AK Tech Training and Placements

Transform Dreams into Reality

DC-bus Voltage Control based on Direct Lyapunov Method for a Converter based Stand-alone DC Micro-grid

In this project, a novel distributed control technique based on the direct Lyapunov method is presented to regulate the DC-bus voltage of a stand-alone DC micro-grid with variant power generation and consumption. This DC microgrid consists of a photovoltaic unit, a wind-turbine unit, a micro-turbine unit, and a lithium-battery-based energy storage unit, where the energy storage system is constantly connected to the DC-bus in order to damp any DC voltage alteration. Moreover, the micro-turbine unit is set to compensate for the lack of power when a significant decrement in the generated power or a severe increment in the load power happens. In these types of energy multi-sources systems with the voltage instability, a proper distributed control technique focusing on the voltage stabilization through the current regulation of DC/DC converters is required to decrease the associated fluctuation impact of power-sharing. This project proposes a control technique based on the comprehensive differential models of the power-converter-based generation units in which both the steady-state and dynamic operating conditions of the DC/DC converters are considered. Moreover, the stability of the generation units is analyzed using an input-output linearization technique. Simulation results in MATLAB/SIMULINK environment verify the accuracy of the energy-management-based control strategy in various operating conditions.

Domain: Power Systems solar Power Generation
Technology: Electrical