

Application Study of a STATCOM with Energy Storage

Arulampalam, A., Ekanayake, J.B. and Jenkins, N.

Abstract

With recent advances in energy storage technology the application of STATCOMs with energy storage for utility applications, such as active- and reactive-power compensation of loads, network-voltage control and mitigation of power system disturbances, is increasingly feasible. As it is more expensive to produce active power than reactive power, it is important to consider methods which can be adopted to minimise the use of the energy store. An application study of a STATCOM with energy storage giving special emphasis to control strategies which minimise the use of the stored energy is reported. Calculation techniques to determine the current rating of the IGBTs, diodes and connecting transformer as well as the losses associated with the switches when the compensator is operated under space-vector modulation are demonstrated. Application studies of the compensator with energy storage for load compensation, steady-state voltage control, mitigation of voltage sags and elimination of power oscillations are described. The analytical studies of each of these applications are supplemented by simulation results carried out in PSCAD/EMTDC and by experimental results obtained from a laboratory prototype.