

For a single-shift parallel hybrid electric bus, hybrid-driving with multiple operation modes is adopted for better fuel economy. However, in the process of hybrid-driving, frequent mode transitions (MTs) would be triggered, which are accompanied by extra fuel consumption and abrasion of the clutch, especially for the MTs between engine-on modes and engine-off modes. Therefore, reducing unnecessary MTs and taking advantage of multiple operation modes to improve fuel economy of single-shift parallel hybrid powertrain should be given high priority. To solve this problem, a corrected stochastic model predictive control (MPC) is proposed in this study. First, the Markov-chain based stochastic driver model is built for the statistic of city bus driving cycles. Second, the process of motor starting engine is analyzed based on real-world data and the cost of the process is quantified for optimization. Finally, a novel system operating control strategy based on multiobjective stochastic MPC is proposed. To obtain a better knowledge of the proposed multiobjective control strategy, three kind of commonly used control strategies are adopted for comparison. The simulation results in real-world driving cycles and standard driving cycles show that the proposed energy management strategy can greatly improve the fuel economy of a plug-in hybrid electric bus compared with the equivalent consumption minimization strategy. This study may offer some useful insights for the current strategies to get higher fuel economy.