

## Design and Testing of Real Scale MgB<sub>2</sub> Coils for SUPRAPOWER 10 MW Wind Generators

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**Abstract** — Superconducting MgB<sub>2</sub> coils have a promising application niche in large wind generators. The potential implementation as field coils results in machines with smaller size and reduced weight, which is the real benefit compared to conventional non-superconducting alternatives. This is a key factor where wind market demands higher power rate and more compact turbines in order to optimize capital and operational costs

Under the SUPRAPOWER project, a 10 MW direct drive wind generator concept will be probed through an experimental scale validator, where superconductivity is implemented in the rotor DC coils. For the required operational temperature, current density and magnetic field the available commercial MgB<sub>2</sub> wire has been selected, as it is a cost effective and well suited compared to other solutions.

The aim of the present work is to analyze the operational conditions of MgB<sub>2</sub> DC field coils, cooled by a cryogen-free system and developed according the required performance for the SUPRAPOWER generator. The paper deals with the design, manufacturing and experimental results of such full scale superconducting coils.

**Keywords (Index Terms)** — Cryogen-free, MgB<sub>2</sub> coil, superconducting generator, wind turbine.