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Reference Model 2: “Rev 0” Rotor Design

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Abstract

The preliminary design for a three-bladed cross-flow rotor for a reference marine hydrokinetic turbine is presented. A rotor performance design code is described, along with modifications to the code to allow prediction of blade support strut drag as well as interference between two counter-rotating rotors. The rotor is designed to operate in a reference site corresponding to a riverine environment. Basic rotor performance and rigid-body loads calculations are performed to size the rotor elements and select the operating speed range. The preliminary design is verified with a simple finite element model that provides estimates of bending stresses during operation. A concept for joining the blades and support struts is developed and analyzed with a separate finite element analysis. Rotor mass, production costs, and annual energy capture are estimated in order to allow calculations of system cost-of-energy.