

As the wind power generation develops, the doubly fed induction generator (DFIG) based wind power system is more and more likely to operate in the emerging weak network rather than in the conventional stiff network. Due to the comparatively large impedance of the weak network than the stiff grid, the DFIG system may be subject to the resonances due to the impedance interaction between the DFIG system and the weak network. Especially, when connected to a series π sections weak network, the multiple high-frequency resonances (MHFR) may occur and require careful studies. The impedance modeling of the DFIG system and the series π sections weak network is first demonstrated in this paper. Then, due to the multiple magnitude peaks of the series π sections of the weak network, the MHFR will be produced and can be theoretically explained based on the impedance modeling results. For the purpose of mitigating the MHFR, an active damping strategy which introduces a virtual impedance, including a phase leading compensation unit and a virtual positive resistance, is proposed and demonstrated. Simulations are conducted to validate the DFIG system MHFR as well as the proposed active damping strategy.

