

Alireza Soroudi, Pouria Maghouli, Andrew Keane, 2017, Resiliency oriented integration of distributed series reactors in transmission networks, *IET Generation Transmission & Distribution*.

Abstract Secure and reliable operation of power system in normal and contingency conditions is of great importance for system operator. Natural disasters can seriously threaten power systems normal operation with catastrophic consequences. While hardening approaches may be considered for resiliency improvement, an application of a new and cost effective technology is proposed in this paper. This work proposes a planning procedure for integrating Distributed Series Reactors (DSR) into transmission grids for improving the resiliency against these disasters. DSRs are able to control power flows through meshed transmission grids and thus improve the power transfer capability. This can improve the penetration level of renewable generation as well which is addressed in this paper. The problem of integrating DSRs into transmission grids is formulated as a mixed integer linear programming problem. Different load and wind profiles and a predefined number of disaster scenarios are considered in evaluating the impacts of DSR deployment on system's operational costs, wind curtailment and load shedding during disasters and normal condition. The uncertainty of wind generation can affect economic viability of DSRs deployment thus; an information gap decision theory based method is proposed for uncertainty handling. The proposed methodology is implemented on the IEEE-RTS 24 bus test system and results show the functionality of DSRs in converting the conventional transmission grid into a flexible and dispatchable asset.

Keywords Power system resiliency, distributed series reactors, wind curtailment, information gap decision theory, uncertainty.