



DE-FOA-0002334 - SHARKS

Questions can be sent to ARPA-E-CO@hq.doe.gov

FIRST DEADLINE FOR QUESTIONS TO ARPA-E-CO@HQ.DOE.GOV:
5 PM ET, FRIDAY MAY 15, 2020

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QUESTIONS AND ANSWERS

PLEASE REFER TO THE GENERAL FAQs SECTION OF ARPA-E'S WEBSITE ([HTTP://arpa-e.energy.gov/?q=faq/general-questions](http://arpa-e.energy.gov/?q=faq/general-questions)) FOR ANSWERS TO MANY GENERAL QUESTIONS ABOUT ARPA-E AND ARPA-E'S FUNDING OPPORTUNITY ANNOUNCEMENTS. ADDITIONAL QUESTIONS SPECIFIC TO THIS FOA ONLY ARE INCLUDED BELOW. PLEASE REVIEW ALL EXISTING GENERAL FAQs AND FOA-SPECIFIC QUESTIONS BEFORE SUBMITTING NEW QUESTIONS TO ARPA-E.

I. Concept Paper Phase Questions:

Q1. With reference to DE-FOA-0002334 and Cost Sharing for Small Business, there appears to be a Grace Period of 12 months (waiving the shared / matching cost) and beyond the 12 months there would be a shared cost of 10%. My question is, if the project is completed within the 12 month period and 'Proof of Concept' established and other conditions met, are there any costs to the Small Business beyond the 12 month time frame?

ANSWER: If a project is completed within the 12 month grace period no cost share requirement attaches to the agreement. Prospective applicants are reminded that ARPA-E subjects Full Applications to merit review, including both the proposed resources and project schedule.

Q2. From DE-FOA-0002335 SHARKS SBIR/STTR, it is clear that ARPA-E will not pay a fee or profit on Cooperative Agreement from this FOA. However is not clear if the same is true for DE-FOA-0002334. Can you please clarify.

ANSWER: Per 2 C.F.R. § 910.358(d), the Department of Energy does not allow profit or fee on the financial assistance programs it sponsors.

Q3. I notice that the title of the SHARKS - Submarine Hydrokinetic And Riverine Kilo-megawatt Systems program does not specify turbines but the content does. Would you be interested in a technology that is better for the environment, safer for wildlife, and more affordable than turbines?

ANSWER: As set forth at FOA Section I.B.1: *[t]he SHARKS Program seeks to develop new designs for economically attractive Hydrokinetic Turbines (HTK) for tidal and riverine currents.* Submissions that fall outside the technical parameters specified in the FOA may be deemed non-responsive and not subjected to merit review.

Q4. The FOA specifically considers Tidal and Riverine systems, and does not exclude man-made, canal systems. Canal systems are not typically considered either Riverine or Tidal. Please indicate the responsiveness of an application that considers Canal systems and in which category it should provide appropriate metrics (S1-S4).

ANSWER: The SHARKS program seeks to develop new designs for economically attractive Hydrokinetic Turbines (HKT) for riverine and tidal applications. Proposals for designs that are only applicable to man-made canal systems are not responsive to the FOA. Proposals shall use one of the four case studies described in the FOA and the corresponding metric space workbooks. If an applicant



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QUESTIONS AND ANSWERS

believes their proposed device is also suited for deployment in man-made canal systems, they may describe this use case alongside the chosen case study.

Q5. Each of the S1 to S4 cases mention a specific water channel size, specifically the water depth. Question is, does this apply to the response (concept paper), or can water depth of the device be any number?

ANSWER: The channel size specified for each case study must be used in the applicant's submission.

Q6. Are FOAs 2334 and 2335 inadvertent duplicates or actual separate opportunities?

ANSWER: Prospective applicants are encouraged to read the funding opportunity announcements and independently assess if a submission is warranted under DE-FOA-0002334 or DE-FOA-0002335. DE-FOA-0002335 is targeted at small business concerns under the Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) programs, and reflects the unique rules and regulations applicable to those programs. Entities that qualify as "Small Business Concerns" are strongly encouraged to apply under DE-FOA-0002335. To determine eligibility as a "Small Business Concern" under DE-FOA-0002335, review the eligibility requirements in Sections III.A-III.D of the FOA.

Q7. The program description states, "These teams may include experts in hydrodynamics, mechanical design, materials, hydro-structural interactions, turbine and/or turbine array efficiency, system-level control solutions, power electronics, grid connection, numerical modeling, computer tools, and experimental validation." Do we have to include experts in all those areas?

ANSWER: It is not expected or required that each team will have a single expert from each of the stated areas.

Q8. Will collaborators from national labs and industries be allowed?

ANSWER: Yes. Experts from national labs, small and large businesses, academia, and other eligible organizations are encouraged to collaborate.

Q9. Who will own the intellectual property generated from the project?

ANSWER: Refer to FOA Sections VIII.A-C, FOA Section IV.G.3, and FOA Section IX. These sections address the retention of intellectual property rights by an awardee subject to the retention of certain rights by the Government and other requirements.

Q10. Please clarify if this opportunity is open to non-turbine hydrokinetic energy devices that harvest energy from riverines and tidal flows.

ANSWER: Refer to SHARKS FAQ 3.

Q11.1a Referencing the S2 and S4 Metric Space Workbooks:

- For the S2 (Tidal, Remote area) site, the average depth is shown as 60 m (Cell H25) while the rotor swept area is shown as 21.21 m² (Rotor D = 5.2 m)



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QUESTIONS AND ANSWERS

- For the S4 (Tidal, Utility scale) site, the average depth is shown as 11 m (Cell H25) while the rotor swept area is shown as 100 m² (Rotor D = 11.3 m)

As such, the S4 rotor diameter is larger than the average depth. Is it possible that the site details, or turbine details, have been reversed for S2 and S4?

ANSWER: The channel size listed for each study are correct as stated and based off of available data for each site. Each case study only states the swept rotor area for the original device. No assumptions regarding rotor geometry, diameter, or number of rotors are made in any case study.

Q11.1b If the width and depth values have been reversed, can you please confirm the velocity distributions are correct for the S2 and S4 sites?

ANSWER: The velocity distributions for each case study are correct as stated and based off of available data for each site.

Q11.2 Referencing the S2 and S4 Metric Space Workbook resource probability distributions provided in Workbooks S2 and S4, Columns N & O, Rows 30 to 136: We are unsure as to why the S2 and S4 sites were chosen since neither appears on the NREL US “Hot Spot” Report: “Marine Hydrokinetic Energy Site Identification and Ranking Methodology Part II: Tidal Energy,” Levi Kilcher, Robert Thresher, and Heidi Tinneland (Oct. 2016).

ANSWER: The sites were chosen based on a variety of criteria and conversations with stakeholders across the industry, and communities that could benefit from the technology.

Q11.3 Can an applicant provide an alternative resource (site) for design and optimization that is more representative of viable tidal energy sites globally? For example, can an applicant provide an alternative water velocity distribution for the S4 Tidal, Utility scale site, measuring the Original Design to the Proposed Design using that same distribution?

ANSWER: No, applicants must use the sites provided in one of the four case studies and corresponding metric space workbooks.

Q11.4 Referencing the Metric Space Workbook’s ‘Glossary’ tab, the definitions of the “Manufacturing factor” and the “Installation factor” are stated as follows:

- T15, Manufacturing factor (fm), Ratio between the cost per kilogram of the manufacturing of the component divided by the cost of one kilogram of the original material of the component



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QUESTIONS AND ANSWERS

- **U15, Installation factor (fi), Ratio between the cost per kilogram of the installation of the component divided by the cost of one kilogram of the original material of the component**

Please clarify whether assembly costs associated with the assembly of individually manufactured subcomponents to a final system should be included in the manufacturing factor or in the installation factor.

ANSWER: This can be determined by applicants based on their assumed installation and assembly strategy for the system and sub-systems. As a general rule, if sub-systems/sub-components will be assembled in a facility or shore-side prior to the installation of the entire system, this can be considered in the manufacturing factor. If the sub-components will be assembled as part of deployment/installation of the overall system, this can be considered in the installation factor.

Q12.1 The program description states, “These teams may include experts in hydrodynamics, mechanical design, materials, hydro-structural interactions, turbine and/or turbine array efficiency, system-level control solutions, power electronics, grid connection, numerical modeling, computer tools, and experimental validation.” Do we have to include experts in all those areas?

ANSWER: Refer to SHARKS FAQ 7.

Q12.2a Will collaborators from national labs and industries be allowed?

ANSWER: Refer to SHARKS FAQ 8 and FOA Section III.A.

Q12.2b Who will own the intellectual property generated from the project if they are involved?

ANSWER: Refer to SHARKS FAQ 9.

Q12.3 Any other advice to build our team?

ANSWER: Interested parties must read and review the FOA and independently assess whether or not to submit an application.

Q13. I have read with interest your announcement. I have a concept which is interesting to the S1 and S2 case studies, and possibly in arrays to the S3 and S4, but it is not a turbine. Your Announcement is very much focused on Hydro Kinetic Turbines (HKTs). I believe I can meet the requirements outlined in the Announcement – would you consider my proposal if it met the stated requirements but was not a HKT?

ANSWER: Refer to SHARKS FAQ 3.



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QUESTIONS AND ANSWERS

Q14. [FOA Section] I.F Proof of Concept Experiments: According to the FOA, TEAMER may offer a series of open Requests for Technical Support (RFTS's) starting in mid-2020. Should applicants include costs for concept experiments (such as tank tests) or should applicants only indicate the number and type of tests to be completed in hopes that TEAMER RFTS will become available?

ANSWER: Costs for concept experiments (such as tank tests) should be included in the project. The SHARKS Program is expecting the teams to validate experimentally the main new concepts proposed in the projects.

Q15. [FOA Section] I.F Proof of Concept Experiments: Are applicants required to submit a quote for testing at TEAMER or equivalent facilities with the full application?

ANSWER: Not at the Concept Paper phase of the solicitation. Instructions for supporting a proposed project budget will be provided following disposition of Concept Papers with a FOA modification setting forth the requirements for preparing and submitting a Full Application.

Q16. [FOA Section] II.A Award Overview: Maximum project duration in case of award is 36 months. May applicants submit phased proposals consisting of 2 or 3 phases, with requested funds for each phase?

ANSWER: Applicants may submit phased proposals with corresponding go/no-go milestones; however, as set forth at FOA Section II.A, ARPA-E will fund the negotiated budget at the time of award.

Q17. [FOA Section] III.B Cost Sharing Para 3.5 Reduced Cost Sharing: "Project Teams where domestic educational institutions, domestic nonprofits, small businesses, and/or FFRDCs perform greater than or equal to 80% of the total work under the funding agreement (as measured by the Total Project Cost) are required to provide at least 10% of the Total Project Cost as cost share." This requirement seems to assign an onerous cost burden on a small business that is teamed with domestic educational research institutions. ... Is there a mechanism within ARPA-E contracting that takes into account and adjust for such excessive cost burdens?

ANSWER: Reduced cost share requirements are set forth at FOA Section III.B.3; otherwise entities and project teams are subject to the base cost share requirements set forth at FOA Sections III.B.1-2.

Q18.1 My company has an enabling component technology for SHARKS, and per the FOA we are not suitable for priming a proposal. Rather, we have opportunities to participate as a subcontractor on multiple SHARKS teams. Are we allowed to participate in multiple contracts as a sub?

ANSWER: There is no limitation on the number of contracts, as that term is as defined at 2 C.F.R. § 200.22, that an entity may receive under the SHARKS FOA. There is also no limitation on the number of subawards, as that term is defined at 2 C.F.R. § 200.92, on the number of subawards an entity may receive.



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QUESTIONS AND ANSWERS

ARPA-E agreements are subject to the requirements of 2 C.F.R. Part 200 and provide for reimbursement of actual costs incurred, both direct and indirect, in the performance of work under the agreement, subject to the limitations of the pertinent cost principles (i.e., 2 C.F.R. Part 200, Subpart E or 48 C.F.R. Subpart 31.2). It is fundamental that costs incurred may only be assigned to a single cost objective, or pooled and allocated as indirect cost in proportion to the benefits received. Note that 2 C.F.R. § 200.405(a)(2) provides that a cost is allocable to a Federal award if it *[b]enefits both the Federal award and other work of the non-Federal entity and is assignable in part to the Federal award in accordance with the principles* [found at 2 C.F.R. Part 200, Subpart E]. Similar text can be found at FAR 31.201-4. *Double billing* of cost is not permitted under any circumstance.

Q18.2 If so, due to the predefined S1-S4 case studies around which every proposal will be based, it seems possible that we might receive multiple awards for performing similar work, which we could not accept because that is not allowed per government regulations. Should this potential conflict be addressed at the Concept Paper, Proposal, or Contract Negotiation stage? If a conflict arises at the Contract Negotiation stage, is it possible to modify the subawards to eliminate that conflict? Is there anything we can do as a prospective subawardee to manage such a potential conflict at the Concept Paper and/or Proposal stages?

ANSWER: Refer to SHARKS FAQ 18.1.

Q19. Good afternoon. We have the following question that we would like to submit. We look forward to your response. Columns S and T, rows 3 through 12 in the case study metric space workbooks show the materials and associated material factors used in the original designs, including the reference material. If an applicant's turbine requires additional materials, please advise on the correct procedure for adding the new materials to the workbook.

ANSWER: For additional materials, please use cells (S-13, T-13) and (S-14, T-14). The S column is for the name of the material and the T column for the cost of the material relative to the cost of Steel of reference (material factor, ft). The cost of Steel of reference is \$2/kg, as described in the FOA, and corresponds to a material factor ft =1 in T-12. If you need extra cells for more materials, please use the cells (S,T) of materials that are not used or add additional rows (S,T). Then, use your new material factors "T column" in your "I column" to calculate M2.

Q20. I wanted to know if you expect the designs for this call to be based on a turbine/propeller or if other designs are also applicable. I ask this because the case studies you have shown for calculating the metrics M1 and M2 are based on a turbine design.

ANSWER: Refer to SHARKS FAQ 3.



DE-FOA-0002334 - SHARKS

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QUESTIONS AND ANSWERS

Q21. ... We recently got information about Funding Opportunity Announcement No. DE-FOA-0002334 & DE-FOA-000235 under which ARPA seeks to develop new designs for economically attractive Hydrokinetic Turbines (HKT) for tidal and riverine currents. ... We ... want to apply under this program but we have following [questions].

Q21.1 Who will own the Patent Rights of the technology developed under both Funding opportunities?

ANSWER: Refer to SHARKS FAQ 9.

Q21.2 Is it compulsory to tie-up with any US based company before applying in this funding opportunity or we can apply first and do collaboration after getting an award?

ANSWER: Applicant eligibility information can be found in FOA Section III.A. Any post-award changes to a project team require the prior approval of the cognizant ARPA-E Contracting Officer. Refer to Attachment 1, Clause 31 of ARPA-E's Model Cooperative Agreement, found at <https://arpa-e.energy.gov/?q=site-page/funding-agreements>.

Q21.2 After being selected for [an] ARPA Award can we be allowed to work secretly with our team or [do] we need to disclose our patented designs to other private teams?

ANSWER: ARPA-E requires every Project Team to negotiate and establish an Intellectual Property Management Plan and a Data Management Plan and provide them to ARPA-E for review during the first quarter of the period of performance. For additional details refer to Attachment 4, Part I.E of ARPA-E's Model Cooperative Agreement, found at <https://arpa-e.energy.gov/?q=site-page/funding-agreements>.

Q22. We will appreciate if the following questions can be addressed. Case Study (Tidal, Remote Area):

Q22.1 Questions for M1 Calculation

Q22.1a in the worksheet the water density is 1025 kg/m³, but in Key West the density

ANSWER: Any cells color coded brown in the metric space workbook are input variables and may be adjusted based on the proposed design. All adjustments must be justified in the tab '2.c Summary of Changes'.

Q22.1b The swept rotor area in the worksheet is defined as 21.21 m². This gives us a rotor diameter of 5.19 m. Are we allowed to change the swept area based on the proposed design?

ANSWER: Any cells color coded brown in the metric space workbook are input variables and may be adjusted based on the proposed design. All adjustments must be justified in the tab '2.c Summary of Changes'.



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QUESTIONS AND ANSWERS

Q22.1c If the proposed design does not have a drive-train, can we set the drivetrain losses to 0?

ANSWER: Any cells color coded brown in the metric space workbook are input variables and may be adjusted, or zeroed, based on the proposed design. All adjustments must be justified in the tab '2.c Summary of Changes'.

Q22.1d Are we allowed to change the max power coefficient from 0.45 to 0.6 which is the maximum of the Betz limit, which we have obtained in our experiments?

ANSWER: Any cells color coded brown in the metric space workbook are input variables and may be adjusted based on the proposed design. All adjustments must be justified in the tab '2.c Summary of Changes'.

Q22.2 Questions for M2 Calculations

Q22.2a in line 1 rotor (blades, hub) are we just supposed to put in the estimated weight of our rotor?

ANSWER: Input cell L9 represents the mass of the rotor for a proposed design in kilograms. Any cells color coded brown in the metric space workbook are input variables and may be adjusted based on the proposed design. All adjustments must be justified in the tab '2.c Summary of Changes'.

Q22.2b In line to "nacelle" can we put in zero if the proposed design does not have a nacelle like traditional HKTs?

ANSWER: Any cells color coded brown in the metric space workbook are input variables and may be adjusted, or zeroed, based on the proposed design. All adjustments must be justified in the tab '2.c Summary of Changes'.

Q22.3 Other Questions

Q22.3a In the SHARKS_MetricSpaceWorkbook.xlsx, cell S25 says, "Cost of electrical lines (intra-farm and farm to shore) and substation are excluded", yet the FOA states that this program will need to decrease LCOE by methods including "lowering operating and maintenance costs". Power-converter cost, wire cost, wire installation cost, and wire maintenance cost are 4 significant parts of CapEx and OpEx and thus LCOE, so is the intent of this cell comment in the workbook:

- that proposers should focus innovation exclusively within the turbine design itself, and specifically AWAY from innovative ideas that reduce LCOE (including CapEx and OpEx) by reducing the mass & cost of the electrical lines and the power converter? (if so, why?)



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QUESTIONS AND ANSWERS

- **to assume that M2 already addresses these costs by including the electrical lines and substation within the total system mass? (note that the electrical lines and substation are NOT included in the workbooks in cells G9:G19)**

- **Other intent?**

ANSWER: The SHARKS Program is not aimed at developing technologies to reduce the cost of the electrical lines or substations.

Q22.3b Does the scope of the SHARKS program include innovations that improve overall LCOE by efficient optimization of hybrid power source availability, including hydrokinetic as well as other intermittent renewable sources?

ANSWER: Systems that leverage other renewable energy sources in combination with tidal and/or riverine energy are of interest.

Q23. I had a question regarding the reduced cost share requirement described on page 36 of the SHARKS FOA. It states:

Project Teams composed exclusively of domestic educational institutions, domestic nonprofits, and/or FFRDCs/DOE Labs/Federal agencies and instrumentalities (other than DOE) are not required to provide cost share.

Do you U.S. Military-operated entities fall under the definition of “Federal agencies and instrumentalities [(other than DOE)]?”

ANSWER: Yes. Any Federal agency and instrumentality organized under the Organizational Chart of the U.S. Government, except those organized under the Department of Energy, are included. The Organizational Chart of the U.S. Government can be found in the U.S. Government Manual at <https://www.usgovernmentmanual.gov>.

Q24.1 As an undergraduate mechanical engineering student am I eligible to file as the Lead for my Project Team or do you require a Ph.D. to file?

ANSWER: Individuals may submit applications under the SHARKS FOA; however, ARPA-E will only award funding to an entity formed by the Applicant. Refer to FOA Section III.A.1.

Q24.2 At the time I am submitting these questions, my team only consists of three (3) individuals; Will we be required to form the complete team before we submit our project proposal?

ANSWER: ARPA-E assesses the Applicant’s capabilities to accomplish the work proposed as part of its Merit Review process at both the FOA’s Concept Paper and Full Application phases.



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QUESTIONS AND ANSWERS

Q24.3 Will we have a better chance of receiving an award under these FOA(s) if we form an LLC, or file as an individual?

ANSWER: Applicants should consult with their advisors and decide what form of business organization is best for their needs.

Q25.1 Regarding T0a.2 ..., can you please clarify if by “ready for micro-grid connection” that is to be taken to mean the ability to support or feed a microgrid without injecting power quality problems, or to serve as its largest source, control the grid, establish the grid frequency and voltage, or provide stand-alone or black start capability? ...

ANSWER: By ‘ready for micro-grid connection’ the emphasis is on devices that are able to control active and reactive power, and as a result control both frequency and voltage.

Q25.2 Clarification on Response to Q11.2. We thank you for your response to the previous Question Q11.2 Can you please elaborate on the referenced ‘variety of criteria’ and the target ‘communities’ this FOA is trying to serve? Table 1 of the FOA seems to indicate that the practical tidal and river extractable HKE are not necessarily represented by these selected resource distributions.

ANSWER: Interested parties must read and review the FOA and independently assess whether or not to submit an application.

Q26.1 [General FAQ 10.10] indicates that “no agreement can charge more than \$200,000 in direct costs per individual for employee salaries.” Can you please confirm that this limitation is based on salary costs only rather than the total of salary + benefits for each employee?

ANSWER: The limit on salary compensation does not include properly allocable fringe benefits.

Q26.2 Will including an international educational institution as an unpaid collaborator trigger the cost-sharing requirement?

ANSWER: Cost sharing requirements are based upon the proportion of Total Project Costs borne by the individual Project Team members.

Q26.3 Alternatively, will including an international educational institution as a paid team-member trigger the cost-sharing requirement?

ANSWER: Refer to SHARKS FAQ 26.2.



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QUESTIONS AND ANSWERS

Q27. I understand from ARPA-E's response to Q3 of the FAQ for this FOA that the proposed system must be a type of turbine. However, in the literature and common usage, the definition of "turbine" can vary. In most cases a turbine refers to a rotary device that extracts energy from a flowing fluid. In other cases oscillating systems, such as oscillating hydrofoils, that extract energy from flowing fluid but do not have a rotating component are called turbines. Are systems based on such oscillating hydrofoils considered turbines for purposes of this FOA?

ANSWER: In the context of this FOA 'turbine' refers to any system that harvests energy from riverine or tidal streams, and converts that energy into electrons. It does not make any assumptions regarding the shape, degrees of freedom, or any other specifics of the design of the system.

Q28.1 Would a UK Research University operating in the UK, be considered a Foreign Entity?

ANSWER: Yes.

Q28.2 Could a UK Research University seek a waiver (under Business Assurances & Disclosures Form submitted with the Full Application), to participate directly without its own US entity BUT undertake the majority of the work in the USA?

ANSWER: As set forth at FOA Section III.A.3: *[f]oreign entities must designate in the Full Application a subsidiary or affiliate incorporated (or otherwise formed or to be formed) under the laws of a State or territory of the United States to receive funding.*

Q28.3 Could a UK Research University seek a waiver to participate as a single applicant BUT undertake the majority of the work in the USA?

ANSWER: As set forth at FOA Section III.A.3: *[f]oreign entities, are eligible to apply for funding as Standalone Applicants, as the lead organization for a Project Team, or as a member of a Project Team.* Also refer to SHARKS FAQ 28.2.

Q28.4 Would ARPA-E consider as suitable grounds for the waiver, that the UK Research University has unique domain experience/capabilities, advanced reference designs, modelling tools and large test tank turbine results which are in full alignment with the program and which are not available from any Domestic Entity?

ANSWER: ARPA-E will not pre-assess the contents of any submission. Applicants must review the the FOA and independently determine whether a submission is warranted.



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QUESTIONS AND ANSWERS

Q29. ARPA-E requests “Personal Qualification Summaries [for each PI/Senior Person] (each PQS limited to 3 pages in length, no cumulative page limit)”. Does ARPA-E have any preference on what information goes into these PQSs files (e.g. Education, Training, Employment History, Publications, etc.), or should each applicant make that determination for themselves?

ANSWER: Applicants should include qualifications for key personnel that the applicant deems relevant to the specific details of their proposal.

Q30.1 Prior to the time of application, the applicant has successfully completed part of the research and development through its own considerable investments. [Description of research omitted.]

Q30.1a Would lab and in-river testing to validate our novel HKT be applicable under this FOA application?

ANSWER: The SHARKS program aims to fund the development of radically new hydrokinetic turbine designs. This includes the development of new systems, and preliminary physical testing of these systems. Proposals aimed purely at validating existing designs are not responsive under the FOA.

Q30.1b Can ARPA fund a multi-milestone/stage program within one application, or does it require separate applications for each stage? [Description of planned stages omitted.]

ANSWER: The SHARKS program is focused on funding the development of holistic hydrokinetic systems, which is inherently a multi-disciplinary process. Proposals that include multiple stages of testing for various critical components and systems are responsive under the FOA.

Q30.2 Does ARPA have sites where applicants can run full in-river testing? If so, what would be the permitting timeline associated with those sites and what are the characteristics of the sites?

ANSWER: ARPA-E does not maintain or operate any testing sites or facilities.

Q30.3 Our technology is an advanced design comprised of multi-stages draft tubes to amplify power at the runner cross section and as a result, produces larger amounts of power than conventional HKT systems. The current ARPA Metric Space Workbooks only allows for linear systems, limited by Betz laws. Could the Applicant work together with ARPA to adapt the [Pwater] equations below [ROW 29] to reflect the Coefficient of Performance “Cp” increase as a result of our novel HKT system?

ANSWER: Applicants may alter the equations in the metric space workbook based on their proposed device. Any changes must be justified in the tab ‘2c. Summary of Changes’.



DE-FOA-0002334 - SHARKS

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5 PM ET, AUGUST 18, 2020

QUESTIONS AND ANSWERS

Q30.4 The current Metric Space Workbooks require manual adaptation of the velocity-frequency for velocity ranges beyond the indicated velocities in S1 and S3. In addition to providing results showing the applicant performances using the same metrics as S1 and S3, could the applicant adapt the velocity-frequency distribution to fully illustrate the robustness of wider range of velocity classes which our novel system can handle?

ANSWER: The velocity frequency distributions in the metric space workbooks are based on real-world data for specific sites and are related to the LCOE objectives in the FOA. They should not be altered by applicants.

Q30.5 The applicant has carried out research and optimised development for higher velocities (up to 5m/s). Consequently, additional R&D will be required to economically optimise the HKT system for lower velocities through the same CCD approach. Further to the testing and validation that would be undertaken (ref. [SHARKS FAQ 30.1-2]), could ARPA accept a separate application to develop a different velocity class for the same technology, or could ARPA accept to include such R&D program within the same application associated with the novel HKT we are proposing at present.

ANSWER: The SHARKS FOA is specifically interested in HKT systems that are optimized for lower flow velocities. Utilizing CCD approaches to develop systems for these environments is responsive to the FOA. Proposed systems should be capable of operating within the velocity distributions described in at least one of the four case studies.

Q30.6 As submissions may be reviewed by experts hired by ARPA that come from organisations that are themselves involved or have ties with competing HKT technologies, how does ARPA treat the confidential and proprietary information from applicants to ensure that it does not get inadvertently used or shared by its service providers, or others?

ANSWER: Refer to FOA Section V.B.2-3 and FOA Section VIII.I.

Q30.7 Metric Space Workbook – Factors for Material, Manufacturing and Installation: We note that our HKT turbine approach lies on the riverbed and does not require components 9 (Floating system), 10 (Mooring system). We would like to understand how these factors are determined so we can follow the same school of thoughts and adapt to our novel HKT.

ANSWER: Any cells color coded brown in the metric space workbook are input variables and may be adjusted, or zeroed, based on the proposed design. All adjustments must be justified in the tab '2.c Summary of Changes'.



DE-FOA-0002334 - SHARKS

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QUESTIONS AND ANSWERS

Q31.1 The metric spaces (S1 through S4) shown in the FOA do not include any HK configurations sized/optimized for use in ocean currents; the largest system (S4) is a tidal unit with a water depth of 11 meters. Does ARPA-e have any interest in larger megawatt-sized ocean current units?

ANSWER: Refer to FOA Section III.C.3

Q31.2 Please verify that units designed for any of the metric spaces (S1 through S4) may be tested in the facilities/locations of the bidders choice, i.e., not at the site identified under “Associated LCOE calculation” for each Metric Space.

ANSWER: The sites specified in S1-S4 are not meant to be used as physical test sites for proposals. They are solely meant for use in metric space workbook calculations. Physical experimentation may be proposed at any facility or site the applicant deems appropriate.

Q31.3 Can ARPA-e provide some forward-looking examples (descriptions) of operational systems resulting from successful SHARKS projects and related follow-on procurements? Please include on-grid, off-grid, commercial and military applications examples.

ANSWER: The SHARKS FOA specifies interest in operational systems that can be deployed on either utility scale grids or as part of micro-grids serving remote or rural communities. However, the SHARKS FOA also identifies the broader Blue Economy as a potential market for HKT. Applicants may highlight specific use-cases beyond those described in the metric space workbook that they believe are relevant. However, the LCOE calculations must be based on one of the operational systems described in the four case studies.

Q32. We have a question on the reduced cost share requirement for the SHARKS FOA. Our team will be composed exclusively of domestic educational institutions, domestic nonprofits, and/or FFRDCs/DOE Labs/Federal agencies and instrumentalities. However, the team plans to contract with a small business vendor to supply commercial supplies and/or services used to support the project. Does the use of a small business vendor disqualify the team from the reduced cost share?

ANSWER: The term Project Team is defined in Section IX as follows:

A Project Team consists of the Prime Recipient, Subrecipients, and others performing any of the research and development work under an ARPA-E funding agreement, whether or not costs of performing the research and development work are being reimbursed under any agreement.

Whether a particular entity is considered a Project Team member, which does affect the eligibility of a Project Team for reduced cost share, or as a contractor, which does not impact the eligibility of a Project Team for reduced cost share, requires a fact-based determination. Applicable criteria can be found at 2 C.F.R. § 200.330.



DE-FOA-0002334 - SHARKS

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QUESTIONS AND ANSWERS

Q33.1 For S4, the metric space workbook suggests that the ‘start of the art’ CapEX including installation of a 500kW rated power tidal turbine is \$601,474 (cell O11). This equates to \$1,203 per installed kWe. This would place the ‘start of the art’ capex of utility scale tidal stream energy below that of most other generating technologies. <https://atb.nrel.gov/electricity/2019/summary.html>.

While recognising that the capex does not include submarine cables, can further information be provided on why it is considered that this represents an accurate state of the art CAPEX given it appears lower than more mature generating technologies? Has any model benchmarking against published industry CAPEX being carried out?

ANSWER: The values in the Metric Space Workbook are based on published systems. The CapEx is based on the equivalent mass values for each system component and is reduced by the exclusion of items such as submarine cables, substation connection, etc...

Q33.2 S4_SHARKS_MetricSpaceWorkbook. In cell P11 of worksheet 1a. Original Design and worksheet 2a. Proposed Design, the unit for the CAPEX parameter is labelled as ‘\$’. On page 17 of the call for papers, it is suggested that the unit for the CapEX parameter is ‘\$/kWe’. Could clarification be provided on this?

ANSWER: The unit for CapEx should be dollars (\$) as stated in the Metric Space workbooks. The use of ‘\$/kWe’ in the FOA text is a typo. This is true for each of the four case studies.

Q34. For the S4 Metric Space Workbook, there is no curve showing for the “Target 4 LCOE” on Tab 1b. Is this an error in the spreadsheet?

ANSWER: As per FOA Section I.C.3: “Note that if a LCOE target isline is not visible ... it is because there is no mathematical solution for that isline for a system with physically meaningful parameters”

Q35. ARPA-E are asking for a breakdown of material cost, fabrication cost and installation cost for each component, e.g. blades and hub. For installation cost, do ARPA-E mean the cost of installing that component onto the turbine, or some proportion of the turbine installation cost that we are attributing to that component?

ANSWER: The installation factor is based on the cost to install a specific component onto the larger system.



DE-FOA-0002334 - SHARKS

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QUESTIONS AND ANSWERS

II. Full Application Phase Questions:

Q36. I viewed the General Q&A section of ARPA-E's website and could not find the answer to this question: Can a consulting engineering firm assist a prime recipient with their full application and still be eligible to work on the project as a contractor/sub recipient if awarded? Or does the prime need to competitively procure that service beforehand?

ANSWER: Assuming the consulting engineering firm is an eligible member of the prospective Project Team, as that term is defined in FOA Section IX, it may participate in the preparation of application materials submitted to ARPA-E and any resulting project. Recipient procurement actions (as opposed to participation on a Project Team as a Prime or Subrecipient) are governed by 2 C.F.R. §200.319, and requires that contractors preparing specifications, requirements, work statements, etc., to be excluded from competing for any resulting contract employing the contractor's work product.

Q37. Our team had two questions with regard to the above-referenced FOA:

Q37.1 Is it possible to obtain the time series data (or a link to that data) that was used to generate the distributions for the S1-S4 case studies in Fig. 2 of the FOA? ...

ANSWER: The data sources used in the four case studies can be found in Footnotes 10, 11, 12 and 13 on page 12 of the SHARKS FOA.

Q37.2a Our team has a design that will satisfy the LCOE requirements for the S2 tidal site. In addition to providing specifics on that design and the corresponding S2 metrics spreadsheet, can we also show in the full application how our design applies to a utility-scale tidal site other than S4?

ANSWER: Applicants are responsible for the content of their proposals. All applications must show that the LCOE requirement for at least one case study (S1-S4) is satisfied.

Q37.2b If so, can we include an additional metrics spreadsheet showing the resulting LCOE (and corresponding M1 and M2) for this additional site?

ANSWER: The content and form of Full Applications must comply with the instructions set forth at FOA Section IV.D.



DE-FOA-0002334 - SHARKS

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QUESTIONS AND ANSWERS

Q38. INSTRUCTIONS for Cover Page and Executive Summary Section:

4) The Executive Summary shall not exceed 1 page in length

Is the executive Summary part of the cover page? That is, Title/Cost/Duration AND Executive summary should not exceed one page or is the Executive Summary a separate page?

ANSWER: That is correct.

Q39. With respect to the program costs proposed in our concept paper, I have several questions regarding the full proposal:

Q39.1 May we modify the proposed dollar amount to accommodate new costs and scope developed since submitting the concept paper?

ANSWER: Refer to General FAQ 7.13.

Q39.2 If so, is there some % modification that would be considered allowable?

ANSWER: There are no guidelines; however, the purpose of seeking and evaluating Concept Papers is to provide early feedback on whether an idea is likely to form the basis of a successful full application. Substantive revisions of the anticipated research program at the Full Application stage could have the effect of diminishing the benefits of the Concept Paper review.

Q39.3 May we add new team members?

ANSWER: Refer to General FAQ 7.14.

Q39.4 May we reallocate funding between team members and modify the % allocations?

ANSWER: Yes.

Q40.1 We submitted concept papers to both the SBIR and non-SBIR FOAs. We were encouraged to submit full applications to both concept papers, but the response on one of the papers was to make significant changes to the concept. In order to address the reviewer's questions, we will need to make significant changes to our approach, including proposed teammates. Are there any issues with making significant changes, including changing team partners, to our full application compared to our concept paper?

ANSWER: Refer to SHARKS FAQ 39.

Q40.2 We also noted the following [at DE-FOA-0002235, Section III.F.4]:



DE-FOA-0002334 - SHARKS

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QUESTIONS AND ANSWERS

However, small businesses that qualify as a “Small Business Concern” may apply to only one of the two ARPA-E SHARKS FOAs: ARPA-E FOA DE-FOA-0002335 (SBIR/STTR), Submarine Hydrokinetic And Riverine Kilo-Megawatt Systems (SHARKS) (SBIR/STTR), or ARPA-E FOA DEFOA-0002334, Submarine Hydrokinetic And Riverine Kilo-Megawatt Systems (SHARKS). Small businesses that qualify as “Small Business Concerns” are strongly encouraged to apply under the former (SBIR/STTR FOA). To determine eligibility as a “Small Business Concern” under DE-FOA-0002335, please review the eligibility requirements in Sections III.A – III.D above.

Does the above only apply to submitting the same concept to both FOAs? In other words, are we allowed to submit two distinctly different applications in response to both the SBIR and non-SBIR FOAs?

ANSWER: Yes, provided that a responsive and compliant Concept Paper as been submitted to each FOA.