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CFD tools for characterizing particle passage through an idealized hydro-turbine model.[1] RAJESH SINGH, Pacific Northwest National Laboratory, PEDRO ROMERO-GOMEZ, Andritz HYDRO GmbH, 4030 Linz, Austria, MARSHALL RICHMOND, SAMUEL HARDING, WILLIAM PERKINS, Pacific Northwest National Laboratory — The survival of fish passing through a hydroelectric power plant is a critical challenge to understand and address adverse environment impacts. Although alternative routes to bypass fish in extreme hydraulic conditions are designed in many power plants, fish bypass still remains as a critical issue. A computational fluid dynamics based tool, biological performance assessment (BioPA) method, has been developed to assess the biological performance of fish passage during the turbine design phase in new and existing turbine designs. The current work reports high fidelity turbulent flow investigations to predict the behavior, trajectories, and collisions of inertial particles in an idealized hydro-turbine model to predict the biological impact of hydro turbines on fish passage. The turbulent flow simulations were conducted using detached eddy simulation to accurately capture the flow recirculation and wake region proximate to representative geometry of the distributor of a typical hydro turbine. The flow field proximate to the distributor geometry significantly impacts the trajectory and collision of particles. Naturally buoyant spherical and cylindrical particles were released at the upstream of the distributor. The trajectory and collision rate of the particles to distributor wall is computed and further compared with corresponding experimental results for different conditions.

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