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**Numerical Investigation of Active Flow Control on Wind Turbines under Yaw Misalignment**[1] STEVEN TRAN, MANE, RPI, DAVID CORSON, Altair Engineering Inc, ONKAR SAHNI, MANE, RPI — Yaw misalignment dramatically increases unsteady aerodynamic loading on wind turbine blades over each revolution. The resulting fluctuating loads on each blade cause fatigue in the system and subsequently, failure leading to increased maintenance costs and unnecessary downtime. In this study we numerically analyze the effects of yaw misalignment on complete rotating wind turbines with blades of O(5m) in length. We consider two wind speeds at rated and above-rated regimes, where the effect of yaw misalignment is more pronounced. For the baseline configuration comparisons are made with the existing experimental data. To mitigate the resulting unsteady aerodynamic loading, we apply synthetic-jet based fluidic actuation in order to achieve fast-time response (in contrast to traditional yaw control strategies). O(5-10) jets are placed along the outer half of blade span. Along the chord two jet locations (x/c = 0.05 and 0.40) are considered. Actuation strategies for jets are based on partial loop control with pulse modulation. All simulations are based on unsteady Reynolds-averaged Navier-Stokes (URANS) equations.

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