the device to the turbine?
How do we power these devices?
Are these devices robust enough?



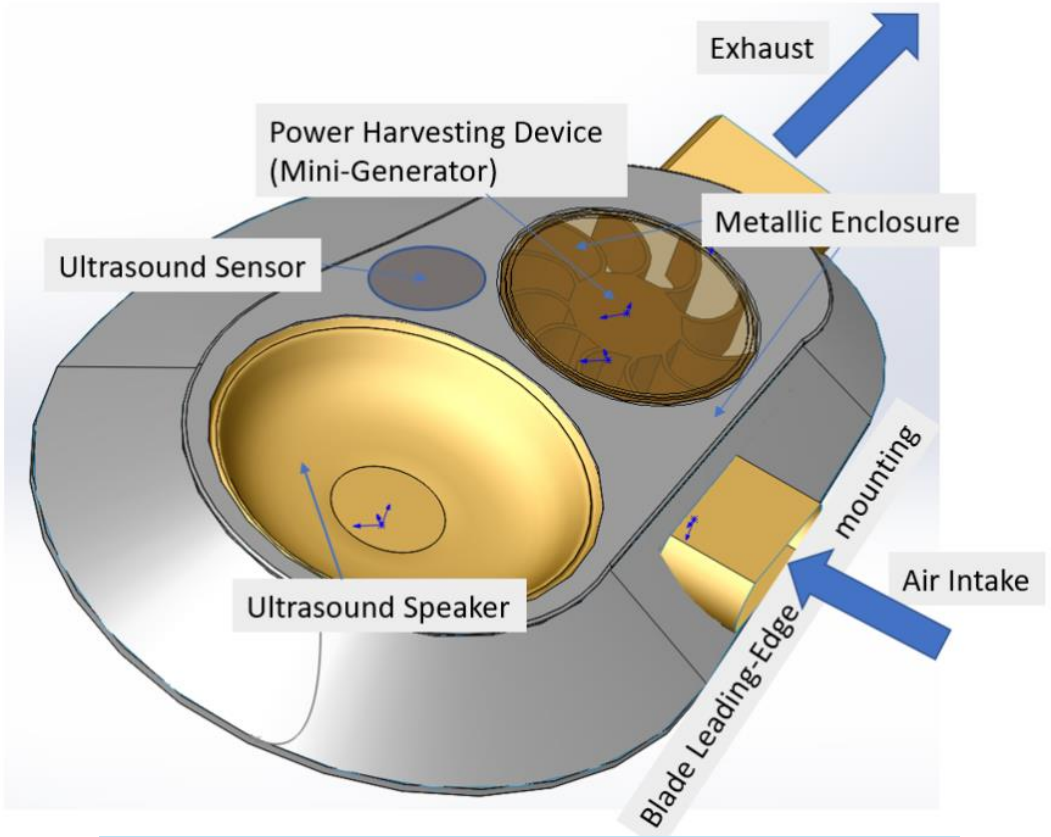
Self Powered Ultrasound Generator

- The device we envision is self powered and mounted on the blades
- It is composed of mainly two parts:

1) The power harvesting system



2) The ultrasound generator

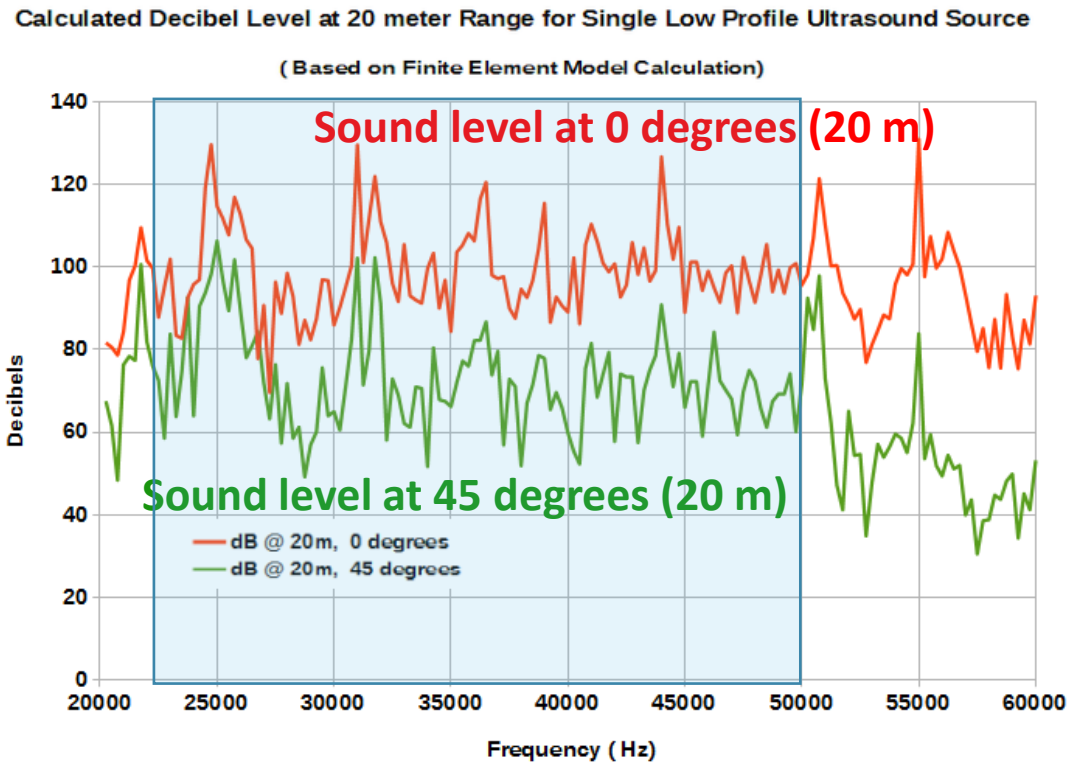


- Projected device performances based on preliminary results show that we are able to produce the required energy.

It is a very challenging project- no doubt!

The Ultrasound in more detail

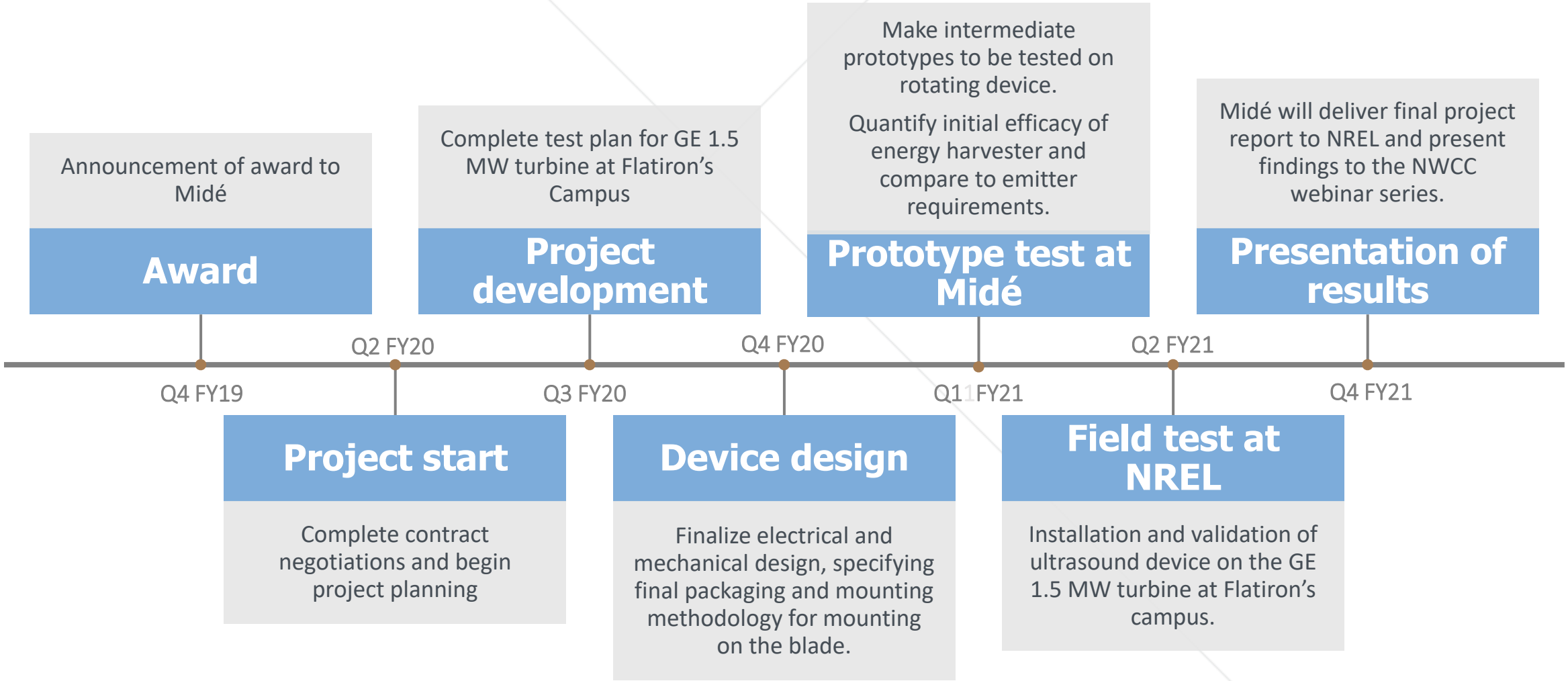
- The ultrasound generator is a stainless-steel cone driven by a piezoelectric actuator
- Our simulations show
  - 80 dB at 20 m distance (at 0 degrees)
  - Requires less than 10 W in dry air



- Data reported in literature show that the range of the most common bat species ranges between 20 and 50 kHz.
- The idea of this deterrent is that an ultrasound source would jam bat echolocation, and, as a result, the bat would avoid that area.
- This approach has been validated in some studies, although exceptions are reported.

There are many different questions that will remain after Phase I of this project, including, how far and what level of sound is necessary for deterrence. However, in this phase, we will concentrate on producing the target sound level (which is in line with other solutions). The final product will be a TRL1 to 3 (prototype)

Project timeline



Summary of Project Outcomes

- Quantification of efficacy of mounting methodology on blade (both from ground tests and on a rotating rotor).
- We will have quantitative results from a rotating frame on how much energy is available to power this device.
- This will be the first in-field deployment of a Midé device on a MW-scale turbine. We will get significant feedback as a result as to the robustness of the device.
- Conducting this field experiment will give more insight into the challenges associated with mounting a device like this on a wind turbine blade.
- Operational validation of energy harvesting and ultrasonic emitter performance.

Acknowledgment: "This material is based upon work supported by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) under the National Renewable Energy Laboratory (NREL) Technology Development and Innovation (TD&I) Award Number RDC-9-92218"

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