Producing Turbulent Wind Tunnel Inflows Relevant to Wind Turbines using an Active Grid[1] CHRISTOPHER RUMPLE, MATTHEW WELCH, JONATHAN NAUGHTON, University of Wyoming — The rise of industries like wind energy have provided motivation for generating realistic turbulent inflows in wind tunnels. Facilities with the ability to produce such inflows can study the interaction between the inflow turbulence and the flow of interest such as a wind turbine wake. An active grid a system of actively driven elements - has gained increasing acceptance in turbulence research over the last 20 years. The ability to tailor the inflow turbulence quantities (e.g. turbulence intensities, integral length scale, and turbulence spectrum) is a driving reason for the growing use of active grids. An active grid with 40 independent axes located within the forward contraction of a low speed wind tunnel is used to explore the range of turbulent inflows possible using hot-wire anemometry to characterize the turbulence. Motor control algorithms (i.e. user waveform inputs) used to produce various turbulent inflows will be presented. Wind data available from meteorological towers are used to develop relevant inflows for wind turbines to demonstrate the usefulness of the active grid.

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