



Contribution ID: 397

Type: Poster

Wed-Mo-Po.05-04: Demonstration of a MgB₂ DC-DC boost converter for ultra-fast battery charge up to 200 A - 200 V output power.

Wednesday 2 July 2025 09:15 (2 hours)

An increase in the ratio of Electric Vehicles (EV) to conventional petrol cars will be one of the most effective ways to reduce CO₂ emissions throughout their life cycle, and make the goal of 2050 carbon neutrality more realistic. The boost converter, which is the most essential for photovoltaic plants to maximize its output power for providing electricity to the utility grid was chosen as a prototype of DC-to-DC converter whose inductor is made of MgB₂ superconducting material that is to be suitable for liquid hydrogen cooling. Since fast battery chargers introduce DC-to-DC converter topologies, the conversion by the proposed system from the DC output of renewable sources to batteries introduced to EV and/or other storage stations makes the system extremely effective even in very short-time charge. A double-boost converter operating up to 15kW, 100A output current has already been provided to a 3-ohms constant load demonstrated with 95 percent efficiency in the previous phase of our project, this time, higher current operation with up to 200A, which imposes the inductor current up to 400 A will be demonstrated. Besides, another circuit topology with higher step up voltage type has been designed and tested, which helps the system strengthen their design flexibility for practical use.

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Session Classification: Wed-Mo-Po.05 - Novel and Other Applications I