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Impact of different strut geometries on the performance of H-Darrieus vertical-axis turbines[1] THIERRY VILLENEUVE, GUY DUMAS, Laval University — Previous studies have shown that the performance of H-Darrieus vertical-axis turbines are highly sensitive to the blades mounting structure. More precisely, the struts, that are supporting the turbine blades, are detrimental to the power extraction. Indeed, the presence of the struts leads to an additional viscous drag contribution for the moving blades that results in a negative torque contribution at the turbine shaft. In addition to this added drag contribution, the struts also affect the flow field within the turbine, and thus, the forces acting on the turbine blades. In order to better understand these interactions between the blades and the struts, URANS and DDES numerical simulations are conducted for an H-Darrieus vertical-axis turbine with different strut configurations at a high Reynolds number. The results obtained from these simulations show that the struts affect importantly the spanwise distribution of the forces on the turbine blades. Moreover, the numerical simulations provide useful insights into the flow field within the turbine that can help to develop a strut geometry that could extract energy from the flow while minimizing its interference with the blade, and thus, contributing positively to the turbine efficiency.

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Thierry Villeneuve
Laval University

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