

This paper presents a passivity-based control (PBC) for a type 2 static synchronous compensator (STATCOM) based on an Euler-Lagrange model. The proposed method is designed based on a Lyapunov function by considering dissipation to improve transient performance. An additional nonlinear damping term is designed to regulate the capacitor voltage. It is guaranteed that the equilibrium point of the system is locally exponentially stable in the operating range. The performance of the proposed method is validated via a 100 Mvar STATCOM system connected to the 345-kV grid system in SimPowerSystems, MATLAB/Siumlink. To compare with the input-output feedback linearization method, the proposed control method has improved convergence and reduction of oscillations of the active current and DC voltage, as shown in simulation results. Lastly, it shows that the proposed method is robust to model mismatches as the variation of the grid voltage and the degradation of the capacitance.

