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[Invited] Superconducting Wind Generators: Development and Challenges

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The study of large superconducting generators for wind turbines has been ongoing for several years both in Europe and in the US. Several very promising fully and partially superconducting designs have been developed using both YBCO and MgB₂ conductors. Most of the activities entails detailed designs and derisking activities, however, no full size prototype has been fabricated and tested yet. The development of wind turbine superconducting generator is a multi-disciplinary activity and requires advanced optimization tools considering the full turbine or even the wind farm as a system targeting the minimization of the cost of energy. The value proposition of large superconducting generators has been reported in numerous publications and documents (i.e. NREL, DOE). However, technology development is still required before such machines can be deployed. This paper will discuss the technology development (superconductor, protection, fault management, cooling systems, structural materials...) still required and propose a roadmap for the development of large HTS generators. The impact of the generator topology and superconducting material on the cost of energy and generator performance will also be presented.

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