

PMC-ND

(1.08 09.13)

**U.S. DEPARTMENT OF ENERGY  
OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY  
NEPA DETERMINATION**

**RECIPIENT:** Virginia Polytechnic Institute and State University**STATE:** VA**PROJECT TITLE** : Efficient and Reliable Power Takeoff for Ocean Wave Energy Harvesting

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DEFOA0001182	DEEE0007174	GFO-0007174-002	

**Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), I have made the following determination:**

**CX, EA, EIS APPENDIX AND NUMBER:**

Description:

**A9 Information gathering, analysis, and dissemination** Information gathering (including, but not limited to, literature surveys, inventories, site visits, and audits), data analysis (including, but not limited to, computer modeling), document preparation (including, but not limited to, conceptual design, feasibility studies, and analytical energy supply and demand studies), and information dissemination (including, but not limited to, document publication and distribution, and classroom training and informational programs), but not including site characterization or environmental monitoring. (See also B3.1 of appendix B to this subpart.)

**B3.6 Small-scale research and development, laboratory operations, and pilot projects** Siting, construction, modification, operation, and decommissioning of facilities for smallscale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment.

**B5.25 Small-scale renewable energy research and development and pilot projects in aquatic environments** Small-scale renewable energy research and development projects and small-scale pilot projects located in aquatic environments. Activities would be in accordance with, where applicable, an approved spill prevention, control, and response plan, and would incorporate appropriate control technologies and best management practices. Covered actions would not occur (1) within areas of hazardous natural bottom conditions or (2) within the boundary of an established marine sanctuary or wildlife refuge, a governmentally proposed marine sanctuary or wildlife refuge, or a governmentally recognized area of high biological sensitivity, unless authorized by the agency responsible for such refuge, sanctuary, or area (or after consultation with the responsible agency, if no authorization is required). If the proposed activities would occur outside such refuge, sanctuary, or area and if the activities would have the potential to cause impacts within such refuge, sanctuary, or area, then the responsible agency shall be consulted in order to determine whether authorization is required and whether such activities would have the potential to cause significant impacts on such refuge, sanctuary, or area. Areas of high biological sensitivity include, but are not limited to, areas of known ecological importance, whale and marine mammal mating and calving/pupping areas, and fish and invertebrate spawning and nursery areas recognized as being limited or unique and vulnerable to perturbation; these areas can occur in bays, estuaries, near shore, and far offshore, and may vary seasonally. No permanent facilities or devices would be constructed or installed. Covered actions do not include drilling of resource exploration or extraction wells, use of large-scale vibratory coring techniques, or seismic activities other than passive techniques.

## Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to Virginia Tech to improve upon current ocean wave energy harvesting by designing, prototyping, and validating an innovative PTO (Power Take-Off) with a novel Mechanical Motion Rectifier (MMR) mechanism and unique power electronics to improve energy conversion efficiency and power output and reduce failure rate.

DOE previously completed a NEPA review for Tasks 1-8 of the proposed project (GFO-0007174-001 CXA9 and B3.6 11/17/2015). Since that time Virginia Tech has made some modifications to the Statement of Project Objectives (SOPO), added some additional proposed tasks, and re-numbered previously approved tasks.

In the original SOPO Virginia Tech proposed nine tasks for this project, with Tasks 1-8 previously reviewed. In their new SOPO Virginia Tech proposes 11 tasks.

Tasks 1-4 remain the same. These tasks were previously reviewed.

The new Task 5 (Tank Testing and In Water Test of Scaled Wave Energy Converter (WEC)) is a new task which must be evaluated in this NEPA review.

Though slightly renamed, the new Tasks 6, 7, and 8 are the same as the old Tasks 5, 6, and 7. These tasks were previously reviewed.

The new Task 9 (Development of Control Algorithms for Device Tuning and Peak Power Extraction) is a new task which must be evaluated in this NEPA review.

Though slightly renamed, the new Task 10 is the same as the old Task 8. That task was previously reviewed.

The new Task 11 (Third-party Verification and Planning for In-ocean Testing) is a new task which must be evaluated in this NEPA review.

The new Task 5 would include three subtasks. Subtask 5.1 would involve the testing of a 1:20 scale WEC in a wave tank. Subtask 5.2 would include testing of the 1:20 scale WEC in Claytor Lake, at Claytor Lake State Park in Dublin, Virginia. Subtask 5.3 would involve testing the 1:20 scale WEC in the Atlantic Ocean near Virginia Beach, Virginia.

The proposed WEC device to be tested would be an approximate 1:20 scale point absorber. (Design and fabrication of the proposed device was reviewed during the previous NEPA determination). The device would consist of an approximate 8 inch diameter 10 foot long shaft. Attached to the bottom of the shaft would be an approximate 10 inch diameter 10 foot long truss section. Attached to the bottom of the truss would be a water tank which could hold approximately 1,000 gallons of water and would be approximately 6 feet in diameter and 8 feet in length. A 48 inch diameter buoy/float would be attached to the shaft approximately 6 feet from the top of the shaft. When installed into the water the device would have approximately 6 feet of shaft sticking above the waterline, and approximately 22 feet of device (remaining shaft, truss, and water tank) below the water line, with the buoy at the water line. The device would be constructed of aluminum, plastic, stainless steel and rubber, and would contain no hazardous materials.

Under Subtask 5.1 Virginia Tech would test the device in the University of Maine indoor wave tank located at the University Advanced Structures & Composite Center. The university wave tank is a purpose built center designed for testing WEC devices. No modifications to the wave tank or Center would be required for the tests.

Under Subtask 5.2 Virginia Tech would test the device in Claytor Lake, at Claytor Lake State Park in Dublin, Virginia. Virginia Tech would conduct the test in one day, between July 15 and August 15, 2017. Virginia Tech would load the device into a van on the morning of the test, drive to Claytor Lake on paved roadways, and park in a paved parking lot that includes a paved boat ramp. Virginia Tech would then place the device in the water at the bottom of the boat ramp. The water tank located at the bottom of the device would be filled with air so that, given the buoy on near the top of the device, the entire device would be floating on top of the water. Virginia Tech would attach a 1/2 inch diameter rope to the top of the device and a 3/8 inch diameter cable to the bottom of the device. Virginia Tech would then use a 30 foot long aluminum pontoon boat to drag the device into the middle of Lake Claytor. This would take approximately 10 minutes. Virginia Tech would then open a valve on the water tank, the tank would fill with lake water, and the device would position itself with the water tank at the bottom of the device in the lake, and the shaft above the buoy sticking out of the lake. Virginia Tech would allow the device to float and collect data for approximately 2 hours. Virginia Tech would then tow the device back to the boat ramp and, using the cable attached to the bottom of the device, pull the tank onto the ramp where the water could be drained. The testing would be completed in one day and all testing work would be completed during daylight working hours. At no time would the device engage with the bottom or shoreline of the lake.

There are 5 Threatened or Endangered (T&E) species known to occur in the area around Claytor Lake State Park, but the area contains no critical habitat. T&E species include the Indiana Bat, the Northern Long-eared Bat, the Virginia Big-eared Bat, the Virginia Fringed Mountain Snail, and the Smooth Coneflower. The testing of the device would be completed in the middle of the day when bats are least active. The above water portion of the device would consist of an 8 inch diameter shaft sticking up from the lake approximately 6 feet. Given the time of day of device testing, the limited 2 hour period of testing, and the small size of the device above water line, the proposed testing would not affect the Indiana Bat, the Northern Long-eared Bat, or the Virginia Big-eared Bat. The Virginia Fringed Mountain Snail lives on the bluffs above the New River, which feeds in and out of Claytor Lake. Given that the device will be placed into the water at a paved boat ramp, and that at no time will the device or the boat contact the shore of the lake or river, the proposed testing would not affect the Virginia Fringed Mountain Snail. Likewise, since there will be no contact with terrestrial areas with the exception of the paved road, parking lot, and boat ramp, the proposed testing would not affect the Smooth Coneflower. Based on this "no effect" determination, DOE is not required to consult with the US Fish and Wildlife Service under the Endangered Species Act prior to authorizing expenditure of federal funds for task subtask 5.2. For subtask 5.2 Virginia Tech must comply with any local or state requirements, including but not limited to obtain necessary permits and authorizations from Claytor Lake State Park, and follow all required boating and safety regulations.

Subtask 5.3 would include testing in the ocean off Virginia Beach, VA. There are numerous T&E species known to be in the proposed testing area, however DOE does not at this time have enough information to evaluate the impacts of that proposed testing. A Biological Evaluation would need to be completed by Virginia Tech prior to a NEPA review of subtask 5.3.

The new Tasks 9 and 11 would involve information gathering, algorithm development, computer modeling, concept designs, third party review, and development of a test plan. Some work may be completed at the National Renewable Energy Labs (NREL) in Golden, CO.

Any work proposed to be conducted at a DOE laboratory may be subject to additional NEPA review by the cognizant DOE NEPA Compliance Officer for the specific DOE laboratory prior to initiating such work. Further, any work conducted at a DOE laboratory must meet the laboratory's health and safety requirements.

Based on the review of the proposal, DOE has determined the Subtasks 5.1 and 5.2 and Tasks 9 and 11 fit within the class of action(s) and the integral elements of Appendix B to Subpart D of 10 CFR 1021 outlined in the DOE categorical exclusion(s) selected above. DOE has also determined that: (1) there are no extraordinary circumstances (as defined by 10 CFR 1021.410(2)) related to the proposal that may affect the significance of the environmental effects of the proposal; (2) the proposal has not been segmented to meet the definition of a categorical exclusion; and (3) the proposal is not connected to other actions with potentially significant impacts, related to other proposals with cumulatively significant actions, or an improper interim action. This above identified Subtasks and Tasks are categorically excluded from further NEPA review.

#### NEPA PROVISION

DOE has made a conditional NEPA determination for this award, and funding for certain tasks under this award is contingent upon the final NEPA determination.

Insert the following language in the award:

You are restricted from taking any action using federal funds, which would have an adverse affect on the environment or limit the choice of reasonable alternatives prior to DOE/NNSA providing either a NEPA clearance or a final NEPA decision regarding the project.

Prohibited actions include:

Subtask 5.3 - Ocean test of 500W WEC

This restriction does not preclude you from:

Task 1.0: Model and Analyze the Marine Hydrodynamics and MMR Dynamics

Task 2.0: Design and Development of MMR-based PTOs

Task 3.0: Power Electronics Design

Task 4.0: Lab Testing and Evaluation

Subtask 5.1: Test of the 1:33 scale WEC in wave tank

Subtask 5.2: Lake test of the scaled WEC

Task 6: Optimize the Marine Hydrodynamics and MMR Dynamics of 10 kW PTO

Task 7: Development of the 10 kW MMR-based PTO

Task 8: 10 kW PTO Power Electronics Design

Task 9: Development of the Control Algorithm(s) for Device Tuning and Peak Power Extraction

Task 10: National Renewable Energy Laboratory (NREL) Testing and Evaluation

Task 11: Third-party Verification and Planning for In-ocean Test

If you move forward with activities that are not authorized for federal funding by the DOE Contracting Officer in advance of the final NEPA decision, you are doing so at risk of not receiving federal funding and such costs may not be recognized as allowable cost share.

Insert the following language in the award:

You are required to:

Any work proposed to be conducted at a DOE laboratory may be subject to additional NEPA review by the cognizant DOE NEPA Compliance Officer for the specific DOE laboratory prior to initiating such work. Further, any work conducted at a DOE laboratory must meet the laboratory's health and safety requirements.

For subtask 5.2 Virginia Tech must comply with any local or state requirements, including but not limited to obtain necessary permits and authorizations from Claytor Lake State Park, and follow all required boating and safety regulations.

Note to Specialist :

Water Power Technologies Office.

This determination does require a tailored NEPA provision.

Review completed by Roak Parker on 6/14/17

**SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.**

NEPA Compliance Officer Signature: \_\_\_\_\_



Signed By: Kristin Kerwin

Date: 6/15/2017

NEPA Compliance Officer

**FIELD OFFICE MANAGER DETERMINATION**

Field Office Manager review required

**NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:**

- Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
- Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

**BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :**

Field Office Manager's Signature: \_\_\_\_\_

Field Office Manager

Date: \_\_\_\_\_