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## Modal Analysis for Optimal Location of Doubly Fed Induction-Generator-Based Wind Farms for Reduction of Small Signal Oscillation

Authors: Meet Patel, Darshan Patel, Nilay Shah

**Abstract :** Excess growth of wind-based renewable energy sources is required to identify the optimal location and damping capacity of doubly fed induction-generator-based (DFIG) wind farms while it penetrates into the transmission network. In this analysis, various ratings of DFIG wind farms are penetrated into the Single Machine Infinite Bus (SMIB) at a different distance of the transmission line. On the basis of detailed examinations, a prime position is evaluated to maximize the stability of overall systems. A damping controller is designed at an optimum location to mitigate the small oscillations. The proposed model was validated using eigenvalue analysis, calculation of the participation factor, and time-domain simulation.

**Keywords:** DFIG, small signal stability, eigenvalues, time domain simulation

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