



ICEM 2024, Torino, September 1-4 2024

Special Session on Superconducting Electrical Machines

Organized and co-chaired by

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Call for Papers

The drive towards Net-Zero is leading to an electrical revolution in the energy and transport sectors. Within the energy sector renewable energy is the focus on decarbonisation with large amounts of wind and solar being installed around the world. In order to meet net-zero targets 8000 GW of offshore and onshore wind needs to be installed globally by 2050, which under current installation rates will be very challenging. Increasing turbine rating is one way to meeting the challenge of installation rated. The current average turbine rating is around 8-9MW, with the leading EU and Chinese manufacturers announcing turbines in excess of 20MW. At such ratings the generator design, whether it be direct drive or low-medium speed, becomes very challenging resulting in physically large and heavy machines using conventional PM technology, with power density typically 50 W/kg. In the aerospace sector the challenge is to replace the jet engine with an all electric propulsion system in order to reduce emissions and meet 2050 targets. As with wind energy, power density of the electrical machine is the significant challenge. There have been successful demonstrations of all-electric propulsion systems for small aircraft using permanent magnet technology, with Siemens achieving a power density of 5 kW/kg. For larger commercial aircraft electrical motors with a power density in the region of 20-40 kW/kg are required. In both sectors the challenge is to increase power density, albeit with different targets due to the speed and operational environment. However, it is clear that conventional machines are operating at their design limits, and not able to meet these targets. Superconducting machines offer an alternative providing magnetic loading and electrical loading several times greater than conventional permanent magnet and copper windings. This special session will provide a forum for presenting developments in superconducting electrical machines for both energy and transport applications.



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Topics of interest include, but are not limited to:

- Modelling of superconducting machines, in particular ac losses.
- Superconducting machine demonstration projects.
- Novel superconducting machine topologies.
- Superconducting flux pumps for energisation.
- Integration of power electronics in superconducting machines.
- Design and integration of cooling systems for superconducting machines.
- Design tools for superconducting machines.

Submission of papers: paper submission follows the rules of regular papers. All the instructions for paper submission are included in the conference website

<https://icem.cc/2024>