

**UNC Coastal Studies Institute
North Carolina Renewable Ocean Energy Program (NCROEP)
Request for Pre-Proposals: 2018-2019**

Preface – Ocean kinetic and thermal energy generation technologies have great potential value in electrical power generation and for other commercial applications including aquaculture, ocean observation systems, shoreline protection, ecotourism, etc. The mission of the North Carolina Renewable Ocean Energy Program (“NCROEP”) is to investigate and develop technologies that enable the sustainable use of ocean energy resources to cost-effectively supply a portion of the energy needs of the State of North Carolina while serving as a catalyst for economic development. The NCROEP is focused on waves and ocean currents as the most promising marine renewable energy resources off the coast of North Carolina. Over the past six years, NCROEP has supported crosscutting, multidisciplinary research and innovation that has been applied to marine renewable energy. Global interest in ocean renewable energy is growing and is being expressed in large-scale investments in research, development and installations. As the industry matures and the number of installations increases, energy costs will become more competitive and benefits realized will include not only reducing US dependence on non-renewable energy resources, but also providing a range of social and environmental benefits including a revitalized maritime economy and improved coastal resiliency.

Introduction

The purpose of this RFP is to request pre-proposals to further the strategic research objectives of the NCROEP. To increase and diversify the renewable energy portfolio of the State of North Carolina, the UNC Coastal Studies Institute (CSI) is leading a program focused on ocean-based sources of energy from marine and hydrokinetic (MHK) technologies. The CSI has partnered with the Colleges of Engineering at NCSU, NCA&T, and UNCC to bring together multiple disciplines (including coastal, civil infrastructure and environmental systems, mechanical, electrical, and industrial engineering) needed to harness renewable ocean energy and develop a strategy for future inclusion in North Carolina’s energy portfolio and beyond. Research of interest includes discrete as well as integrated system studies in the near shore, coastal shelf and deep ocean with a robust public education component coordinated by UNC CSI. The NCROEP has developed, and maintains, a permitted testing site at Jennette’s Pier, a State-owned, multi-use facility for evaluating marine energy devices. The program also supports a strong K-12 educational and public outreach component.

Summary of Provision in Legislation

The authorizing legislation for this program includes recurring funding for renewable ocean energy research including provisions for MHK technology development, ocean energy resource assessment and environmental effects studies. The funding available through this program may be used to conceptualize, design, construct, operate and transfer to market (through industry collaboration) new and innovative technologies that harness, or facilitate the harnessing of, ocean

energy. To the extent possible, State funding will be supplemented by federal or private research funding.

In addition, State guidelines require the NCROEP to adopt an interdisciplinary approach to the study and development of marine energy resources and to also consider the health of the ocean so that efforts to extract energy shall account for ecosystem effects.

Research Areas:

The proposed program research areas are developed with the goal of having a scope that is beneficial to the State of North Carolina. Target areas include:

- Innovative MHK device components that improve energy capture or system availability with potential for broader impact on offshore and nearshore renewable energy industry;
- Renewable energy systems including components for energy transfer to shore, mooring and deployment and retrieval systems;
- Resource assessment including Gulf Stream currents for energy generation (field observations and modeling) as well as wave resources with the goal of establishing North Carolina as a testbed site for MHK wave devices;
- Environmental and regulatory conditions and public engagement; and
- Other technologies with a clear impact on marine energy and the MHK industry.

For the next funding cycle, investigators are invited to submit pre-proposals in one or more of the areas identified below, which have been identified by industry leaders as supportive to MHK industry development.

- Improvements related to development, testing, and demonstration of technologies that capture ocean energy. In addition, the impact of such improvements on performance metrics (such as Levelized Cost of Energy “LCOE”, Annual Energy Production “AEP,” Risk, etc.) with focus on:
 - a. Deployment/Retrieval of MHK devices;
 - b. Operation and Maintenance of MHK devices and individual components ;
 - c. Materials, manufacturing, and logistics; and
 - d. Distribution/transmission of power.

Possible guidance for assessing performance metrics are IEC/TS 62600-100, IEC/TS 62600-101 and IEC/TS 62600-102 on calculating AEP for wave energy converters, and an adaption of the tidal energy standard (IEC/TS 62600-200 and IEC/TS 62600-201) for the Gulf stream energy, for example.

- Innovations targeted at improving the reliability and efficiency of MHK device components and arrays including:
 - a. Advanced/innovative materials for marine environment with an emphasis on long term durability;
 - b. Seabed sediment stabilization and sediment transport analysis;
 - c. Prime movers and related power take-off systems;
 - d. Sub-sea cabling and subsea connectors;
 - e. Moorings and foundations;

- f. Mechanical, electrical, and hydrodynamic subassemblies;
 - g. Design criteria, load measurement, prototype testing, health & safety;
 - h. Array dynamics – performance, availability, interconnection, and optimization;
 - i. Supervision, Control and Data Acquisition System (SCADA) and prognostics and health management systems;
 - j. Advanced control technologies; and
 - k. Opportunities for implementation of robotics technologies.
- Resource Assessment (RA) – provides significant value to the industry to improve RA estimates and capabilities:
 - a. Gulf Stream measurements and numerical modeling including flow field characterization, model validation and model predictions;
 - b. Impact of energy extraction on the resource;
 - c. Connection to, and support of, standards and certification;
 - d. Effect of turbulence and waves on power performance; and
 - e. RA techniques (experimental and numeric).
 - Social License including environmental effects analyses, stakeholder outreach methodologies and social impact analyses:
 - Environmental effects analyses will focus on quantifying the Gulf Stream at appropriate scales (macro and meso) including:
 - a. Species and habitat of interest (EFH, ESA, MMPA);
 - b. Seasonal variation and corresponding effects; and
 - c. Environmental performance metrics.
 - Stakeholder engagement methodologies include the development of more effective means for engaging communities in meaningful dialog about the development and use of North Carolina’s ocean assets;
 - Social impact analyses of interest involving the development and application of innovative methods to measure, analyze and report effects on the health and welfare of North Carolinians and region that stem from changes to the ocean environment and economy.

Proposal Specifications

- Either UNC-CSI, UNCC, NCSU or NCAT must be the lead organization for any proposal.
- A proposal from one of the four research institutions may include a partner from the private, public, government or NGO sector. However, funding is primarily for the UNC academic institutions identified as the lead organization.
- Proposals will be funded for one year and new proposals will be required annually.
- Funding will be from July 1, 2018 until June 30, 2019. Funds may not be carried forward into the next fiscal year.
- All approved projects will be required to submit quarterly reports, one of which will be the comprehensive annual report.
- Representation and presentation by each funded research team is required at the annual symposium that is held at the CSI in the Spring of each year.

- No indirect or tuition costs are allowed for these projects but salaries and stipends are permitted.
- Pre-proposals shall not exceed three pages and shall include a brief problem statement and information about: project goals, prior research, potential impact, project investigators, institutional affiliations, work scope and estimated budget;
- At the conclusion of the pre-proposal process; reviewers may recommend revisions to the budget and/or work plan.
- Successful pre-proposal applicants will be asked to prepare a final proposal which shall include:
 - A project narrative which shall not exceed 10 pages using 12 pt font and 1-inch margins;
 - One page, one-year budget in addition to the project narrative. The budget must include mileage and accommodation expenses for all researchers and students who plan to attend the annual CSI symposium;
 - One-page Bios demonstrating each researcher's relevance to the proposed project. Note: Bios will not count toward the page limit;
 - If confidential information is a necessary part of the proposal it must be clearly marked.

Proposal Review

The Technical Advisory Committee will review the pre-proposals and its recommendations will be submitted to the Governing Board for final selection. Any member of the Governing Board or Technical Advisory Committee (TAC) participating in a pre-proposal will be excluded from the review process for that pre-proposal. The reviewers will consider the following priority review criteria:

Priority Review Criteria:

- Extent to which the work plan supports the strategic directions of the NCROEP;
- Extent to which the proposed project: builds upon prior research (prior research must be clearly identified); identifies gaps in literature; and includes a detailed plan with specific objectives that contribute to the achievement of program goals;
- Potential impact of the project;
- Extent to which the project plan shows how State funds will be used to leverage other sources of funds. (Preference will be given to work that will be further developed into proposals seeking funding from external sources such as: NSF, DOE, ARPA-E, etc);
- Extent to which the research program will lead to the development of intellectual property owned by a UNC-CSI partner university/college;
- The strength of the team and their track record for creativity and productivity;
- Clarity of explanation, completeness and validity of team construct; and
- How the research team will iteratively evaluate process/ progress as well as manage and archive data.

Pre-proposals that do not focus on solving a specific problem or a need facing the MHK industry will not be considered. Also, pre-proposals focusing primarily on literature searches are strongly discouraged.

Timeline (subject to change)

- Pre-proposals shall be submitted electronically in PDF format by 5 pm on June 1, 2018 to ARMSTRONGK@ecu.edu.
- Requests for full proposals will be sent by June 22, 2018.
- Complete proposals shall be submitted electronically in PDF format by 5 p.m. on July 9, 2018 to ARMSTRONGK@ecu.edu.
- Accepted proposals will be announced by July 16, 2018.
- Final work plans and approved budgets will be due to the administrative unit by July 23, 2018.
- The contract process will begin immediately with funds to be distributed via 606 transfer process in July, pending the status of the State budget;
- Researchers should be prepared to present the results of their research at the NCROEP symposium April 15 – 16, 2019

Finally, we iterate that it is critical that funded projects remain focused on developing products that can supply renewable power to the State, support development of economic opportunities and support job creation. For additional issues or questions, please contact Mo Gabr at 919-515-7904 (gabr@ncsu.edu) or Kim Armstrong at 252-475-3663 (ARMSTRONGK@ecu.edu).