Computational Fluid Dynamics Framework for Turbine Biological Performance Assessment

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ABSTRACT

In this paper, a method for turbine biological performance assessment is introduced to bridge the gap between field and laboratory studies on fish injury and turbine design. Using this method, a suite of biological performance indicators is computed based on simulated data from a computational fluid dynamics (CFD) model of a proposed turbine design. Each performance indicator is a measure of the probability of exposure to a certain dose of an injury mechanism. If the relationship between the dose of an injury mechanism and frequency of injury (dose–response) is known from laboratory or field studies, the likelihood of fish injury for a turbine design can be computed from the performance indicator. By comparing the values of the indicators from various turbine designs, the engineer can identify the more-promising designs. Discussion here is focused on Kaplan-type turbines, although the method could be extended to other designs. Following the description of the general methodology, we will present sample risk assessment calculations based on CFD data from a model of the John Day Dam on the Columbia River in the USA.

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