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## A study on development of DC-DC converter for 1 MW-class high speed electric power charge

**Gil-dong Kim**

Korea Railroad Research Institute, Korea

Electric railway vehicle has no storage media system to save electrical energy necessary for the operation of the vehicle. Therefore, electric railway vehicle is supplied with electric energy through the catenary. The catenary has caused environmental damage and accompanied many of the construction costs. However, using the rapid energy charge technology of driving energy during stop time at station, electric railway vehicle can travel between stations of approximately 1 km intervals without the contact line. In addition, the regenerative energy which is stored in energy storage while braking can be efficiently recycled. In order to operate electric railway vehicle without the catenary, it needs a large ESS (Energy Storage System) and 1 MW-class DC-DC converter meeting the rapid electric power charge within 20 seconds. This paper presents DC-DC converter (called multi distributed DC-DC converter) topology design and verifying simulation to meet the rapid energy charge within 20 seconds. Multi distributed DC-DC converter consists of two-phase interleaved converters in three series. The three serial configurations allow using the input voltage 1800 V through IGBT with small voltage like 1200 V. Also, it is possible to use a high switching frequency and to reduce the inductor volume with reduction of the inductor energy. And the input and output current ripple can be reduced by applying the interleaved converters. The analysis result of measured powering/regenerative energy in the test vehicle is utilized to verify the DC-DC converter design. In the future, developed converter will be equipped and tested using this test vehicle. Converter boost/buck mode operation is simulated to verify converter capability according to vehicle powering and charging. In addition, the rapid energy charging simulation within 20 seconds is performed by applying control algorithm for charge/discharge mode.

### Biography

Gil-dong Kim has received his MS and PhD degrees in Electrical Engineering from Myongji University, Seoul, Korea in 1991 and 2003 respectively. From 1991 to 1994, he was with Woojin Industrial Systems, Korea. He has joined KRRRI (Korea Railroad Research Institute), Uiwang-si, Korea, in 1995 and he is presently a Chief Researcher. His research interests include propulsion system for railway vehicles and converter for energy storage system.

[gdkim@krri.re.kr](mailto:gdkim@krri.re.kr)

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