

# Superconducting wind turbines

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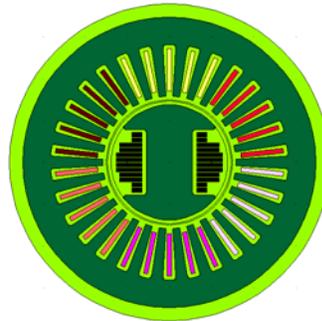
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## ABSTRACT

Conversion of coal and oil based energy production to renewable and CO<sub>2</sub> neutral energy will be a major political, technical and scientific challenge in the near future. In order to cover 20% of the European electric power consumption by 2030 by wind turbines, it is proposed to install 120 Giga Watt offshore wind power in northern Europe.

In this project we shall investigate the feasibility of using type II high temperature superconductors in electric generators of future off shore wind turbines. High temperature superconductors can be used to generate a considerable higher magnetic field than in classical magnet designs. The power per mass of the generator increases, thereby reducing size and weight. The load on the wind turbine foundation, tower and nacelle is reduced and the total construction costs can be lowered. The purpose of the project is to assess the technical and economical feasibility of using superconducting generators for sea based wind turbines each producing 10-20 MW.



**Left figure:** Wind turbine. **Right figure:** Small scale prototype superconducting generator from the Super Wind project (<http://www.supervind.dk>). The superconducting coated wires generating the magnetic field are shown in black colour in the rotor. This part is cooled by liquid nitrogen. The outer stator windings are made of normal conducting Cu wires.

**Reference:** *Design study of 10 kW superconducting generator for wind turbine applications.* A.B. Abrahamsen et al., IEEE Transactions on Applied Superconductivity, **19**(3), 1678-1682, 2009.

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