## Development of a Hybrid Electric Vehicle with the Power Supply from Dual Voltage Trolley and On-board Battery and Its Power Flow Control

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Hybrid electric vehicle (or Hybrid Electric Multiple Units) can be defined as railway electric vehicles (EMU) fed by both contact feeder line (trolley) and on-board electric energy storage device. This type of vehicle runs with good energy re-cycling characteristics in electrified lines, and is able to run into non-electrified lines also. In Japan, there are two kinds of trolley voltage of direct current -"High voltage" of d.c.1500V, and "Low voltage" of d.c.600V or d.c.750V. From the view point of interoperability into the sections of two kinds of trolley voltage, we've developed a hybrid electric vehicle with the power supply from dual voltage trolley and on-board battery. In this paper, we report on the study results of the dual voltage hybrid traction circuit and control algorithm as well as the running test results.