

Impact of Renewable Energy penetration on Power System Protection - Grid operator's perspective

Keynote Session D III

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Abstract:

Government of India has set an ambitious target to integrate 175 GW of RE generation by 2022 and further to achieve a target of 450 GW by 2030. The present all India RES installed capacity is 101 GW (as on September 2021) and renewable energy has a share of 26% in the total installed generation capacity in the country. Few states like Karnataka have seen very high RE penetration i.e., nearly 90% instantaneous penetration and almost entire load of the state is met by renewables during high RE season. Increased RE penetration has also led to change in the load pattern of the states and few pockets in the grid experience higher loading during high RE generation period leading to stress in the network. This not only imposes challenges from the integration point of view but also leads to change in the dynamic behaviour of grid. All the more important is the protection aspects of RE as well as the associated system. It is desired that the protection system behaves in a manner for which it is designed. Various protection issues & challenges have been observed with RE (Wind & Solar) connected stations during real time grid operation such as tripping of RE generators due to mis-operation of anti-islanding relays; presence of high zero sequence current at PV inverter stations, high grid voltages in the night time and operation of over flux protection of transformers, protection co-ordination issues, permissible LVRT operation during successive fault on transmission network, tripping of Inverters during momentary PLL loss of synchronism caused by phase jumps, distortion during grid events. All the protection aspects need to be well co-ordinated in-order to avoid any unwanted tripping which may have a profound and a large-scale impact on the grid. In future there will be large/ vast pockets of renewables in the grid and hence it is required to leverage on new technologies and use adaptive & wide area protection for RE in-order to make the protection system and the grid more resilient. There is need to develop a uniform protection philosophy/ guideline for RE sources and its associated system and carry out regular protection audits.