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Energy harvesting using horizontal axis wind turbines with hydrostatic transmission HELBER ANTONIO ESQUIVEL-PUENTES, School of Mechanical Engineering, Purdue University, ANDREA VACCA, School of Mechanical Engineering, Purdue University., LEONARDO P. CHAMORRO, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, JOSE GARCIA-BRAVO, Technology Engineering Department, Purdue University, HUMBERTO BOCANEGRA-EVANS, ALI DOOSTTALAB, DAVID WARSINGER, LUCIANO CASTILLO, School of Mechanical Engineering, Purdue University — The integration of a hydrostatic transmission provides flexibility and modularity in the turbine configuration, allowing installation of a pump in the turbine nacelle and a motor at ground level while having the possibility to decouple the input and output angular velocities of the power transmission system. Energy harvesting using wind turbines with hydrostatic transmission was studied experimentally using kW-level test units in the field. We tested and validated the viability of hydrostatic transmission capabilities and compared against laboratory experiments using an electric motor to drive the wind-turbine rotor. Power spectra as a function of the turbulent incoming flow reveal distinct modulation of the system. These modifications may reduce the turbine structure mass to 30% and 5-15% in the cost of energy. The measured power transmission efficiency was found to be in the range of 70-77%.

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