AMERICAN MADE WATER PRIZE

FISH PROTECTION PRIZE

U.S. DEPARTMENT OF ENERGY

Pacific Northwest National Laboratory Capabilities

The Pacific Northwest National Laboratory (PNNL) specializes in research on the environmental effects of water infrastructure and research to improve aquatic ecosystem health. PNNL's staff have diverse capabilities including advanced computing, sensor system design and deployment, aquatic biology, battery technology, advancing material design, and complex field research. Some recent research areas and projects related to the Fish Protection Prize—the experience which could be leveraged during the INCUBATION Stage—include:

- Determining biological criteria for advanced turbine design, fish passage, and survival at hydroelectric projects including fish physiology and energetics
- Modeling river flows and simulating hydroelectric dam and turbine passage using hyperbaric chambers
- Evaluating novel fish passage systems
- Assessing water diversions and fish screens to meet federal and state regulatory guidelines.

Additional capabilities PNNL could provide to INCUBATION Stage participants include:

- Refining an effective pitch for the PITCH CONTEST Stage
- Supporting cost/benefit analyses, siting options, and providing input on regulatory policy
- Engineering support to ground-truth solver ideas and assess feasibility.

Facilities Available for SUPPORT Stage

Aquatic Research Laboratory

The Aquatic Research Laboratory is a state-of-the-art 7,400-square foot Aquatic laboratory space. Competitors will have access to an advanced aquaculture and water reuse system that provides accurate and precise experimental conditions. The aquaculture equipment, including holding, rearing, and incubation tanks, simulates conditions at water infrastructure to study fish passage.

Recirculating Flume

The 13,000 liter (L) flume is 9.1 meters (m) long x 1.2 m wide x 1.2 m deep and incorporates bulk flow rates and jet type at a recirculating pumped and submerged nozzle capable of producing up 21 m/s exit velocities.

Large Scale Test Tank

The fiberglass oval tank is equipped with an instrument positioning system and a removable center divider. The tank measures 3 m x 7.3 m x 1.8 m deep and has a 121,000 L capacity.

Bioacoustics and Flow Laboratory

The Bioacoustics and Flow Laboratory is a multidisciplinary research and development laboratory used to address a broad range of engineering and ecological issues. A team of chemists, engineers, materials scientists, mathematicians, and fish biologists work together on challenges related to environmental monitoring and risk assessment for hydropower energy systems.

PNNL Staff Contributions and Expertise

INCUBATION Stage applicants will have access to experienced PNNL fisheries biologists and systems engineering staff. The test environment will enable competitors to evaluate the feasibility of their ideas with a real-world perspective. These scenarios could include:

- Conducting live fish interactions and determination of passage rates of the system under various test conditions
- Characterization of the bulk water flow and point velocities, diel considerations, fish species, size or life stage, impact of debris, or impingement rates
- The use of Sensor Fish or Sensor Fish Mini to determine possible fish delay or injury locations based on strike, rotation velocity, or pressure
- The characterization of behavior type barriers utilizing hydrophones and photometers, current meters, turbidimeter, and underwater video.

Please reach out to the Fish Protection Prize team at FishProtection@nrel.gov with any further questions.