

EQUIVALENT TRANSFER FUNCTION FOR A VARIABLE SPEED WIND TURBINE IN POWER SYSTEM DYNAMIC SIMULATIONS

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ABSTRACT

This paper presents a generic dynamic model for simulating variable speed wind turbines in power systems. The model is derived from a more detailed turbine model that is described in literature.

The wind turbine model presented here is basically an equivalent transfer function of the first or second order. The input is the wind speed, and the output is active and reactive power. This alleviates very much the computational efforts for power system simulations, and decreases the risk for numerical instabilities, compared to the existing detailed wind turbine models described in literature. Also, the basic model blocks that are used in the model are available in practically all power system simulation packages.

The model structure is not directly linked to a certain turbine and generator technology, such as doubly fed or synchronous generator. However, the model parameters and time constants of the various model blocks are technology dependent. They summarize the complicated turbine behaviour in a very dense way that is directly usable for grid operators or project developers.

The model is intended for estimating the amount of wind power that can be absorbed in a given grid connection point, rather than to make accurate predictions of the impact of a specific farm with given turbine type. It may be used by system operators to quantify the general connection requirements on a certain grid connection point, taking into account the inherent characteristics of wind power and an accepted decrease of grid power quality.