A Review of Cyber-Physical Energy System Security Assessment

Increasing penetration of renewable energy resources (RES) and electrification of services by implementing distributed energy resources (DER) has caused a paradigm shift in the operation of the power system. The controllability of the power system is expected to be shifted from the generation side to the consumption side. This transition entails that the future power system evolves into a complex cyber-physical energy system (CPES) with strong interactions between the power, communication and neighboring energy systems. Current power system security assessment methods are based on centralized computation and N-1 contingencies, while these risks should still be considered in the future CPES, additional factors are affecting the system security. This paper serves as a review of the challenges entailed by transforming the power system into a CPES from a security assessment perspective. It gives an indication of theoretical solutions to CPES challenges and proposes a new framework for security assessment in CPES.