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Abstract: This paper presents a new integrated model for the simulation of wind energy systems. The proposed model is more realistic and accurate, considering a variable-speed wind turbine, two-mass rotor, permanent magnet synchronous generator (PMSG), different power converter topologies, and filters. Additionally, a new control strategy is proposed for the variable-speed operation of wind turbines with PMSG/full-power converter topology, based on fractional-order controllers. Comprehensive simulation studies are carried out with matrix and multilevel power converter topologies, in order to adequately assert the system performance in what regards the quality of the energy injected into the electric grid. Finally, conclusions are duly drawn.

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