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



RECIPIENT: Alaska Center for Energy and Power

STATE: AK

**PROJECT TITLE:** Water Horse Hydroelectric Harvester Development

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DE-FOA-0001663	DE-EE0008389	GFO-0008389-001	GO8389

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Policy 451.1), 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 funding to the Alaska Center for Energy and Power (ACEP) to design, develop, and test a novel hydrokinetic generator (i.e. the "Water Horse") that would produce energy from turbulent water conditions in river environments. A prototype device would be fabricated and tested in laboratory environments. Field demonstration activities would then be performed at the Tanana River Test Site (TRTS) in Nenana, Alaska in June/July in 2020 and 2021.

Proposed project activities would include the following:

Task 1: Electrical System Development – This activity would focus on the design and assembly of a 1.5 kW electrical system for the water horse prototype. Task work would include the selection of a commercial generator, system component assembly, and preliminary device testing. The water horse prototype would be assembled from off-the-shelf, commercially available components and equipment.

Task 2: Mechanical System Development – This activity would focus on design work for the mechanical systems of the prototype device. Task work would include system dynamics simulations, linkage transmission design, water horse prototype platform design, and computer-based performance simulations.

Task 3: Single Device Islanded Microgrid Testing, Performance Assessment and Validation – This task would consist of a laboratory-based power demonstration of the prototype's electrical system using a microgrid system installed at the University of Alaska Fairbanks (UAF). Grid/control interfaces and the mechanical drive system for the water horse prototype generator

Task 4: Single Device Field Testing – This task would consist of field testing of the water horse prototype at the TRTS in Nenana. Testing would be performed in the first year (i.e. June/July 2020). A field testing plan would be developed at the outset of the task. Field preparation activities would then be performed, including boat ramp repair/renovation, deployment of a debris diversion platform, monitoring equipment deployment, and prepping the instrumentation barge for transport of the water horse prototype.

Boat ramp repair/renovation would consist of filling in ruts and grooves in the earthen ramp that have developed during the spring snow melt. A bulldozer would be used to patch these ruts. Throughout the process of patching the ramp a three-foot buffer would be maintained between the river and the portion of the ramp in which grading ceases. Accordingly, it is not anticipated that any runoff would be deposited into the Tanana River.

The water horse prototype and associated devices would be deployed for testing using a barge measuring 24 ft. by 40 ft. All testing devices would fit within the barge. The barge would be launched using pneumatic rollers. A bulldozer/front end loader would be used to push the barge down the ramp and into the river in a controlled fashion. A motorboat would then be used to push the barge upstream into position.

The turbine would be anchored to the river bed using a custom-made system consisting of a research platform, a surface debris deflector, a mooring buoy, and a drag embedment anchor. Once anchored, field-testing of the water horse prototype would be performed over a five day period.

Task 5: Single Device Signal Conditioning Development – This task would consist of the design and assembly of a power conditioning system, which would condition the electric power harvested from the water horse so that the energy is suitable for grid use. This task work would be undertaken concurrently with task 4. Field testing of the system would take place as part of the water horse testing (Tasks 4 and 8). The power condition system would be connected to the water horse and mounted on the barge, above the water surface. Power (e.g. voltage, current) and hydrodynamic variables would be monitored during testing to characterize the performance of the coupled systems.

Task 6: Mechanical Modification and Second Prototype Fabrication – This task would consist of the design and fabrication of a second, optimized 1.5 kW prototype. The second prototype would incorporate mechanical modifications based on lessons learned from previous testing.

Task 7: Dual System Islanded Microgrid testing, Performance Assessment and Validation – This task would consist of laboratory-based testing of the second prototype's electrical system using UAF's microgrid system.

Task 8: Dual system field testing – This task would mirror the testing performed during the first year as part of Task 4. Testing would be performed using both 1.5 kW water horse prototype devices during the second year (i.e. June/July 2021). A testing plan would be developed and the testing site would be prepared in the same manner as specified under Task 4. Field testing would last for 10 days.

Task 9: Synthesis and Reporting – This task would consist of the preparation and delivery of all final reporting materials.

The land where the TRTS is located is owned by the Nenana Native Council and a land use agreement with UAF is currently in place. National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) data

show no threatened or endangered species (T&E species) listed under the Endangered Species Act or critical habitats at the testing site location. As such, DOE has determined that the project would have no effect on T&E species and/or their critical habitats. The National Register of Historic Places (NRHP) shows no listed properties near the TRTS.

Permits to perform work activities in the Tanana River at the TRTS during the testing period (2020 – 2021) have been obtained from the Alaska Department of Natural Resources (ADNR), the Alaska Department of Fish and Game (ADF&G), and the US Army Corps of Engineers (USACE). Any additional permits or authorizations needed for completion of project activities would be obtained by ACEP prior to commencing testing activities.

All laboratory fabrication, assembly, and testing activities would be performed at UAF. Established university health and safety policies would be adhered to in order to mitigate against any potential risks. Potential hazards during field testing activities would include boating or floating platform failures, line failure, and floating river debris. To mitigate against these risks all personnel involved in testing would wear personal protective equipment when on the water and all boats would be equipped with secondary motors in the case of engine failure. All lines, gear, and other equipment associated with the floating platform would also be inspected regularly. ACEP and UAF would observe all applicable Federal, state, and local health, safety, and environmental regulations.

## NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Water Power Technologies Office

This NEPA determination does not require a tailored NEPA Provision.

NEPA review completed by Jonathan Hartman, 07/26/2019

## FOR CATEGORICAL EXCLUSION DETERMINATIONS

The proposed action (or the part of the proposal defined in the Rationale above) fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D. To fit within the classes of actions listed in 10 CFR Part 1021, Subpart D, Appendix B, a proposal must be one that would not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Subpart D, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Subpart D, Appendix B.

There are no extraordinary circumstances related to the proposed action that may affect the significance of the environmental effects of the proposal.

The proposed action has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)), and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.

The proposed action is categorically excluded from further NEPA review.

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

NEPA Compliance Officer Signature:



Casey Strickland

NEPA Compliance Officer

Date: 7/26/2019

## FIELD OFFICE MANAGER DETERMINATION

- Field Office Manager review not required
- Field Office Manager review required

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

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

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