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(54) **VOLTAGE CONTROL OF MULTI-BATTERY SYSTEMS**

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(57) **ABSTRACT**

A system for controlling propulsion in a vehicle includes a switching system connected to a battery system connected to a drive unit and to one or more electrical loads by a propulsion bus. A controller is configured to control the switching system to vary a voltage applied to the drive unit. The controller is configured to receive a request to transition between operating modes, the transition including a change of a voltage applied to the drive unit from an initial voltage level to a target voltage level. The controller is configured to sequentially perform deactivating the one or more electrical loads, based on the target voltage being higher than the initial voltage, pre-charging the one or more electrical loads, based on the target voltage being lower than the initial voltage, performing a discharge procedure, and operating the switching system to apply the voltage at the target voltage level.