



# Ice removal on wind turbine blades by using resonant microwave energy absorption

## Student Project Proposal

### Background

Wind Turbines are getting more and more efficient thanks to the advance in materials and novel engineering solutions. However, to ensure optimal production of energy the blades must perform in all weather conditions. This is particularly challenging in cold climates where ice can accumulate in the blades, resulting in a huge degradation of the aerodynamical performance. To prevent this, modern wind turbines incorporate systems to regulate the temperature of the blade surface. These heating systems are typically based on some sort of electrical heating, but they are complex to manufacture and require a substantial amount of electrical power to perform. A potential alternative would be to use microwave radiation to deliver the energy to the region of the blade that needs to be heated, this energy should have some transducers able to absorb the energy with high efficiency. This kind of system may result in a simpler and more efficient design; however, how to do this in a wind turbine blade is poorly understood.

### Scope

The aim of this study is to analyze the viability of using a heating system for wind turbines based on microwave energy absorption, including:

- A deep literature review to identify what has been done in the field, or in other fields that can be applied to wind turbine blades.
- An initial study of the viability of the concept using a mathematical model developed in COMSOL coupling the electromagnetic and thermal fields in a simplified blade geometry.
- Establish an envelope for needed power, frequency and transducer characteristics based on the simulation results.

### Keywords:

Wind turbines, microwave radiation, COMSOL, resonant cavity

### APPLY

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Image from: dtu.dk

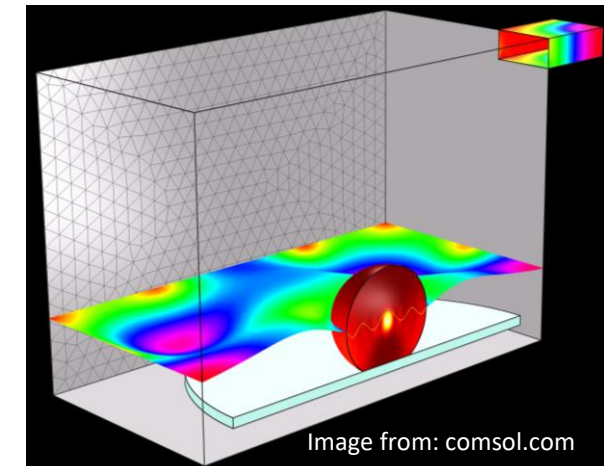


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