On-Line Generation and Arming of System Protection Schemes

This paper presents a new method to automatically generate system protection schemes in real-time, where contingencies are filtered using a method providing N–1 system snapshots. With future power systems consisting largely of renewable distributed generation with time-varying production, highly fluctuating conditions throughout the day will be the result. This makes off-line design of extensive defense plans for power systems infeasible, forming the motivation for the presented method. It relies on the real-time identification of which disturbances that threatens a power systems integrity. The method is based on a recently proposed method of calculating post-contingency Thevenin equivalents, which are used to assess the security of the post-contingency condition. The contingencies that violate the emergency limits are contained by pre-determining event-based remedial actions. The instability mechanisms threatening the system are individually treated, such that appropriate controls are allocated. The procedure is illustrated through a case study using the Nordic32 benchmark system.