

# **STOCHASTIC SYSTEM-LEVEL MODELING OF A HYDROPOWER SYSTEM TO INFORM OPERATIONAL DECISION MAKING**

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The optimization of operations of a hydropower system must consider many competing objectives, often including power generation, flood control, ecological constraints, recreational uses, navigation, and safety. Some of these constraints are inflexible, such as preserving the structure of a dam, and some are opportunistic in nature, like when and how to produce power. Operational decisions must be made with consideration of uncertainty, as the principal driver for the system is water, which is provided by nature in a stochastic fashion.

An example of a stochastic system-level model of the system of five dams and reservoirs along the Missouri-Madison River at Great Falls, Montana is presented. The system model, written using the GoldSim software, evaluates the effects of different operational strategies for maximizing power production, constrained by pool elevation limits and minimum flows required for sustaining fish populations. The model user can select operational strategies, and determine their outcomes given different stochastic upstream flows. The model is internally documented and self-explanatory, and is available to the public using a free player version of the GoldSim modeling software.