Small-Signal Stability of Wind Power System With Full-Load Converter Interfaced Wind Turbines

Small-signal stability analysis of power system oscillations is a well established field within power system analysis, but not much attention has yet been paid to systems with a high penetration of wind turbines and with large wind power plants (WPP). In this paper a comprehensive analysis is presented which assesses the impact of full-load converter interfaced wind turbines on power system small-signal stability. The study is based on a 7 generator network with lightly damped inter-area modes. A detailed wind turbine (WT) model with all grid relevant control functions is used in the study. The WT is, furthermore, equipped with a park level WPP voltage controller and comparisons are presented. The WT model for this work is a validated dynamic model of the 3.6 MW Siemens Wind Power WT. The study is based on modal analysis which is complemented with time domain simulations on the nonlinear system.

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