

# Development of A New Power Control Unit Built Into e-Axle For the 6<sup>th</sup>. Generation Plug-in Hybrid System

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This study presented the development of a sixth-generation plug-in hybrid system tailored for large-size PHEV applications. The newly designed power control unit (PCU) integrates advanced technologies such as SiC-MOSFETs achieving a balance of compactness, cost efficiency, and reduced power loss (Fig. 1).

Through the integration of the DC-DC converter and the adoption of an e-Axle configuration combining generator (MG1) and traction motor (MG2), the system realizes significant packaging improvements. The lower-profile design enabled the AC charger to be mounted directly above the PCU, contributing to a 12% increase in system output, a 15% reduction in height, and an 18% reduction in weight compared to previous models(Fig. 2).

Furthermore, the use of SiC-MOSFETs not only facilitated downsizing (Fig. 3) but also reduced PCU losses, resulting in an approximate 70% improvement of PCU loss as ratio of vehicle fuel efficiency under WLTP conditions(Fig. 4).

We remain committed to achieving carbon neutrality through a multi-pathway approach, developing optimal and efficient powertrain solutions that meet the diverse needs of customers across global markets.

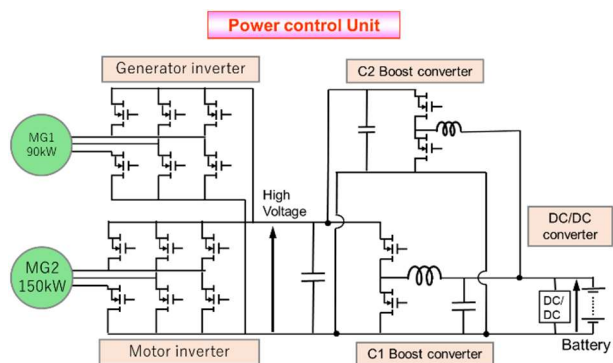


Fig.1 schematic circuit of new power control unit

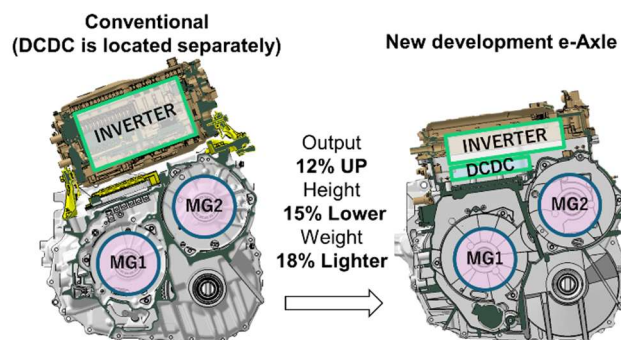


Fig.2 Comparison between conventional axle and new development e-Axle

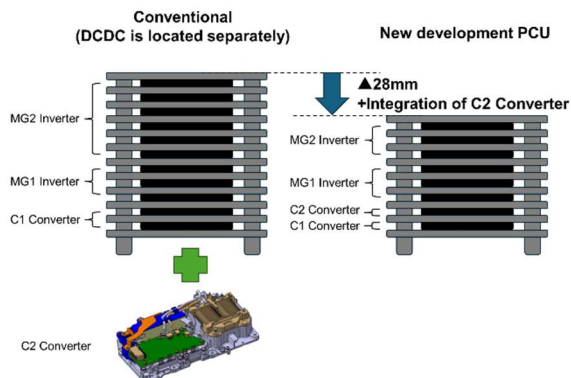


Fig. 3 Comparison between conventional power stack And 6<sup>th</sup> PHEV system's one

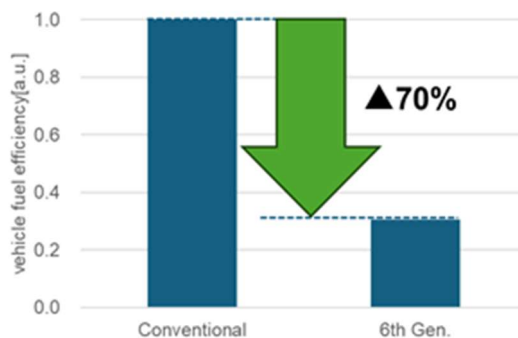


Fig. 4 Comparison of PCU loss between conventional PHEV system and 6<sup>th</sup> PHEV system