U.S. Department of Energy
Advanced Research Projects Agency – Energy

Announcement of Teaming Partner List for an upcoming Funding Opportunity Announcement:

Submarine Hydrokinetic And Riverine Kilo-megawatt Systems (SHARKS)

The Advanced Research Projects Agency – Energy (ARPA–E) intends to issue a new Funding Opportunity Announcement (FOA) to solicit applications for financial assistance to develop innovative technologies for the design and proof-of-concept of economically attractive tidal and riverine hydrokinetic turbines[1]. The program seeks to leverage large multi-disciplinary teams to apply co-design and control co-design (CCD) methodologies to the technology development. Co-design brings together scientists and engineers from different disciplines to work concurrently, as opposed to sequentially, and considers the coupled design space from the outset, including dynamics and feedback control (CCD). Projects in this future program are envisioned to develop both a conceptual design, as well as perform proof-of-concept experimentation in physical environments (in the water) to confirm the technology's capability. As described in more detail below, the purpose of this announcement is to facilitate the formation of new project teams with multi-disciplinary expertise to respond to the upcoming FOA. The FOA will provide specific program goals, technical metrics, and selection criteria. For the purposes of the Teaming Partner List, the following summarizes current planning for the FOA:

The national and global resource and market available for clean energy from tidal streams, rivers, and canals are vast yet largely untapped. The growth of the industry has been inhibited by technical challenges and the associated high levelized cost of energy (LCOE). Technical challenges include: harsh operating environments, risk of environmental damage, inaccessibility for installation or repairs, difficulty of extracting power at low flow speeds, low generation efficiency, high operation and maintenance costs, high installation costs, high turbulence intensity and high torques among others. The aim of this future ARPA-E program is to make a transformational change in the hydrokinetic industry by designing and de-risking new systems with a significant reduction in LCOE compared with today's standard. This includes proof-of-concept experimentation to reduce the technical risk of the technology. This program will lay the foundation for widespread adoption of inexpensive, clean, reliable, hydrokinetic energy.

To accomplish this goal, ARPA-E is looking for multi-disciplinary teams to develop new hydrokinetic turbine designs for either tidal or riverine applications. Teams are encouraged to use co-design, control co-design, and designing-for-OpEx approaches to develop and perform proof-of-concept testing for new devices with radically lower LCOE. Each team will demonstrate that the proposed design meets the LCOE targets based upon a metric space supplied by ARPA-E. It is envisioned that teams will be required to reduce the LCOE through a number of approaches including increased device efficiency, a lower equivalent mass-to-swept area ratio, and a significant reduction in operation and maintenance costs. Given the low technical readiness level of hydrokinetic technology, and the inherent coupled physics within the design space, the teams will demonstrate the technology viability in a number of ways,

[1] Link to HYDROKINETIC Industry Day Materials : https://arpa-e.energy.gov/?q=site-page/2020-hydrokinetic-industry-day

including paper studies, simulation methods, and experimentation of scaled systems in the water. Each team will have to propose an in-water proof-of-concept that demonstrates the system's performance and/or the viability of the enabling concepts. The wide range of tasks ARPA-E will request for this proposed program makes large multi-disciplinary teams necessary.

In order to realize the goals of the proposed ARPA-E program, teams may find expertise in areas including, but not limited to, the following: (i) hydrodynamics; (ii) systems and control engineering; (iii) mechanical engineering; (iv) electrical generators; (v) power electronics; (vi) electrical connection; (vii) experimental testing (viii) numerical simulation; (ix) system identification; (x) anchoring and mooring systems; (xi) cavitation analysis; (xii) techno-economic analysis; (xiii) blockage and array efficiency optimization; (xiv) environmental impact attenuation; (xv) fish presence sensing; (xvi) data analysis; (xvii) experimentation; (xviii) rapid deployment in water; (xix) operation and maintenance; (xx) control co-design; (xxi) efficiency; (xxii) materials; (xxiii) corrosion. As a general matter, ARPA–E strongly encourages outstanding scientists and engineers from different organizations, scientific disciplines, and technology sectors to form new project teams. Interdisciplinary and cross-sector collaboration spanning organizational boundaries enables and accelerates the achievement of scientific and technological outcomes that were previously viewed as extremely difficult, if not impossible.

A Teaming Partner List is being compiled to facilitate the formation of these new project teams. ARPA-E intends to make the Teaming Partner List available on ARPA–E eXCHANGE (http://ARPA–E-foa.energy.gov), ARPA–E's online application portal, starting in February 2020. The Teaming Partner List will be updated periodically, until the close of the Full Application period, to reflect the addition of new Teaming Partners who have provided their information.

Any organization that would like to be included on the Teaming Partner list should complete all required fields in the following link: https://ARPA–E-foa.energy.gov/Applicantprofile.aspx. Required information includes: Organization Name; Contact Name; Contact Address; Contact Email; Contact Phone; Organization Type; Area of Technical Expertise; and Brief Description of Capabilities and Interests related to the hydrokinetic turbine designs for tidal and riverine applications.

By submitting a response to this Notice, you consent to the publication of the above-referenced information. **By facilitating this Teaming Partner List, ARPA–E does not endorse or otherwise evaluate the qualifications of the entities that self-identify themselves for placement on the Teaming Partner List.** ARPA–E will not pay for the provision of any information, nor will it compensate any respondents for the development of such information. Responses submitted via email or other means will not be considered.

This Notice does not constitute a FOA. No FOA exists at this time. Applicants must refer to the final FOA, expected to be issued in March 2020, for instructions on submitting an application and for the terms and conditions of funding.