Analysis of lightning transient effects on hybrid renewable energy sources

ABSTRACT

Lightning strike causes large transient current injection into hybrid systems at the point of contact. The generated transient overvoltage due to lightning current is a high concern on various expensive electrical equipment of the hybrid system and is meant to be studied in depth to reduce damages caused by this overvoltage. Analysis of lightning transient effects on a hybrid PV-wind system has been carried out in this study. The complete model of the system has been simulated by PSCAD /EMTDC software. The system consists of 2 MW PV farm, 2.1 MW wind farm, energy storage system and load. The entire system is integrated with the utility grid. Lightning current is generated by Heidler function with the help of same software. In this work, two points are selected from hybrid system to inject lightning current. The first point is the DC side of the PV modules whereas the other is the wind turbine tower. In the second case, the partial lightning current is assumed to be injected into the electrical part in the form of arcing. Transient overvoltage has been observed at different locations of the hybrid system by injecting lightning currents; the simulation results are obtained for 50% waveform of negative first stroke and negative subsequent stroke.

Keyword: Hybrid PVï wind system; Heidler function; Lightning; Transient effect; Overvoltage; PSCAD/EMTDC