ADAPTIVE AND FUZZY PI CONTROLLERS DESIGN FOR FREQUENCY REGULATION OF ISOLATED MICROGRID INTEGRATED WITH ELECTRIC VEHICLES

ABSTRACT

The number of electric vehicles and renewable energy resources integrated into the power system is increasing day by day. The objective behind the development of electric vehicles and renewable energy sources is to build a sustainable and green power system. The renewables either don't possess system inertia or have less system inertia, therefore, they don't effectively respond to the load variations. The battery storage system of electric vehicles is used as the first line of defense to counter the effect of load/frequency variations and make the system stable. As active power is inversely proportional to the system frequency, for this purpose electric vehicles are included in the microgrid environment. In this project, an isolated microgrid having a reheat turbine system, wind turbine system, photovoltaic system, and electric vehicles is studied. The output of the renewables is not controlled to utilize its maximum output power. Therefore, adaptive droop control and fuzzy PI control mechanisms are implemented to cater to the frequency variations of the isolated microgrid; the former regulates the power of electric vehicles while maintaining the energy needs of each EV and the later controls the output power of reheat turbine system according to the frequency variation. Furthermore, the genetic algorithm optimization toolbox is utilized to optimize the parameters of the adaptive and fuzzy PI controllers. The proposed model is developed in MATLAB/Simulink which shows that these control techniques effectively sustained the system frequency of isolated microgrid in the desired limits.