

Water Power Technologies

Background

The most widespread environmental constraints to the development of hydropower are interference with fish passage, provision of adequate environmental flows, and alteration of water quality. The US Department of Energy is supporting research at its national laboratories to address these issues and to help ensure environmentally sound hydropower development in the following three areas.

Fish Passage

Mortality of downstream migrating fish, particularly as a result of passing through hydropower turbines, remains a serious problem at many sites. The fish passage task focuses on refining our understanding of turbine and reservoir passage stresses and predicting the responses of a wide range of fish species to those stresses. Project objectives include:

- Better characterization of causes of injury/mortality during turbine passage
- Predictions of injury/mortality among untested fish species
- Development and experimental verification of models to predict turbine passage survival for different species, turbine designs, and operating conditions

Environmental Flows

Reservoir releases to support fish habitat and other environmental resources below dams often constrain electrical power production. We are evaluating existing quantitative tools and developing new tools for assessing operational flow releases, so power production and environmental protection can be simultaneously optimized. Project objectives include:

- Develop a method for characterizing altered flow regimes based on their resemblance to the natural hydrograph
- Characterize relationships between various components of natural flow regimes and environmental benefits
- Develop procedures to help operators and regulators select the appropriate flow assessment methodology or approach

Greenhouse Gas Emissions

Concern has been expressed that hydropower reservoirs emit large quantities of greenhouse gases, thereby reducing the value of conventional hydropower as a renewable, emissions-free source of electricity. Studies that document seasonal and regional variations in GHG emissions are underway to develop a predictive understanding of the issue for U.S. reservoirs. Project objectives include:

- Develop measurement protocols for GHG emissions in U.S. reservoirs
- Apply these protocols in reservoirs across a range of climate and hydrodynamic settings
- Develop predictions of reservoir GHG emissions based on climatologic, hydrodynamic, or other environmental characteristics

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