U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Request for Information: Marine Sciences Laboratory

DATE: June 2019

SUBJECT: Request for Information (RFI)

PURPOSE: The main focus of this document is to elicit responses to questions addressing the growing Research and Development (R&D) interest in the use of the Pacific Northwest National Laboratory's (PNNL's) Marine Sciences Laboratory (MSL) facilities for renewable energy, maritime markets, and energy storage research, technology development and testing. This information will help DOE and PNNL prioritize resources and investments.

Description

Pacific Northwest National Laboratory's (PNNL) Marine Sciences Laboratory (MSL), located in Washington State, is the US Department of Energy's (DOE) only marine research facility. The laboratory helps the nation achieve sustainable energy, a healthy environment, and robust security in coastal settings. The purpose of this request for information is to solicit feedback from industry, academia, other national laboratories, government agencies, and private entities regarding the use of this unique DOE marine laboratory as a research, development, testing, and validation venue supporting multiple DOE missions as they relate to the coastal and ocean environment. MSL is a unique facility that offers direct access to clean air and clean marine water and freshwater in the laboratory and in the adjacent environment (including wetlands, sheltered marine water, and near-open ocean conditions), permitted in-water research and development (R&D) venues, research vessels and autonomous research platforms, and a DOE-certified dive team. Personnel expertise covers a broad range of topics, including harnessing the ocean for energy, maximizing the use of marine resources, and enhancing knowledge related to coastal resilience under changing natural and man-made conditions.

This document will describe MSL, its capabilities, and existing and potential projects in the sections below:

1. Background
2. Facilities
3. Capabilities
4. Current Work at MSL
5. Vision beyond Current DOE-Supported Programs

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

1. Background

MSL supports multiple DOE offices including the Office of Energy Efficiency and Renewable Energy's (EERE) Water Power Technologies Office (WPTO), Wind Energy Technologies Office (WETO), Bioenergy Technologies Office (BETO), and Fuel Cell Technologies Office (FCTO). MSL also supports other DOE offices such as Office of Science (OS), Nuclear Energy (NE), Office of Electricity (OE), and Advanced Research Projects Agency-Energy (ARPA-E), and other government agencies, such as the Department of Defense, National Oceanic and Atmospheric Administration (NOAA) and the US Coast Guard. These offices support the following program efforts:

- quantifying environmental effects of marine renewable energy (MRE) including wave, tidal and offshore wind
- developing and testing new technologies to measure environmental conditions around ocean energy conversion devices
- improving productivity of algal biomass for biofuels
- improving the technology and cost performance of systems to extract trace elements (i.e. uranium, selenium, lithium etc.) from seawater
- developing and testing materials and coatings that reduce biofouling and biocorrosion
- developing and validating models combining atmosphere, ocean, and terrestrial processes that integrate responses to changing environmental conditions, quantifying opportunities for ocean energy conversion, and estimating infrastructure risks from hurricanes and coastal flooding
- modeling and characterization of acoustic signatures from biological and anthropogenic sources

Setting of the Marine Sciences Laboratory

MSL (https://marine.pnnl.gov/) is in Sequim, Washington, in the northwest corner of the state on the Olympic Peninsula (Figure 1). The lab is situated at the entrance to Sequim Bay, which opens to the Strait of Juan de Fuca, the body of water separating the US and Canada, and the shipping route for major ports such as Seattle, WA and Vancouver, B.C. The lab's location allows direct access to sheltered bays and to high wind, wave, and tidal flow environments with depths up to 100 m. The current speed in the adjacent channel is up to 2 m/s, with a depth of 10-12 m, opening into a quiescent bay with depths over 30 m. The proximity to open ocean provides one of the cleanest airsheds in the world, providing an ultra-trace-level background for measurement and signature science.

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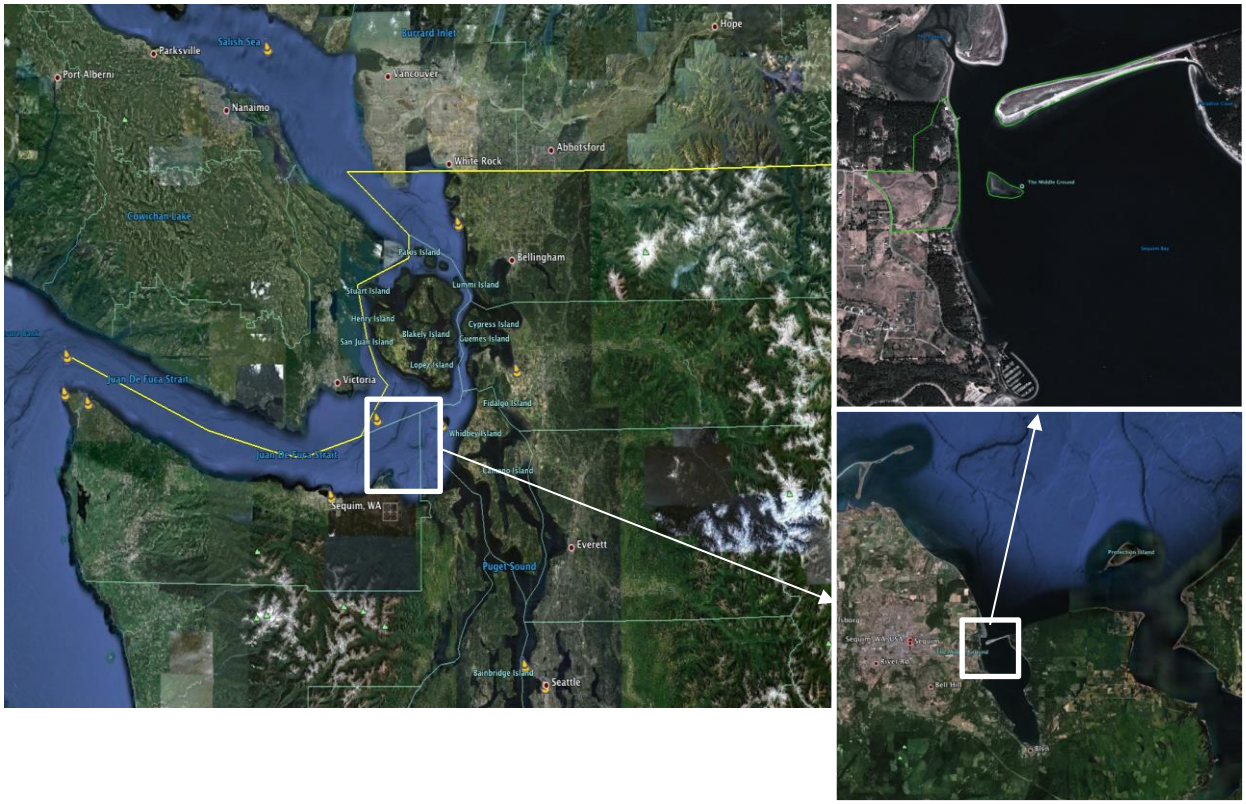

Figure 1 Location of the Marine Sciences Laboratory on the Olympic Peninsula

2. Facilities

The MSL property, approximately 100 acres, contains indoor and outdoor research facilities specifically designed for marine research and ocean science. Aquatic laboratories (15,000 ft^2) are equipped with through-flowing seawater that can be heated, cooled or diluted with freshwater to reflect water conditions from the tropics to the arctic. Experimental tank systems inside and outside the laboratories include flow- and wave-tanks and full-spectrum computer-controlled lighting capabilities. Engineering facilities include electrical and biological laboratories supported by chemistry laboratories for organic and inorganic constituents. The facility maintains a pier and dock with power and data feeds supporting in-water devices, a mobile operations and data analysis command center, and research vessels (Figure 2).

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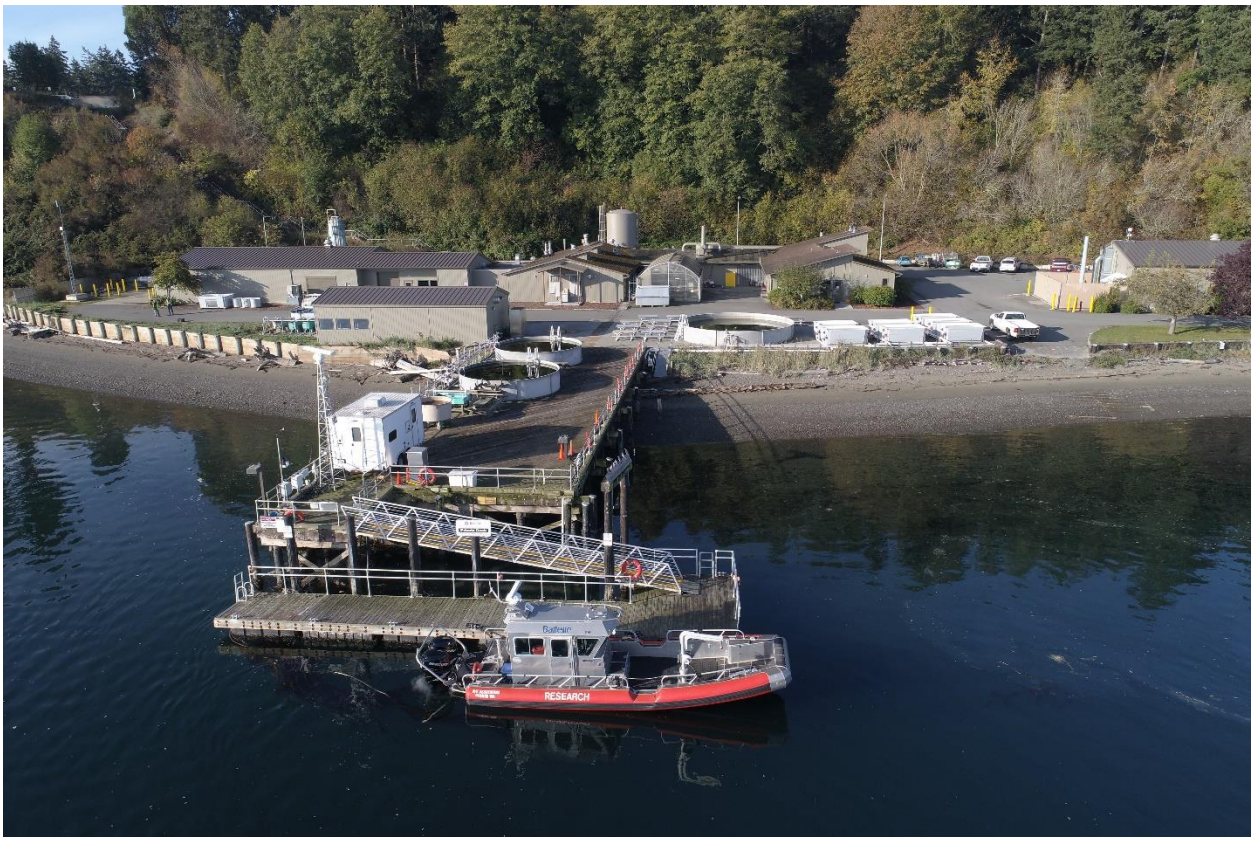

Figure 2 Pier, shoreland facilities and 33-ft SAFE boat

Permitted Areas/Underwater Test Sites and Available Baseline Data

Research and testing of devices in aquatic ecosystems like those adjacent to MSL requires environmental permitting. DOE has worked with PNNL and regulatory agencies to obtain permits for activities at or near MSL including the following activities:

- installation of equipment on or in the seabed
- installation of floating platforms or moored buoys
- installation of scientific equipment on the MSL dock and pier
- deployment and operation of Autonomous Underwater Vehicles (AUVs)
- habitat and species surveys and sediment sampling (amounts, depths, and locations may be limited for sediment sampling without amendments)
- vessel use for deployment of sensors
- operation of acoustic or emitting devices at frequencies outside of marine mammal hearing ranges (below 7Hz or above 180 kHz) or at sound pressures that are below the Level B harassment thresholds for marine mammals (160 dB_{rms})

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- electromagnetic fields studies (temporary operation of EMF fields less than 1.1 µT and 0.5 V/m in a single, discrete location) to test potential impacts to the marine environment

In addition, MSL staff are working with regulatory agencies to obtain permits in Clallam Bay, Washington, a site west of MSL that can be used to test devices under higher wave energy conditions than those found within Sequim Bay.

Consistent data streams are crucial for predictive model inputs such as current velocity and wave height for oceanographic models. Supplemental environmental data, such as sound speed, can be critical to differentiate detailed quantitative analysis for sonar measurements or a generalized estimate with unacceptable error. Current velocity, wave height, sound speed, water quality, bathymetry, and bottom type have been well-characterized in Sequim Bay. Although permits have been obtained to collect baseline data, MSL is not currently collecting real-time data.

Research Vessels

MSL owns several research vessels:

- a 33-ft SAFE Boat with davit and optional gantry system
- a 28-ft Aluminum vessel with A-frame and davit
- a 23-ft SAFE Boat
- a 17-ft- Alumaweld Super-Vee LS
- a Sun Tracker 20 Fun Fish
- a Small-scale tethered visual inspection Remotely Operated Vehicle ROV

MSL leases larger vessels when needed to support large-scale deployments and retrievals and has a standing contract with the University of Washington for their 58-ft research vessel, the R/V Jack Robertson.

Laboratories

Laboratories (**Error! Reference source not found.**) and facilities at MSL support the following areas:

Figure 3 Wet laboratory with circular tanks

- aquatics research laboratories with open floor plans that enable research on chemical, biological, or physical components and processes under controlled conditions
- electronics labs for sensor and platform development
- a pier with floating dock for water and research vessel access
- a freezer laboratory capable of maintaining air temperatures between 0°C and -15°C
- a 720 ft^2 greenhouse plumbed with seawater and freshwater

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- a 8 x 14 ft. mobile operations and command center with power, wireless and wired communications connections
- class-100 clean labs used to prepare, handle, and analyze environmental samples for ultra-trace level determinations of metals and metalloids
- a mercury analytical lab internationally recognized for its unique ability to conduct ultra-trace level measurements of mercury (Hg) and monomethyl mercury (MMHg)
- organic and inorganic chemistry labs for multidisciplinary studies
- biotechnology labs equipped for molecular environmental microbiology, microbial physiology, plant and animal tissue culture, genetic engineering and synthetic biology (Most of these labs are certified as Biosafety Level 2 (BSL2) workspaces.)

Figure 4 Aerial view of the MSL laboratories located in the bluff

Figure 4 provides an aerial view of the laboratories associated with MSL. Two unique features housed at MSL include a 1,100-liter raceway equipped with a paddlewheel and a recirculating pump system that generates turbulence and allows researchers to form frazil ice, and a separate arctic laboratory dedicated to small-scale cold-water research.

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The entire facility is equipped with an onsite waste water treatment system that removes chemical and biological constituents before discharging water to Sequim Bay through a National Pollutant Discharge Elimination System-permitted outfall.

3. Capabilities

Scientists and engineers at MSL, with support from the larger PNNL campus in Richland, Washington have expertise in materials engineering, battery technology, systems engineering and integration, technoeconomic analysis, data analytics, marine technology/engineering, biotechnology, biogeochemistry, ecosystems science, environmental compliance, toxicology, data collection, development of sensors, and earth systems modeling, as well as a scientific dive team to support in-water research, technology development, and testing.

Further details for specific areas are given below.

Sustainable Ocean Energy

Researchers at MSL are enabling sustainable energy from coastal and ocean environments, including renewable electricity, biofuels, hydrocarbons, and nuclear energy. Our science and engineering programs are directed towards the following efforts:

- developing, testing, and deploying predictive tools supporting device siting, operation, performance, and emergency response
- developing, testing, and deploying resource characterization and environmental effects technologies
- developing and testing technologies to improve energy production and environmental performance of MRE devices
- quantifying potential environmental effects in the field and developing any needed mitigation measures
- developing new technologies that couple diverse sensing systems with pattern- and signature-analysis algorithms to identify species and interactions with devices under adverse observing conditions
- developing and testing new materials to improve effectiveness and cost-performance of devices and systems operating in marine environments
- applied biofouling and biocorrosion research and technology development
- developing and testing new technologies to extract critical minerals from marine waters

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Environmental Systems Integrity

MSL researchers deliver integrative science, modeling, and analytical tools to help prevent and reverse damage to terrestrial and aquatic ecosystems, with emphasis on the linkages between them. Areas of focus include the following research:

- research on nutrient, contaminant, and carbon transport and cycling within the land-ocean interface
- multi-scale population, community, and earth systems modeling, linking environmental systems to climate, engineered systems, and landscapes
- adaptive environmental management within a quantitative systems framework

Measurements and Signatures

Researchers work on improving situational awareness and identifying potential threats in multiple ways. Programs focus on developing efficient and effective ways to acquire data from the air, water, sediment and biota, and translate those data into actionable intelligence. These include ultra-trace detection for high fidelity sensing and forensics and maritime systems and operations development and testing.

Scientific Dive Team

MSL has an experienced dive team (Figure 5) composed of research scientists who support scientific and engineering projects in a wide range of underwater environments. Typical assignments include habitat and species assessment, habitat restoration, underwater sampling, equipment deployment, and underwater video and photography. The team has advanced standardized equipment including standard SCUBA, closed-circuit rebreathers, and a variety of scientific and video/photographic equipment. The divers use full face masks that allow underwater communication. The team works under the auspices of a Diving Control Board and can perform both scientific and light commercial dives, the latter for the purposes of installing, maintaining, and retrieving scientific equipment.

Figure 5 Members of the dive team

Coastal and Ocean Modeling

Modelers at MSL develop and apply state-of-the-art oceanographic, hydrodynamic, water quality, and ecosystem models in watersheds, rivers, estuaries, and coastal regions. Comprehensive numerical modeling builds scientific understanding and supports decision making for all aspects and scales of the

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hydrologic cycle, including resource assessment for marine energy and river energy generation devices. Investigations include hydrodynamics, water quality and quantity, sediment transport, and ecosystem modeling that support the diversity of science and decision needs. Modeling capabilities range from simple one-dimensional (1-D) flow and effluent dilution models to complex three-dimensional (3-D) hydrodynamic models, incorporating computational fluid dynamics (CFD), fate and transport, and comprehensive water quality models. In addition, PNNL's computational sciences portfolio, including computational engineering, high performance computing, semantic and human language technologies, machine learning, systems integration and software development are at the forefront of basic and applied research.

4. Current Work at MSL

Researchers and facilities at MSL currently support several DOE EERE programs including the Office of Energy Efficiency and Renewable Energy's (EERE) Water Power Technologies Office (WPTO), Wind Energy Technologies Office (WETO), Bioenergy Technologies Office (BETO), and Fuel Cell Technologies Office (FCTO). MSL also supports other DOE offices such as Office of Science (OS), Nuclear Energy (NE), Office of Electricity (OE), and Advanced Research Projects Agency-Energy (ARPA-E), and other government agencies, such as the Department of Defense, National Oceanic and Atmospheric Administration (NOAA) and the US Coast Guard. Brief descriptions of projects from some of these offices are provided in the following sections.

EERE - Water Power Technologies Office Research

WPTO supports early-stage research focused on innovative water power technologies designed to ensure that environmental issues are addressed. Examples of such work at MSL are given below.

Triton Initiative

Since 2015, the Triton Initiative has supported the development of advanced and cost-effective environmental monitoring technologies for MRE. This includes providing permitted underwater test sites, vessels and scientific crew support. The expertise and capabilities of Triton are leveraged to provide testing and technical development support to competitively-selected awardees from a separate DOE funding opportunity targeted at improving technical performance while reducing costs of technologies. The research includes baseline data collection of seafloor characteristics, integrated acoustic monitoring systems to measure noise emission from turbines or capture sounds made by nearby marine species, electromagnetic force generated from cables and devices, and remote sensing techniques for monitoring environmental interactions of marine species with devices.

In addition to the environmental monitoring technology development, MSL is leading an effort to observe fish behavior around a deployed tidal turbine combining optical and sonar sensors with tagged fish for separate 3D tracking. Beyond this, Triton is developing recommendations for consistent environmental measurements through the development of guidelines for the marine energy industry.

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Ocean Energy Systems (OES) Environmental/Annex IV and Tethys

Information on potential environmental effects of MRE have been collated, studied, and made widely available worldwide in partnership with the international collaborative OES, and through the online knowledge management system Tethys (https://tethys.pnnl.gov). In partnership with other OES countries, the environmental initiative has gathered scientific literature, monitoring reports and data collected from deployed wave and tidal devices, as well as expert inquiry and judgement to provide insight into how environmental effects influence regulatory processes for deployment and operation of MRE devices. By collaborating internationally, MSL staff can benefit from the timeliest information, often before formal papers or reports are written. All the information and analyses created under OES-Environmental are publicly available and gathered in the *State of the Science* report every four years. Working with experts in North America, Europe, and Asia, timely and pertinent information is readily available to assist regulators, researchers, and developers in moving the MRE industry forward.

BioFouling Research

MSL biotechnology experts are developing a new antifouling coating to address the unique operating needs and environment of MRE devices. As a member of the multi-lab Advanced Materials Program, MSL performs in-water tests demonstrating how advanced composites materials perform in the marine environment. It is anticipated that MRE devices will need multiple materials types, which introduces an untested potential for fouling and several corrosion processes (e.g., galvanic, stress/crack, crevice, pitting, microbially-induced) between composite-metal interconnects. MSL and its partner labs are working closely with industry to advise on materials and coatings to improve device design and efficiency while reducing operations and maintenance costs.

Maritime Markets/Powering the Blue Economy

Information on potential end markets for MRE power have been investigated over the past 2 years, culminating in a report for WPTO (*Powering the Blue Economy: Exploring Opportunities for Marine Renewable Energy in Maritime Markets*). The report sets the stage for a multi-year strategy that will help national laboratories, university researchers, and the industry apply their expertise and resources to pursuing engineering solutions and analytical tools for these off-grid markets. As part of the WPTO contribution to the emerging Blue Economy, foundational research and development programs will pursue a design-build-test program at MSL.

EERE - Wind Energy Technologies Office Research

MSL has supported the WETO office in the development of technologies associated with offshore wind through resource characterization and the assessment of environmental effects of development and operations. Descriptions for two key projects are provided below.

Wind research LiDAR buoys

The MSL wind research team manages two WindSentinel™ buoys from AXYS. These provide atmospheric and oceanographic measurements for offshore wind resource characterization.

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Observations are recorded and transmitted via high-bandwidth cellular communications to the managed data archive at PNNL. Available observational data include the following information:

- wind profile
- near-surface wind speed
- near-surface air temp, humidity, and pressure
- solar radiation
- wave height
- surface water temperature
- water velocity profile
- water temperature and conductivity profile

Thermal Tracker

ThermalTracker™ is a system for observing bird and bat activity at remote locations. The system uses thermal stereo vision to detect moving animals, characterize their motion – direction of travel, speed, flight height – and provide taxonomic classification. The system was developed at MSL with offshore wind energy in mind, and thus operates autonomously in a marine environment. Real-time processing reduces the raw video data to a concise description of observed animals and composite motion track images. This technology can be used to characterize bird and bat activity at a proposed ocean energy site and to monitor activity post-construction.

EERE - Bioenergy Technologies Office

Algal BioFuels

MSL experts developed climate simulation ponds for culturing aquatic photosynthetic organisms under specific geographical or seasonal conditions. Climate simulation ponds can simulate light (as photosynthetically active radiation), and temperatures of nearly any geographic location by using custom-built, solar-spectrum LED panels. The ponds are plumbed for using seawater, freshwater, and brackish waters for a variety of micro- and macroalgal cultivation experiments.

EERE - Fuel Cell Technologies Office

H2@Ports

PNNL is working with FCTO on evaluating the potential use for hydrogen and fuel cells at seaports as part of the H2@Scale vision (https://www.energy.gov/eere/fuelcells/h2scale). Most US seaports have difficulty in meeting government clean air requirements and thus would benefit from low to near-zero emission fuel cells for different applications. Fuel cells could provide hotel loads for docking ships, shore-side power for cranes and primary or auxiliary power for reach stacks (lift trucks), drayage trucks, cold ironing, and other light, medium and heavy-duty ordinary goods vehicles. The project will identify the potential for hydrogen use in these applications. Another H2@Scale area of interest is the potential use

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of off-shore or deep sea marine resources to producer hydrogen or hydrogen-rich fuels for large-scale energy transport.

Advanced Research Projects Agency - Energy

Development of the Ocean NOMAD (Nautical Off-shore Macroalgal Autonomous Device) for Low-Cost Production of Biomass for Foods, Feeds, and Fuels

The objective of this proposed project is to design, build, and field-test a NOMAD, which is a free-floating sensor-equipped seaweed longline (5 km). The NOMAD would be released from a seeding vessel far offshore the United States West Coast and collected by harvesting boats after six months of southbound journey (~1500 km) along nutrient-rich ocean currents. By continuously releasing seeded NOMADs, the proposed scalable seaweed cultivation system would be capable of generating a similar magnitude of biomass as a 1000-Ha farm. If selected for Phase 2 funding, field testing of kelp growth would be supported by PNNL's research vessels and dive team. Seeded kelp lines would be deployed with anchors, GPS buoys and motion sensors for growth and functionality testing in Sequim Bay under provisional permits for a 2-ha test site. This permit would enable research involving underwater installations, buoys, vessel use, and AUV operation.

Modeling for Scalable Macroalgae Production

As part of the ARPA-E MARINER (Macroalgae Research Inspiring Novel Energy Resources) program, the PNNL project is developing modeling tools to simulate macroalgae trajectories for free-floating systems and, supported by biogeochemical modeling, macroalgae growth and biomass yields. The mechanical stresses on macroalgae from ocean currents and waves will also be simulated. PNNL's set of modeling tools will provide information essential for the deployment and real-time management of free-floating seaweed production systems in the open ocean.

Office of Nuclear Energy

Uranium from Seawater

This research was conducted to develop new technology to extract uranium in anticipation of future shortages and price increases as terrestrial resources diminish. MSL scientists determined the performance, adsorption capacity and durability of novel adsorbents prepared by the program team. The results of the laboratory trials led to a follow-on DOE-NE project sponsored by the Small Business Innovation Research (SBIR) program to commercialize a patent-pending uranium adsorbent. The project resulted in the ability to create a gram-size of a type of uranium concentrate powder from the ocean. In addition to the uranium program, MSL experts are evaluating other critical elements such as lithium co-extracted from seawater.

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Other Related Marine Programs at MSL

Tidal turbines in collaboration with University of Washington Applied Physics Laboratory

MSL is collaborating with the Applied Physics Laboratory at the University of Washington to deploy small cross-flow turbines at a permitted underwater site in Sequim Bay. One goal is to explore tidal turbine power integration with environmental monitoring technologies, but it will also consider wake interaction, plus maintenance operations. This work is funded by the US Department of Defense Naval Facilities Engineering Command and Office of Naval Research.

5. Vision beyond Current DOE-supported Programs

Beyond the current role MSL is providing to DOE, it is a unique resource for midscale testing of MRE devices. MSL is equipped to explore innovative ways to harness non-grid scale energy to recharge AUVs, extend missions dedicated to ocean observations, supply power to islands and isolated communities, and power desalination facilities. MSL could also support offshore aquaculture facilities, increase biosecurity in the marine domain, power nearshore marinas and ports with existing coastal protection infrastructure, provide emergency power following coastal disasters, and study the environmental and economic impacts associated with increasing coastal development and changes in sea level and temperature of the oceans in the coming decades.

DOE-EERE has estimated that nearly 30% of all US energy needs could come from technically extractable marine energy. WPTO has created an initiative around the concept of “Powering the Blue Economy” building on the work done to date.

Blue Economy

In the coming decades, sustainable use of oceans, coasts, and rivers will lead to economic growth, improved livelihoods, and overall ecosystem health. This emerging concept is referred to by many global organizations as the Blue Economy (e.g. European Commission, World Wildlife Fund, Conservation International, Word Bank, and the Center for the Blue Economy).

According to estimates by the Organization for Economic Cooperation and Development (OECD) by 2030, the Blue Economy could outperform the global economy over the next ten years. Sectors within the Blue Economy such as marine energy, marine biotechnology, coastal tourism, transport and food production will offer unprecedented development and investment opportunities.

MSL facilities and expertise will be used along with key partners to support ocean science, security, and innovative technology development using MRE. The capabilities can be used to test ideas and methods for other Blue Economy research, linking into the MRE development mentioned above, but expanding the range of technology and skills being developed.

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Maritime Markets (Powering the Blue Economy)

Maritime markets fit within the context of the larger theme of the Blue Economy. At this time, WPTO is assessing eight maritime markets where applications may exist for MRE technologies. These are markets that are less price-sensitive than utility-scale, and better suited to the smaller MRE devices under development. MRE has the potential to generate power where none has previously been available; the eight end uses have been grouped as *Power at Sea* and *Resilient Coastal Communities*.

Power at Sea end uses include providing power for ocean observations:

- recharging AUVs for ocean exploration and surveillance
- offshore aquaculture power needs including growing macroalgae at sea
- mining of seawater for essential minerals

Resilient Coastal Communities considers the use of MRE in replacing or augmenting power for isolated coastal and island communities*:*

- desalinating seawater for potable water in isolated coastal areas
- generating power in conjunction with shoreline protection infrastructure like breakwaters
- providing power and clean water for recovery after coastal disasters
- other emerging uses

Maritime markets likely to succeed are co-located with abundant wave or current resources, optimized for seasonal energy availability and need, and located proximate to end user needs. Maritime markets and MRE could work synergistically with other renewables, allowing both MRE and innovative end uses to co-develop towards new technologies. The maritime markets will require energy storage at sea or on land.

Additional foundational research and development on promising maritime markets is focusing on analysis of present and future uses and specific requirements that will allow MRE to co-develop with multiple maritime markets including smart microgrids at sea, following a multiyear WPTO and laboratory strategy.

Purpose

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on issues related to the growing Research and Development (R&D) interest in the use of the Pacific Northwest National Laboratory's (PNNL's) Marine Sciences Laboratory (MSL) facilities for renewable energy, maritime markets, and energy storage research, technology development and testing. This information will help DOE and PNNL prioritize resources and investments. This is solely a request for information and not a Funding Opportunity Announcement (FOA). EERE is not accepting applications.

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Disclaimer and Important Notes

This RFI is not a Funding Opportunity Announcement (FOA); therefore, EERE is not accepting applications at this time. EERE may issue a FOA in the future based on or related to the content and responses to this RFI; however, EERE may also elect not to issue a FOA. There is no guarantee that a FOA will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if EERE chooses to issue a FOA regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of EERE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. EERE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. EERE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that EERE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind EERE to any further actions related to this topic.

Proprietary Information

Because information received in response to this RFI may be used to structure future programs and FOAs and/or otherwise be made available to the public, **respondents are strongly advised to NOT include any information in their responses that might be considered business sensitive, proprietary, or otherwise confidential.** If, however, a respondent chooses to submit business sensitive, proprietary, or otherwise confidential information, it must be clearly and conspicuously marked as such in the response.

Responses containing confidential, proprietary, or privileged information must be conspicuously marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Federal Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

If your response contains confidential, proprietary, or privileged information, you must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

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Notice of Restriction on Disclosure and Use of Data:

Pages [List Applicable Pages] of this response may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI [Enter RFI Number]. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

In addition, (1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: "Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure" and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

Evaluation and Administration by Federal and Non-Federal Personnel

Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to EERE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

Request for Information Categories and Questions

Questions Related to Current Capabilities

1. Which MSL capabilities/expertise and facilities/equipment would you use, and for what purpose?
2. What additional capabilities/expertise and facilities/equipment would increase your likelihood of using MSL?
3. What baseline/background measurements would you want to test sensors/devices at MSL?
4. How could MSL become a more suitable site for early testing of sensors/devices? What mechanisms would be useful to enable this?
5. Any other comments on capabilities/expertise, facilities/equipment, challenges, and opportunities.

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Questions for Maritime Markets and the Blue Economy

1. What are the top gaps in knowledge/experience/technology that you consider are preventing the advancement of Maritime Markets and the Blue Economy?
2. What capabilities and facilities should MSL invest in to better position itself in support of Maritime Markets and the Blue Economy?
3. What range of conditions would be useful for testing technologies supporting the Blue Economy, including, but not limited to MRE technologies?
4. Which of MSL's capabilities/expertise and facilities/equipment would be useful in developing and validating MRE technologies for existing and emerging Maritime Markets?
5. What are the missing or underdeveloped capabilities/expertise and facilities/equipment at MSL that are needed to fully support the advancement of existing and emerging maritime markets and the Blue Economy?
6. What capabilities/expertise and facilities/equipment not listed here would be of use to you to progress the development of maritime markets?
7. What type of external monitoring of the environment or the technologies themselves would be useful for you (e.g., water level, temperature, acoustic, visual, hydrodynamic) when testing or demonstrating your technologies?
8. What partnerships within the Blue Economy clusters around the country/world would be useful to you?
9. Any other comments on capabilities/expertise, facilities/equipment, challenges, and opportunities.

Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to WPTORFI@ee.doe.gov no later than 5:00 p.m. on August 8, 2019. Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as an attachment to the email, and no more than 10 pages in length, 12-point font, and 1 inch margins. Only electronic responses will be accepted.

Please identify your answers by responding to a specific question or topic if applicable. Respondents may answer as many or as few questions as they wish.

EERE will not respond to individual submissions or publish publicly a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the start of their response to this RFI:

This is a Request for Information (RFI) only. EERE will not pay for information provided under this RFI and no project will be supported as a result of this RFI. This RFI is not accepting applications for financial assistance or financial incentives.

- *company / institution name;*
- *company / institution contact;*
- *contact's address, phone number, and e-mail address.*

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