



*Proudly Operated*  
by **Battelle** Since 1965

## About PNNL

Pacific Northwest National Laboratory is a Department of Energy Office of Science national laboratory where interdisciplinary teams advance science and technology and deliver solutions to America's most intractable problems in energy, national security and the environment. PNNL employs 4,250 staff, has a \$918 million annual budget, and has been managed by Ohio-based Battelle since the lab's inception in 1965.

Pacific Northwest National Laboratory

# Moving marine and hydrokinetic power into the marketplace: The missing link

As our nation transitions from dependence on carbon-based energy to more non-traditional energy sources, the list of successful innovations grows too. Marine and hydrokinetic (MHK) power—harnessing the energy of flowing water—promises to be an important contribution to this shift toward new energy sources.

One of the keys to MHK's successful progression to the marketplace will be the proposed intermediate-scale test facility located at Pacific Northwest National Laboratory's Marine Sciences Laboratory in Sequim, Washington.

## Accelerating the development of MHK devices

The MHK power technology market is expected to grow and mature into a sizable industry in the next 10 to 15 years, just as the wind energy industry has over the last 20 years.

But questions about environmental concerns and device performance must be answered before the market can move forward. These questions cannot be answered through laboratory-scale testing or pilot deployment of devices. An intermediate-scale test facility is needed.

Such a facility will be one-of-a-kind nationwide and will anchor the host of research, development and testing activities required for the MHK industry to mature. For example, an intermediate-scale test facility capable of testing 1/10- to 1/4- scale devices will allow fine-scale measurements of device performance and environmental effects—measurements that cannot be done in the laboratory and must be done before pilot deployment.

A U.S.-based intermediate-scale test facility will accelerate the development of hydrokinetic technologies designed to meet environmental performance requirements in the United States. This could give U.S. companies the competitive edge they need against heavily subsidized European developers, who are currently several years ahead in alternative energy device development.



Aerial view of PNNL's Marine Sciences Laboratory and the proposed site of the intermediate-scale test facility.

## Intermediate-scale testing: location matters

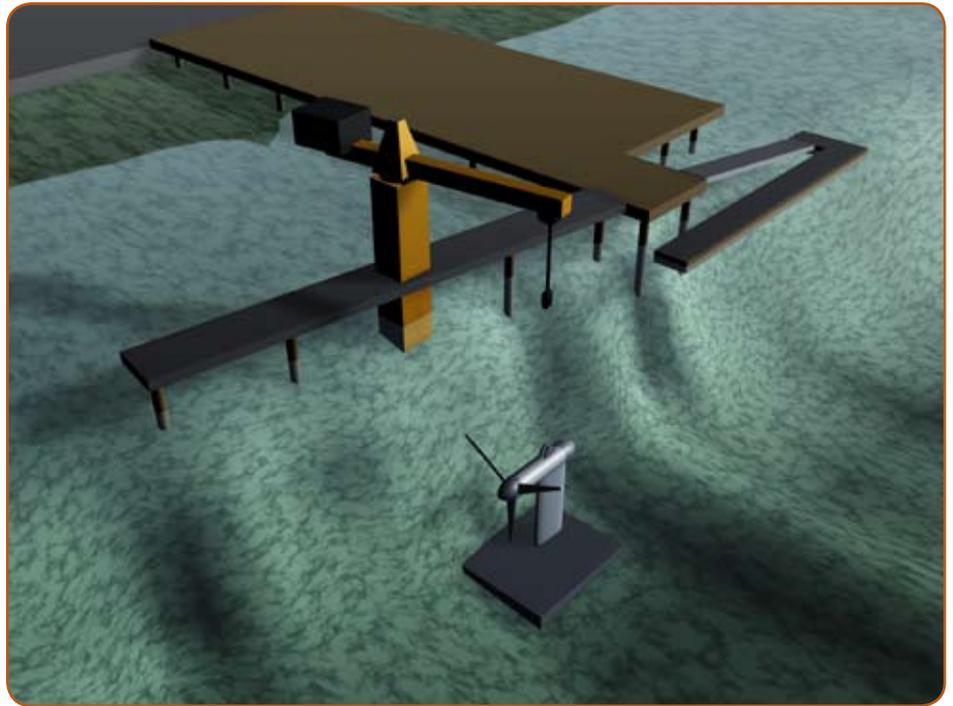
Testing MHK-related devices at an intermediate-scale test facility is critical to bringing this technology to the marketplace. The most effective intermediate-scale facility would provide an environment similar to the one where the devices will be deployed; it would also be near supporting laboratory facilities.

Washington state, and particularly the Puget Sound, has some of the highest potential in the nation for harnessing MHK energy. Sequim Bay, Wash., offers a physical environment similar to that of the Puget Sound. Testing MHK-related devices in Sequim Bay will help researchers understand how these new technologies interact with the biota and physical environment of the Puget Sound. Facilities built elsewhere could not replicate these unique operating and environmental conditions.

## Bringing tidal power to the market

Tidal power is a predictable and potentially significant source of energy. Because of its predictability and the fact that tidal power generation sites are generally closer to urban load centers, tidal power will likely be the first MHK technology ready for market.

But before tidal power is accepted as a viable source of renewable energy, the potential environmental effects as well as the long-term durability, efficiency, and operating costs of MHK devices must be addressed. Answering these questions will require testing in the real world, under known conditions, in an environment similar to where devices will be deployed commercially. An intermediate-scale test facility at PNNL's Marine Sciences Laboratory in Sequim, Wash., will allow users to interact with MHK devices in real time, advancing understanding and confidence in this technology.



This is an artist's rendition of one type of turbine that may be used at the intermediate-scale test facility in Sequim, Wash.

## Promoting responsible research and development

PNNL's proposed intermediate-scale test facility will provide environmental and device assessment capabilities that are not available at the laboratory-scale setting. And unlike a deep-water pilot project deployment, this intermediate test facility will provide accessibility and opportunities for device designers, regulators, and the public to interact with test devices at an onsite information center or via a secure Internet connection. Ultimately, the goal of this facility is to promote responsible investigation and acceptance of tidal power as a meaningful technology in our regional energy portfolio.

The proposed intermediate-scale test facility will be comprised of three primary components related to environmental and device performance monitoring and evaluation:

(1) a testing platform to determine device performance and direct effects to the surrounding environment;

- (2) a sensor array where new sensor/instrument technologies and strategies can be tested to better understand indirect environmental effects; and
- (3) an information center where device manufacturers, regulators and stakeholders can view the operation of devices in real time.

The facility will be modular, with the ability to deploy a wide variety of integrated sensors, device components, and technologies to address multiple research questions and evaluate environmental effects.

### Charlie Brandt

Manager, Marine Sciences Laboratory  
1529 W. Sequim Bay Rd.  
Sequim, Wash., 98382  
(360) 681-3699 • Fax(360)-681-4594  
charles.brandt@pnl.gov



**Pacific Northwest**  
NATIONAL LABORATORY

Proudly Operated by **Battelle** Since 1965