

Abstract Submitted
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Experimental and Numerical Study on Performance of Ducted Hydrokinetic Turbines with Pre-Swirl Stator Blades. ANDREW GISH, United States Naval Academy — Ducts (also called shrouds) have been shown to improve performance of hydrokinetic turbines in some situations, bringing the power coefficient (C_p) closer to the Betz limit. Here we investigate optimization of the duct design as well as the addition of stator blades upstream of the turbine rotor to introduce pre-swirl in the flow. A small scale three-bladed turbine was tested in a towing tank. Three cases (bare turbine, with duct, and with duct and stators) were tested over a range of flow speeds. Important parameters include duct cross-sectional shape, blade-duct gap, stator cross-sectional shape, and stator angle. For each test, C_p was evaluated as a function of tip speed ratio (TSR). Experimental results were compared with numerical simulations. Results indicate that ducts and stators can improve performance at slower flow speeds and lower the stall speed compared to a bare turbine, but may degrade performance at higher speeds. Ongoing efforts to optimize duct and stator configurations will be discussed.

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