Abstract

With the growing need for reliable, clean and economical electrical energy as a result of urbanization and technological advances, power system networks have to be continuously upgraded to meet the increasing demand. However, the existing matured AC power systems are limited by strict standards for reliability, stability and right-of-way (ROW) permit for new transmission lines. As such, high voltage direct current (HVDC) systems provide viable techno-economic solutions to these problems and hence play a very crucial role in modern power systems. In this paper, an Improved Genetic Algorithm (IGA) has been successfully implemented on MATLAB environment and tested on an IEEE 9-Bus system to simulate the HVDC-Economic Dispatch (ED) [HVDC-ED] problem. As compared to the conventional GA and other pure methods, IGA has been found effective in solving HVDC-ED problem since it works with a small population, involves progressive improvement and converges to a global optimum as compared to the basic GA. From the simulated results obtained, it is clear that HVDC-ED has a better ability to control power flow, decreased transmission line losses and an increased capability maintain voltage stability especially for bulk power transmission over the long transmission lines. This compensates for the high costs of the HVDC as compared to the high voltage alternating current (HVAC) in the applications where bulk power is being transmitted over long distances.