

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:

Q1.1 Selection of Topics: Does one concept paper have to be limited to one specific topic from topics 1-4? Can we address multiple topics? For example: can we address T1- Novel alloy development as well as 3 and 4 on process development and comprehensive solution?- as well as address our plans for testing, validation, modeling etc. from Topic 5.

ANSWER: Refer to FOA Section I.B.5, Topic 4 (p.11). As set forth therein:

Comprehensive solutions are technology packages that address the challenge by integrating the capability of the base alloy, coatings, and manufacturing techniques to meet the requirements of the overall system design. ...

Topics 1-4 applicants must provide a plan to accomplish needed testing, manufacturing research, and modeling described in Topic 5, either through their own capabilities/contractors/project team members, or through interactions with the Topic 5 awardee(s). (emphasis in the original)

Applicants may choose to address one or more topics.

Q1.2 Surface finish: If topic 4 is addressed, [are] surface finish and post processing factors ... required to be addressed/within scope as a comprehensive solution?

ANSWER: Refer FOA Section I.B.5, Topic 4. As set forth therein:

This program that aim to supports project efforts provide comprehensive solutions that enable turbines to be able to run at higher temperatures to achieve higher efficiencies.

Prospective applications should include all technical concerns that may affect improvement in turbine efficiency (program goal) in their comprehensive solution proposal.

Q1.3 If Topic 1 on novel alloy development is successfully addressed, do we also have to consider coatings/cladding for later stages of development/deployment? For example, if our new alloy X meets the required performance specs do we also have to pay attention to the fact that this material may still get coated with a TBC/EBC material? Or is alloy development a standalone goal and coating it would be considered later on/not a requirement for this program? Another way of putting this would be- can we address Topics 1,3,4 and not consider Topic 2 for our proposal?

ANSWER: Refer to FOA Section IV.C.1.b (bullet point 2). As set forth therein:

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Clearly identify which particular topic (from the available list of topics 1-5 in section I.D of the FOA) is solved with the proposed technology concept.

While Topic 1 applicants are not expected to address Topic 2 concerns during Phase I, note that new alloys that may deem incompatible with existing or new coatings may not yield to final deliverable (turbine blade with better efficiency).

Q1.4 Is there any interest in- NDE evaluation, NDE/UT characterization, in situ monitoring/structural health monitoring of novel materials and structures?

ANSWER: Scope of testing needs for the program is listed in Section I.B.5 (Topic 5). As set forth therein:

Testing and evaluation of mechanical properties and environmental damage resistance at ultra-high temperatures (1300 °C or higher)

Any tests that support high-temperature testing requirements for properties relevant to proposed metric and turbine blade application would be of interest.

Q2. My question relates to this solicitation subject Novel Alloy Development as follows.

- a. Are fiber-reinforced ceramic composites with required capabilities consistent with this FOA?**
- b. Are fiber-reinforced metallic alloys suitable for this FOA?**
- c. Are only metallic alloys consistent with this FOA?**

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission. Also note that the proposed material system must meet technical and cost metric indicated in the FOA.

Q3.1 If we choose one of the five topics (such as Novel Alloy Development), do we need to address the other topics, such as Coating Development, in the preproposal or proposal?

ANSWER: Refer to ULTIMATE FAQ 1.3.

Also as indicated in Section I.B.5 of the FOA.

Alloy development should be coupled with full considerations and demonstrations of any manufacturing processes that will be used to produce the new alloys.

Q3.2 If we have some researcher involved from Europe, are we allowed to give this person funding?

ANSWER: Refer to General FAQ 3.1.

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Q4.1 The [FOA] seems to be very specific in calling out refractory metal alloys. Would another material class be considered responsive to this call? My team and I had some [other material] in mind.

ANSWER: As set forth FOA Section I.B.3: *The proposed program aims to develop refractory metal alloys (such as Mo, Nb etc.) for high temperature components in gas turbines.* Submissions falling outside the technical parameters specified in the FOA may be deemed nonresponsive and may not be reviewed or considered (refer to FOA Section III.C.2). Also note that the proposed material system must meet technical and cost metric indicated in the FOA

Q4.2 Table II [found at FOA Section I.B.7, p.15] lists a target density less than or equal to 9.0 g/cc, but in the proceeding paragraph it states that "Specific alloy compositions may satisfy most of the metrics in Table II while not meeting one or two of them." Would a material with a density greater than 9.0 g/cc be considered responsive, especially if an argument could be made that specific strength, specific creep, and specific stiffness values are high enough to allow the use of thinner walls/etc? Would a proposal targeting a blisk geometry (integrally bladed rotor geometry) rather than individual blades be considered responsive to the ULTIMATE call?

ANSWER: Material system of density greater than 9.0 g/cc may be considered responsive as long as it is backed up by significant performance improvement. Demonstration of manufacturability feasibility occurs during Phase II of the program through production of generic turbine blade design as indicated in FOA Section I.B.7.

Q5.1 On page 31 of the FOA [Section III.C.3], *Submissions Specifically Not of Interest* include, "Submissions seeking to improve currently known structural ceramics and ceramic matrix composites (CMC)." Provided a approach could meet the objectives and metrics of the FOA, would non-incremental and transformational approaches to structural or ceramic matrix composites (CMCs) that are significantly and define-ably beyond the emerging state-of-the-art of knowledge, understanding or manufacturing potentially be of interest?

ANSWER: Proposals with material system that are novel and approach that is transformational will be considered responsive as long as they meet technical and cost metrics indicated in the FOA.

Q5.2 On page 31 of the FOA [Section III.C.3], *Submissions Specifically Not of Interest* include, "Submissions seeking incremental improvements to additive manufacturing techniques independent of refractory metal alloys development." Provided and approach could meet the objectives and metrics of the FOA and not be related to other areas not of interest in the FOA (ex: not include additive work with known Ni or Co superalloys), would additive approaches to materials (ex. ceramics) that are part of either coating, manufacturing or comprehensive solutions potentially be of interest?

ANSWER: Proposals that seek to develop or improve additive manufacturing technologies as a general manufacturing technique, but not directly tied to the goal of this program will likely be considered non-responsive.

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Q5.3 With regard to this funding opportunity, ARPA-E previously published an announcement of a 'teaming list' opportunity for this funding opportunity. Neither this announcement nor the resulting list of potential teaming partners is available on the ARPA-E website. Is this information for ARPA-E's internal use, or is it publicly available for potential applicants as they establish teams?

ANSWER: The ULTIMATE teaming partner list can be found on ARPA-E eXCHANGE at <https://arpa-e-foa.energy.gov/TeamingPartners.aspx?foaid=de430017-3129-41a2-be65-69aa692e7d0d>.

Q6. For this, the concept paper is limited to 4 pages. If so, I wonder if one or more additional pages [are] allowed for listing bibliography cited in the concept paper?

ANSWER: Refer to General FAQ 6.21.

Q7. The FOA outlines increasing turbine efficiency as the main motivation for the ULTIMATE program but also notes that other applications would benefit from the development of metals and coatings that can withstand elevated temperatures up to 1800 C. Would it be acceptable to propose the development of refractory metal alloy compositions, coatings and manufacturing processes that meet the specified target properties but would be used for high temperature applications other than turbines?

ANSWER: The goal of this program is to develop material solutions including alloys, coatings, and manufacturing processes that can meet the metrics as specified in this FOA. Materials that meet these metrics would have potential for applications in turbines. As set forth in FOA Section I.B.1:

The ULTIMATE Program seeks to fund the development and demonstration of ultrahigh temperature materials that can operate continuously at 1300 °C in a standalone material test environment (or with coatings, enabling gas turbine inlet temperatures of 1800 °C) or higher, targeting gas turbine applications in the power generation and aviation industries

Q8.1 Could you offer clarification on the definition of organization and individual?

ANSWER: Organizations include FFRDCs, GOGOs, GOCOs, for-profit organizations (other than small businesses), institutions of higher education, nonprofit organizations, and small businesses as those terms are defined in FOA Section IX. Individual has the meaning found in general usage – i.e., a single human being.

Q8.2 And clarify, our understanding, that if a PI participates on a project team for topic 5, he/she is prohibited to participate on a project within topics 1-4?

ANSWER: As set forth at FOA Section I.B.7, Paragraph 7.5.6: ... ***individuals participating on a Topic 5 Project Team will not be permitted to participate on a Topic 1-4 Project Team.*** (emphasis in the original)

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Q9. Under this funding opportunity, the stated focus is on "novel refractory metal alloys, including refractory metal high entropy alloys, as well as necessary coatings, for high temperature turbine blade applications." Later, we are told that submissions seeking to improve currently known structural ceramics and ceramic matrix composites (CMC) as well as submissions seeking incremental improvements to additive manufacturing (AM) techniques independent of refractory metal alloys development are not of interest. Will a proposal focused on AM of refractory ceramic components and coatings for high-temperature alloys be considered? We are currently working on concepts that permit laser-based AM of various carbides, borides and nitrides. Our approach has the potential to open up new avenues for production of parts from high-temperature ceramic materials that could be used in turbine engine applications. Does the FOA extend to a program focused in these areas?

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission. Proposals that provide novel material systems and transformational approach may be considered responsive as long as they meet technical and cost metric indicated in the FOA.

Q10. Are GOGOs (Government Owned, Government Operated laboratories) eligible to lead a Project Team under this Funding Opportunity - DE-FOA-0002337?

ANSWER: As set forth at FOA Section III.A.2, FFRDCs/DOE Labs (including GOGOs) are eligible to apply for funding as the Lead Organization for a Project Team. Federal agencies and instrumentalities other than DOE may not apply as the Lead Organization for a Project Team.

Q11. For the current ARPA-E ULTIMATE proposal I see there are topics focused on materials development, and others focused on manufacturing process development for these materials. Would you prefer a team that has integrated materials development with process development, or are separate teams acceptable?

ANSWER: Refer to FOA Section IV.C.1.b (bullet point 2). As set forth therein:

Clearly identify which particular topic (from the available list of topics 1-5 in section I.D of the FOA) is solved with the proposed technology concept.

ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission. ARPA-E subjects the capabilities of the proposed Project Team to Merit Review during both the Concept Paper and Full Application phases of the FOA.

Q12. Can you confirm that the budget and task descriptions presented in the concept paper for DE-FOA-0002337 should reflect both Phase 1 and Phase 2 of the proposed project?

ANSWER: Refer to FOA Section I.A.6. As set forth therein: *[a]pplicants must provide details budgets and task descriptions that cover both Phase 1 and Phase 2.*

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Q13. I hope you are all doing well. I have a question about the budget numbers that we may propose with the Ultimate program's concept paper. Is the budget that we propose at the concept paper stage binding?

ANSWER: Refer to General FAQ 7.13.

Q14. I am a part of a team, lead by [description omitted]. ... For a team of this size, what can you tell us about DOE ARPA-E's rules or expectations with regards to Co-PI's? ...

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission. ARPA-E subjects the capabilities of a proposed Project Team to Merit Review during both the Concept Paper and Full Application phases of the FOA.

Q14.2 For a team of our size, would it be reasonable to structure our budget similar to [description omitted].

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission. ARPA-E subjects the proposed budget to Merit Review during the Full Application phase of the FOA.

Q15. The recent ULTIMATE FOA identifies three principal technical areas (novel alloy development, coating development, and manufacturing process development) as well as a fourth topic targeting comprehensive solutions. In addressing this fourth topic is it acceptable to target two of the technical areas instead of all three (e.g. alloy development and manufacturing process development)? If not, can two teams cooperatively address topic 4 through two separate submissions?

ANSWER: Proposals that are focused on solving topic 4 should address all comprehensive concerns listed in the FOA document in a **single** proposal. Refer to FOA Section I.B.5, Topic 4. As set forth therein:

Comprehensive solutions are technology packages that address the challenge by integrating the capability of the base alloy, coatings, and manufacturing techniques to meet the requirements of the overall system design. Project efforts that aim to provide comprehensive solutions consist of efforts in alloy design and development, coatings, and compatible manufacturing process, all of which are driven by component and system designs. Comprehensive solutions also address supply chain technologies and testing and validation of the technologies developed. It is expected that such project efforts will involve multiple partners with complementary expertise, skills, and processing capabilities.

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Q16. I have specific question about the requirements for coating performance (Table 1). If the coating solution is comprised of a thermal barrier system, is the requirement for the 1700C exposure referring to the surface temperature at the thermal barrier or must the sample be isothermal at 1700C from the thermal barrier coating through the substrate?

ANSWER: We expect to see thermal gradient between coating surface and base alloy. New base alloy must have temperature capability of 1300C and coating must have temperature capability of 1700C.

Q17.1 Can you confirm that concept papers should cover both Phase 1 and Phase 2 of the proposed project?

ANSWER: The concept paper should address both Phase 1 and Phase 2.

Q17.2 The FOA lists a \$10M limit for individual awards. Is this \$10M in federal funding [or] \$10M in total project costs?

ANSWER: The \$10 million maximum amount is Federal share only. It does not include amounts cost shared.

Q17.3 Can letters of commitment from partners be included as an appendix to the concept paper?

ANSWER: Refer to General FAQ 6.5.

Q18. In the DE-FOA-0002337, in [S]ection I.B.5.1, it is stated, "Alloy development should be coupled with full considerations and demonstrations of any manufacturing processes that will be used to produce the new alloys." Does this mean (i) Topic-1 proposers must have in the team a manufacturing partner for Phase-I/II work or (ii) a team partner is not needed, but it is sufficient to demonstrate manufacturing at the laboratory scale (like HIPing, that is industrially scalable without a problem) to meet the Phase I/II targets? or the yet another possibility that (iii) Topic-1 awardees will be matched with manufacturing awardees to demonstrate the manufacturability in Phase-1 or Phase-2?

ANSWER: Applicants that do not have in-house capabilities to demonstrate manufacturing feasibility could partner with appropriate team or use support of topic-5 awardees either approaching them directly or through ARPA-E. Refer to Section I.B.5. As set forth therein:

Topics 1-4 applicants must provide a plan to accomplish needed testing, manufacturing research, and modeling described in Topic 5, either through their own capabilities/contractors/project team members, or through interactions with the Topic 5 awardee(s). ARPA-E will encourage and may require Topic 1-4 awardees to work with the Topic 5 awardee(s), based on ARPA-E's review of each plan during award negotiations.

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Q19.1 Currently our team would have capabilities to fabricate and characterize/measure most material properties. For properties that we cannot measure (currently thermal conductivity), will outside contracted (service/fee based) lab testing be permitted, or is the intent for ARPA to provide an appropriate "Topic 5" partner for properties that the Topic 1-4 teams cannot measure in-house. In such cases, will ARPA coordinate the partnership, to include number of samples tested and testing timelines?

ANSWER: ARPA-E encourages applicants that do not have in-house testing capabilities use topic-5 awardees. Refer to Section I.B.5. As set forth therein:

Topics 1-4 applicants must provide a plan to accomplish needed testing, manufacturing research, and modeling described in Topic 5, either through their own capabilities/contractors/project team members, or through interactions with the Topic 5 awardee(s). ARPA-E will encourage and may require Topic 1-4 awardees to work with the Topic 5 awardee(s), based on ARPA-E's review of each plan during award negotiations.

Q19.2 Are the target material properties under the assumption of isotropic behavior? In the case on mild anisotropy, as might be expect in most current metal AM processes, should all directions meet the minimum tensile strength, creep strain, ductility, thermal conductivity, etc.?

ANSWER: Test conditions should mimic maximum stress conditions observed during the operation of the gas-turbine blades.

Q20. ARPA-E ULTIMATE FOA Questions

Q20.1 Is it viewed as beneficial to have partner(s) in our Topic 1 team that have experience in Topics 2-4?

ANSWER: Refer to FAQ 14.

Q20.2 Is it viewed as beneficial to collaborate with other teams pursuing Topics 2-4 if we are focusing on Topic 1?

ANSWER: Refer to FAQ 14.

Q20.3 Does a Topic 1 team need to produce standard mechanical testing specimens manufactured with the same process used for manufacturing turbine blades in the first 18 months? Can we rely on Topic 3 and/or Topic 5 teams to additively manufacture/print the standard mechanical testing specimens?

ANSWER: Yes, mechanical test specimens should be produced using manufacturing methods relevant to the gas-turbine blades. Topic 5 awardees can be used by Topics 1-4 team during the project to provide manufacturing and testing support. As indicated in the FOA Section I.B.5:

Topics 1-4 applicants must provide a plan to accomplish needed testing, manufacturing research, and modeling described in Topic 5, either through their own capabilities/contractors/project team members, or through interactions with the Topic 5

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awardee(s). ARPA-E will encourage and may require Topic 1-4 awardees to work with the Topic 5 awardee(s), based on ARPA-E's review of each plan during award negotiations.
(emphasis in the original)

Q20.4 For a Topic 1 team, can we assess the performance metrics provided in Table 1 with materials produced by processing techniques other than additive manufacturing?

ANSWER: Yes, all advanced manufacturing methods, including additive manufacturing, is within the scope of the program.

Q20.5 Will Topic 3 and/or Topic 5 teams provide the capability to produce powders for other topic areas?

ANSWER: Topic 5 awardees are required to provide support as described in the FOA including manufacturing technology support, which may or may not include production of powders. However, it is up to the teams of Topic 1-4 and Topic 5 awardees to discuss specifics of such support.

Q20.6a Can a Topic 5 team build mechanical test specimens for our Topic 1 project using AM for validation tests, or do we have to do that within a Topic 1 team?

ANSWER: Topic 5 awardees can be used by Topics 1-4 team during the project to provide testing support which may or may not include building test specimens. As indicated in FOA Section I.B.5: ‘

Topics 1-4 applicants must provide a plan to accomplish needed testing, manufacturing research, and modeling described in Topic 5, either through their own capabilities/contractors/project team members, or through interactions with the Topic 5 awardee(s). ARPA-E will encourage and may require Topic 1-4 awardees to work with the Topic 5 awardee(s), based on ARPA-E's review of each plan during award negotiations.
(emphasis in the original)

Q20.6b If a Topic 5 team addresses this, what is the timeline (before or after the first 18 months)

ANSWER: Timeline for meeting Table I properties is prior to completion of Phase 1 (18 months)

Q20.6c Or, similarly, can we iterate with a Topic 3 team to develop AM parameters, or must it be done within a Topic 1 team? If so, what is the timeline relative to the first 18 months?

ANSWER: Topic 5 awardees can be used by Topics 1-4 team to provide support.. As indicated in the FOA Section I.B.5

Topics 1-4 applicants must provide a plan to accomplish needed testing, manufacturing research, and modeling described in Topic 5, either through their own capabilities/contractors/project team members, or through interactions with the Topic 5 awardee(s). ARPA-E will encourage and may require Topic 1-4 awardees to work with the Topic 5 awardee(s), based on ARPA-E's review of each plan during award negotiations.
(emphasis in the original)

Timeline for meeting Table I properties is prior to completion of Phase 1 (18 months).

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Q20.7 Phase 1 & Phase 2 Targets– The mechanical property requirements for Phase 1 such as creep, ductility and toughness, shown in Table I, are highly dependent on microstructure. Many of the requirements in Phase 2 shown in Table II are not sensitive to microstructure e.g. solidus temperature, thermal conductivity, density, which can be reasonably predicted from models. Is it acceptable to first meet properties that can be reasonably modeled first (solidus temp, thermal conductivity, density) in Phase 1, then evaluate microstructure optimization to meet strength, ductility, toughness, creep, and TMF in Phase 2?

ANSWER: Relevant property metrics in Table 1 must be met by the end of Phase 1 timeline.

Q20.8 Should a Topic 1 team plan to iterate with a Topic 2 and/or Topic 5 team to continuously evaluate coating capability, or should a Topic 1 team plan to evaluate coating compatibility with standard coatings commonly applied to refractory alloys? Does a Topic 1 team need to do the coating performance testing in Table 1 before the first 18 months? After the first 18 months?

ANSWER: Topic 1 applicants are not required to do coating development or testing. However, Topic 1 teams must consider the need for coatings as well manufacturability during their alloy development. Topic 1 applicants are not required to meet coating properties metric listed in Table I.

Q20.9 Does/would a Topic 2 team do the coating performance testing for a Topic 1 team?

ANSWER: Refer to ULTIMATE FAQ 20.8.

Q20.10 Can an entity partner on more than one proposal for a given topic for Topics 1-4?

ANSWER: Refer to FOA Section III.C.4.

Q20.11a For a foreign entity with a subsidiary or affiliate incorporated under the laws of a state or territory in the US, it states that all funded work must be performed in the US. Can program information be shared with the parent entity (outside of the US) ...

ANSWER: U.S. export control laws and regulations apply to all work performed under any agreement resulting from this FOA.

Q20.11b ... and can unfunded work be performed by individuals outside of the US employed by the foreign entity to provide services that contribute to the program?

ANSWER: The Applicant would need to apply for and receive a Foreign Work Waiver from ARPA-E by completing the pertinent section of the Business Assurances & Disclosures Form with its Full Application. Any resulting award would remain subject to enhanced U.S. competitiveness requirements (refer to ARPA-E Model Cooperative Agreement, Attachment 2, found at <https://arpa-e.energy.gov/?q=site-page/funding-agreements> for additional information).

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Q20.12 If a university is the prime recipient, does the university need to provide 20% cost share, or does the cost share of all partners need to total 20%?

ANSWER: Refer to FOA Section III.B.5.

Q20.12 Would a project be allowed to do 10% cost share (p. 27 – i.e., if we anticipate 80% of work is done by educational institution).

ANSWER: Refer to FOA Section III.B.3 for reduced cost share requirements available to certain types of projects.

Q21. I am interested in applying for the ULTIMATE program. I would like to apply as a PI for a TOPIC 5 project and a Co-PI for a TOPIC 1 project. However, I noticed that even though the FAQ states that "an individual may be on more than one submission" in the call it is mentioned that "individuals participating on a Topic 5 Project Team will not be permitted to participate on a Topic 1-4 Project Team."

Q21.1 Does it mean I can only be either on a Topic 1 or Topic 5 [project]?

ANSWER: That is correct.

Q21.2 Can I still submit two concept papers and go ahead with only one of them for the full proposal if only one of them is encouraged?

ANSWER: Timely submission of a compliant and responsive Concept Paper is the only prior eligibility condition for submitting a Full Application. Full Applications can be submitted at the Applicant's discretion. ARPA-E will not make awards to a Recipient or Sub-recipient if any individuals are proposed to perform work under both Topic 1 and Topic 5.

Q22.1 Is it possible to submit a concept paper that does not address performing all the measurements of the benchmark metrics in Table II, but simply focuses on the processing part?

ANSWER: Applicants are not required to meet all properties listed in Table II. Only properties that are relevant to the proposed topic of the applicant will be required to be met. For example, applications focused on topic 3 (manufacturing process development) do not need to meet coating properties metric.

Q22.2 Will ARPA-E suggest teams based on the concept papers submitted?

ANSWER: No. Prospective applicants are encouraged to consult FOA Section I.B.7, Paragraphs 7.5.3 and 7.5.5 for information on collaborations between Topics 1-4 and Topic 5 Applicants and Recipients.

Q23.1 In the concept paper format there is a request:

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Describe the background, theory, simulation, modeling, experimental data, or other sound engineering and scientific practices or principles that support the proposed approach. Provide specific examples of supporting data and/or appropriate citations to the scientific and technical literature.

How should we deal with references related to the proposed work? Is a bibliography expected? And would it be part of the page count? Is a short form (name, year) format acceptable? Is there a preferred format?

ANSWER: Refer to General FAQ 6.21.

Q23.2 Topics addressed 1&3. One of the options for the additive approach that our team is looking at is [description omitted]. Would it be reasonable to model the wire manufacturing process of the new alloy and substitute something like C-103 for the build process?

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission.

Q24. My colleagues and I are preparing a response to DE-FOA-0002337, and have the following questions for which we hope to gain some additional clarity as we finalize our concept paper. ...

Q24.1 Can the proposed work encompass both process development AND alloy development?

ANSWER: As indicated in the FOA section I.B.5: *Alloy development should be coupled with full considerations and demonstrations of any manufacturing processes that will be used to produce the new alloys.* New process development is not expected for topic 1 applicants, but the alloy development should include consideration of manufacturability. Isolated materials development without full considerations of the compatible manufacturing methods will be discouraged.

Q24.2 Is it anticipated that both oxidation and mechanical properties will be explored in the first 18 months?

ANSWER: As indicated in the FOA, properties listed in Table I are required in Phase 1 (maximum 18 months) and comprehensive properties listed in Table II are required in Phase 2 (maximum 24 months) of the program. However, only properties that are relevant to the proposed topic of the applicant will be required to be met. For example, applications focused on topic 1 (alloy development) do not need to meet coating properties metric, although the alloy design and development must consider the compatibility of the alloy with coatings that may be needed.

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Q24.3 Do the elevated temperature measurements have to meet ASTM specifications?

ANSWER: Properties target are listed in Table I and II of the FOA. Wherever applicable and ASTM test exist, applicants are required to use standardized test.

Q24.4 For a team primarily consisting of universities and DOE national laboratories, what is the cost share requirement if there is one industry partner?

ANSWER: Refer to FOA Section III.B.3 for reduced cost share requirements available to certain types of projects.

Q25. Is the requirement for “Applicants” to plan for funding of both Phase I & II in the Concept Paper Submissions or are the initial Concept Papers only to fund Phase I to the stage Gate, with a later separate set of funding for Phase II to be awarded to the Applicants/Awardees who successfully complete Phase I and advance to Phase II?

ANSWER: As set forth at FOA Section II.A: *ARPA-E plans to fully fund your negotiated budget at the time of award.*

Q26. I'd like to know what is the appropriate cost share for a small business entity (doing 20% of the total work), teaming with a University Lead Team (doing 80% of the total work). As per the FOA on page 26, it is evident there will not be a cost share for the first 12 months for small business or university, but 10% beyond the 12 month period. Does this 10% cost share is on the budget for the small business (beyond the 12 month period) or it is on the total budget including the University team, beyond the 12 month period?

ANSWER: Reduced cost share requirements are set forth at FOA Section III.B.3, including:

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 ... are required to provide at least 10% of the Total Project Cost as cost share.

The Cost Share Grace Period is not available to this Project Team, small businesses must perform at least 80% of the project work to qualify. As noted in FOA Section III.B.4, the cost share requirement, calculated on a Total Project Cost basis, applies to the Project Team in its entirety.

II. Full Application Phase Questions:

Q27. We were recently encouraged to submit a full application to ARPA-E's Ultimate program (DE-FOA-0002337). We received the feedback “Budget too high”, and would like to inquire if we can get more detail regarding the program's budget expectations.

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Applicant's are responsible for the content of their applications. Reasonableness of the budget to accomplish the proposed project is a matter assessed during Merit Review (refer to FOA Section V.A.2)

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Q28.1 Thank you for the invitation to submit a full proposal to the DE-FOA-0002337 ULTIMATE solicitation, Topic 1. My co-investigators and I strongly believe that alliances between different Topic teams will be critical for the success of the overall program (both from a technical perspective and from the perspective of maximizing economic value since the teams could share cost burdens). Should we strive to build such alliances as a part of our full proposal, or should we wait until after the Topic teams have been selected?

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Applicant's are responsible for the content of their applications.

Q28.2 Also, can you please let us know how many teams have been selected to compete for the individual Topics? ...

ANSWER: ARPA-E does not publish that information.

Q29. In section 7.5.5 of the subject FOA, topic 1-4 applicants are encouraged to reach out to Topic 5 applicants. Topic 1-4 applicants may not fully be aware of the Topic 5 applicants, and vice versa. Does DOE intend to further aid these discussions (e.g., contact information of, for example, Topic 5 applicants)? ...

ANSWER: Applicants are responsible for the content of their applications. Per FOA Section I.B.7: *[d]uring the period of performance, ARPA-E will – as needed - facilitate collaborations between Topics 1-4 awardees and Topic 5 awardee(s).*

Q30. We have recently received a letter of encouragement to apply for DE-FOA-0002337. I wanted to be sure I understood the full application instructions clearly. The PI is not submitting a separate biosketch and current and pending list but should discuss this in section 3 of the technical volume? Can someone please confirm if this is correct?

ANSWER: Assuming the questioner is referring to the content of the Technical Volume and the template published with the application materials, Personal Qualification Summaries for the Principal Investigator and all Key Personnel are to be included with the Full Application (refer to Template Section 7). Applicants are also instructed to: *[i]dentify Key Personnel, describe how their qualifications relate to the proposed effort, and indicate their roles and responsibilities for each of the project task* (refer to Template Section 3). All relevant Pending and Current financial support (both Federal and non-Federal) must be disclosed by submission of the Business Assurances & Disclosures Form (refer to Item 3 therein).

Q31. If a person is a PI for a full proposal, could he or she be involved with another proposal (including regular or SBIR proposal) with which he or she is not a PI?

ANSWER: Refer to General FAQ 6.13. Even though the FAQ concerns itself with Concept Paper submissions, the reply is equally applicable to Full Applications.

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Q32.1 If we do not have an official cost sharing industry partner is this a severe disadvantage for our proposal? ...

ANSWER: ARPA-E will not pre-assess an applicant's proposal.

Q32.2 Is it sufficient to have industry advisors? If so, how do we include evidence of their agreement to act in an advisory role? Letter of support and offers of in-kind support?

ANSWER: Unless one of the reduced cost share requirements set forth at FOA Section III.B.3 is applicable, the base cost share requirement is described at FOA Section III.B.1. As stated at FOA Section III.B.8, if selected for award negotiations, ARPA-E will require documentation of cost share contributions. Cost share types and allowability are discussed at FOA Section III.B.6. Proposed cost share must be documented on the cost share worksheet of the Budget Justification Workbook.

Letter's of support are discussed at General FAQ 6.5. Even though the FAQ addresses Concept Paper submissions, the same concept is applicable to Full Applications.

Q32.3 Is it beneficial to team with a specific alloy (Topic 1) development group in the proposal, or is it sufficient to say we will work with any alloy group selected by ARPA-E?

ANSWER: Applicants are responsible for the contents of their applications. ARPA-E will not pre-assess an applicant's proposal.

Q33. Is there anywhere to see the teams submitting full proposals under Topic 5? We are leading a team for Topic 4 and would like to identify any potential supporting services available under Topic 5 that may be useful to our proposed efforts. We would plan to reach out to relevant Topic 5 teams and offer a letter of support if we think we could use their services on our project.

ANSWER: Refer to ULTIMATE FAQ 29.

Q34. We would like to inquire with the PM regarding the possibility to maintain our collaborative team for the full proposal. One of our proposed co-PI[s] ... was also selected for DE-FOA-0002337 ULTIMATE (topic 5) and told he could not work with Topic 1-4 awardees. I am thus seeking permission to keep ... as member of our team on DE-FOA-0002338 ULTIMATE ... since these are different FOAs.

ANSWER: The technical subject matter of DE-FOA-0002337 and DE-FOA-0002338, Topics 1-4, is the same. Accordingly, the limit on participation set forth at DE-FOA-0002337, Section I.A.7, Paragraph 7.5.6 will apply equally to DE-FOA-0002338 – i.e., individuals participating on a DE-FOA-0002337, Topic 5 Project Team will not be permitted to participate on a DE-FOA-0002338, Topic 1-4 Project Team.

QUESTIONS AND ANSWERS

Q35. I have a question about the business assurance form. We have national labs partnering with us and we would like to know if the labs should provide answers to sections 7 (FFRDC Authorization) and 8 (Field Work Proposal)? I am reading the FOA and it is a bit ambiguous.

ANSWER: Yes.

Q36. Our ARPA-E proposal addresses all aspects of Topic 1 Novel Alloy Development for Phase I, and will, if successful, show the feasibility of the manufacturing route. Is it acceptable for Phase II to simply indicate that we will work with researchers who win funding for Topic 5 and that these will be assigned by ARPA-E?

ANSWER: ARPA-E will not pre-assess an Applicant's proposal. As set forth at FOA Section I.B.5, Topic 4 (p.12): ***Topics 1-4 applicants must provide a plan to accomplish needed testing, manufacturing research, and modeling described in Topic 5, either through their own capabilities/contractors/project team members, or through interactions with the Topic 5 awardee(s).*** (emphasis in the original)

Q37. I am preparing a proposal for the ULTIMATE program on topic 3 – Manufacturing Process Development. As part of the proposal we are required to demonstrate that the samples we manufacture can exhibit performance that meets the qualifying/benchmark threshold values that are specified in Tables I and II of the FOA (DE-FOA-0002337). I also note that there is a Topic 5 on Testing and Resource Support for Topics 1-4 that is indicated in the FOA. Moreover, for Topic 5 it is also stated in 7.5.3 that ARPA-E will facilitate collaborations between Topics 1-4 awardees and Topic 5 awardee(s). With this in mind, my question is related to the testing. In my proposal do I need to document separately how the testing will be performed in order to satisfy the qualifying/benchmark thresholds or is it satisfactory to indicate that the testing will be done in collaboration with the Topic 5 awardee(s)?

ANSWER: Refer to ULTIMATE FAQ 36.

Q38. In other past DOE funding announcements, Milestones, Go/No-Go Decision Points, and a detailed SOPO has [been] separately requested; the SOPO has specifically been something that was required as a separate document as part of a Workplan (pages counted).

For this call, Section [I.B.]6 on Page 14 is the only place in the FOA that mentions a SOPO and nothing is listed in the Full Application section on page 1. Section [II.] D on Page 24 discusses milestones and establishing Go/No-Go Decision Points being part of the award negotiations. Can you please clarify whether or not milestones and establishing Go/No-Go Decision Points, and a SOPO are required as part of our submitted proposal? If so, are we being asked to submit a separate document for the

QUESTIONS AND ANSWERS

SOPO, or will discussing milestones, establishing Go/No-Go Decision Points, and the SOPO be counted within the maximum pages?

ANSWER: Instructions describing the content and form of Full Applications can be found at FOA Section IV.D.

Q39. Is there is a set start date that we have to have for the ULTIMATE full proposal for budgeting purposes?

ANSWER: Refer to FOA Section V.C.

Q40. I have a question (which I did not see asked in the FAQs) regarding the purchase of [supplies] from foreign sources To make [the supplies], an approach that would result in considerable cost savings would be to use This can be done locally ..., but requires the provision of [certain items]. [Supplier omitted] have told us that their most reliable and least expensive source for these electrodes is a company in [foreign country omitted]. Would it be possible to use ARPA-E funds under this program to purchase such [items]?

ANSWER: Refer to General FAQ 10.15. Recipients must maintain records justifying the acquisition of any non-domestic supplies.

Q41. ... I am writing to clarify a question regarding the length restrictions for sections 1-5 of the full proposal. On the DE-FOA-0002337 Technical Volume template at the top of page 2 it states: [INSTRUCTIONS FOR SECTIONS 1-5: The cumulative length of Sections 1-5 shall not exceed 20 pages.]

At the end of the same template it states:

FORMAT REQUIREMENTS (See Section IV.D of the FOA for Format Requirements):

- (1) Technical Volumes must be submitted in Adobe PDF format, be written in English, use black 12 point or larger Times New Roman font (except in figures and tables), use 8.5 inch by 11 inch paper, be single-spaced, and have margins no less than 1 inch on every side.
- (2) Technical Volumes must not exceed the maximum page lengths specified for each section of the Technical Volume in Section IV.D of the FOA. If applicants exceed the maximum page length, ARPA-E will review only the authorized number of pages and disregard any additional pages.
- (3) The ARPA-E assigned Control Number, Lead Organization Name, and Principal Investigator's (PI's) Last Name must be in the upper right hand

QUESTIONS AND ANSWERS

corner of the header of every page. Page numbers must be included in the footer of every page.

For each of the sections 1-5, there are suggested page lengths. For example, for section 2, Proposed Work, the suggested length is 7-8 pages.

My question is that are we supposed to strictly limit each section to the suggested length limits or is the total of Sections 1-5 limited to 20 pages and that is the only limit? Please clarify.

ANSWER: The suggest section page lengths do not represent limits on the length of each section. Sections 1-5 are limited to 20 pages.

Q42. In developing the budget for the full proposal for this FOA, we have some questions:

Q42.1 In covering budget period (BP), for 42 months, we are interpreting that BP1, BP2 and BP3 are all full years and BP4 would be 6 months. Is this correct? Or ARPA-E's point of view is different?

ANSWER: The maximum term of Phase 1 is eighteen months. The maximum term of Phase 2 is twenty-four months. The maximum term of any agreement resulting from this FOA is forty-two months. The duration of all budget periods is within the discretion of the applicant.

Q42.2 Since Phase-I will be 18 months, this will fall in the middle of BP2 as in Q1. Do we need present the budget totals for Phase I and Phase II as a narrative in the technical proposal?

ANSWER: As set forth in the Technical Volume Template, present budget information within the Technical Volume by entity and major task.

Q42.3 Should we expect that connections between alloy development, testing or coating teams are to be established at a later date? ...

ANSWER: Refer to FOA Section I.B.7, Item 7.5.3 (p.19).

Q43. When identifying team members in our whitepaper submission, we had noted the organization type of the [omitted] as a Federally Funded Research and Development Center (FFRDC). It seems that this team member should have been listed or defined as a government entity

For purposes of ... submission under the subject Funding Opportunity, could you please confirm how we should reflect this relationship in the Technical Volume and Budget sections our submission? ...



DE-FOA-0002337 - ULTIMATE

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, MAY 26, 2020

SECOND DEADLINE FOR QUESTIONS TO ARPA-E-CO@HQ.DOE.GOV:

5 PM ET, AUGUST 21, 2020

QUESTIONS AND ANSWERS

ANSWER: A single submission prepared in accordance with the instructions set forth in the Budget Justification Workbook is required.

Q44. Can you please let me know if we have to upload a separate SOPO document with the proposal package for the DOE ULTIMATE full proposal.

ANSWER: Refer to ULTIMATE FAQ 38.

Q45. Our proposal will require vendor quotes for equipment and supplies purchases, however, the Budget Justification Workbook Guidelines and the FOA do not clearly indicate where the quotes must be included (Workbook vs. Technical or other).

Clarification on this would be most appreciated.

ANSWER: Quotations may be appended or embedded in the Budget Justification Workbook.