

## 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. DO REFERENCES COUNT TOWARDS CONCEPT PAPER 5 PAGE LIMIT?

**ANSWER:** Please refer to section IV.C.1.c ("Content and Form of Concept Papers") of the FOA.

#### Q2. OUR GROUP AT [REDACTED] HAS BEEN APPROACHED BY MULTIPLE INSTITUTIONS THAT WANT TO SUBMIT PROPOSALS IN RESPONSE TO THE CREATING HARDENED AND DURABLE FUSION FIRST WALL

INCORPORATING CENTRALIZED KNOWLEDGE (CHADWICK) FOA, DE-FOA-0003240. OUR ROLE WOULD ESSENTIALLY BE SIMILAR IN ALL PROPOSALS - NAMELY TO PROVIDE FOR PLASMA AND DISPLACEMENT DAMAGE IRRADIATION TO PROMISING FUSION FIRST WALL CANDIDATE MATERIALS. READING THROUGH THE FOA IT WOULD THEREFORE SEEM THAT WE COULD SUBMIT UNDER CATEGORY C OF THE FOA, AND PROPOSE FUNDING THAT WOULD ALLOW US TO SUPPORT ALL OF THE GROUPS THAT WERE CHOSEN FOR FUNDING IN THE CHADWICK FOA. HOWEVER, THE PARTNERS THAT HAVE APPROACHED US ASK THAT WE SUBMIT AS PART OF THEIR PROPOSALS IN CATEGORY A.

BEFORE DECIDING HOW TO PROCEED, I WANTED TO ASK: DOES ARPA-E HAVE ANY GUIDANCE ON HOW YOU WOULD WISH TO SEE A FACILITY LIKE OURS PARTICIPATE IN THE CHADWICK PROGRAM?

**ANSWER:** Please refer to Section I.D.4 of the FOA. ARPA-E will not pre-assess the structure and makeup of proposed project teams.

#### Q3. I COULD NOT FIND THE ANSWER TO THIS QUESTION IN THE ONLINE FAQ. FOR THE CHADWICK FOA: ARE CU ALLOYS AS PART OF THE FIRST WALL STRUCTURE, OF INTEREST TO THIS FOA UNDER TOPIC AREA A (OR IS THIS TOPIC AREA EXCLUSIVELY INTERESTED IN W ALLOYS)?

**ANSWER:** Cu alloys are of interest as a structural component in Category B if sufficient justification is provided on how the new alloy can replace RAFM as a structural component of the first wall and will be analyzed for activation by Category C teams.



**Q4. CONCERNING THE CONCEPT PAPERS:**

**ARE THERE ESTIMATES FOR THE SIZE OF THE GRANTS, THEIR DURATION, AND FOR THE MATCHING FUNDS REQUIRED?**

**ANSWER:** Please refer to the DE-FOA-0003240 CHADWICK funding opportunity announcement sections II.A Award Overview and III.B. Cost Sharing.

**Q5. CAN YOU CLARIFY A COUPLE OF POINTS? THE FOA STATES THAT LIQUID METALS ARE WITHIN SCOPE. AND SUCCESSFUL LIQUID PFCS COULD CERTAINLY BE TRANSFORMATIONAL. HOWEVER, IT SEEMS TO US THAT THE FOA STATES THAT CERTAIN METRICS MUST BE MET, EVEN THOUGH THEY AREN'T NECESSARY AND IN FACT CAN'T BE MET BY ANY LIQUID METAL. EARLIER DISCUSSION REGARDING THIS PROGRAM SUGGESTED THAT LIQUID METAL SOLUTIONS WOULD BE CONSIDERED 'IN SCOPE' AS LONG AS THEY SATISFIED SOME SORT OF 'EQUIVALENT' METRIC. COULD YOU CLARIFY THIS?**

**LET'S CONSIDER, SPECIFICALLY, THE THREE BASELINE METRICS THAT (IT SEEMS TO US) FOA STATES MUST BE MET. WE ARE UNCLEAR HOW TO INTERPRET THEM WHEN SUBMITTING A PROPOSAL ON LIQUID METAL MATERIALS FOR PFCS:**

- 1) LIQUID PFCS INEVITABLY HAVE LOWER THERMAL CONDUCTIVITY THAN THE SPECIFIED 170 W/MK, BUT SINCE THEY ARE MUCH THINNER, THE OPERATING TEMPERATURE IS QUITE ACCEPTABLE, AND HIGH HEAT FLUXES CAN BE ACCEPTED. AS AN EXAMPLE, CONSIDER THE (CONSIDERABLE) EU DEMO PROGRAM ON TIN LIQUID DIVERTOR PFCS, WITH A HEAT SINK BEHIND TO REMOVE HEAT. TIN HAS CONDUCTIVITY ONLY ~ 40 W/MK, BUT SINCE THE LIQUID METAL IS ONLY ~ 2MM THICK, THIS STILL ALLOWS > 20 MW/M2 IN THEIR DESIGNS, WITH A QUITE CONVENTIONAL HEAT SINK BEHIND THE TIN PFC. IN FACT, NO LM THAT IS SUITABLE FOR A PFC CAN APPROACH THE 170 W/MK VALUE, BUT LIKE THE TIN CASE IN THE EU DESIGN, THEY CAN POTENTIALLY HANDLE HEAT FLUXES FAR IN EXCESS OF 10 MW/M2.**
  
- 2) PLASMA EROSION: ALL LMS HAVE SPUTTERING HIGHER THAN THE SPECIFICATION, BUT SINCE THE PFC IS REPLACED, IT DOESN'T AFFECT PFC LIFETIME. FURTHERMORE, OUR PROPOSAL IS TO DEVELOP LMS WITH ONLY LOW Z SPUTTERING, SO IMPACT ON THE PLASMA IS MINIMAL EVEN WITH A MUCH HIGHER EROSION THAN THE VALUE SPECIFIED IN THE FOA ( 3.4 MICRO-METER/HR)- A VALUE PERTINENT FOR VERY HIGH Z TUNGSTEN.**

3) TRITIUM SOLUBILITY: AGAIN USING THE EU TIN PFC PROGRAM AS AN EXAMPLE, THE T SOLUBILITY OF TIN IS ~ 3 ORDERS OF MAGNITUDE HIGHER THAN THE SOLUBILITY IN THE FOA SPECIFICATION, BUT THE EU DOESN'T FIND THIS TO BE AN ISSUE AT ALL, BECAUSE OF THE EXTREMELY LOW VOLUME OF TIN. (TRITIUM INVENTORY IN THE ENTIRE TIN PFC IS ROUGHLY AS MUCH AS IN THE CORE PLASMA IN OPERATION.) FURTHERMORE LMS ALLOW SLOW RECIRCULATION WITH TRITIUM REMOVAL, SO T DOESN'T BUILD-UP. ADEQUATE T REMOVAL WOULD BE ENORMOUSLY EASIER THAN THE COMPARABLE TECHNOLOGY OF REMOVING T FROM A BREEDING BLANKET OF LM BEACUSE OF THE VERY LOW VOLUME AND RECIRCULATION RATE OF THE LM PFC (THE ENTIRE EU DIVERTOR LM PFC VOLUME IS ~ 1/10 CUBIC METER).

SO EQUIVALENT PERFORMANCE IS ATTAINABLE WITH LM PFCS, IN THE SENSE OF HIGH HEAT FLUX CAPABILITY, LOW TRITIUM INVENTORY AND EROSION THAT ALLOWS OPERATION FOR MANY YEARS WITHOUT DEGRADING THE CORE PLASMA. THE LM WOULD ALSO OFFER MAJOR ADVANTAGES IN TRANSIENT RESILIENCE AND AVOIDING HIGH Z "UFO" DISRUPTIONS. AND WITH AN APPROPRIATE HEAT SINK THEY MIGHT BE ABLE TO HANDLE EVEN HIGHER HEAT FLUX THAN SOLIDS, DESPITE THEIR LOWER THERMAL CONDUCTIVITY, BECAUSE THEY CAN BE MUCH THINNER THAN SOLID PFCS, AND LIQUIDS AREN'T SUBJECT TO MECHANICAL STRESS DUE TO THERMAL GRADIENTS.

BUT THE NOMINAL "BASELINE" VALUES SPECIFIED IN THE FOA CANNOT BE MET, BY A WIDE MARGIN, FOR PROBABLY ANY LM USEFUL FOR A PFC. WE'RE JUST VERIFYING THAT WE WILL BE ABLE TO PROCEED WITH A PROPOSAL ALONG THE LINES OF 'EQUIVALENT PERFORMANCE'. OTHERWISE, NO PROPOSAL FOR LIQUID PFCS WOULD BE POSSIBLE, I BELIEVE, FOR ANY GROUP.

**ANSWER:** DE-FOA-0003240 CHADWICK is a material discovery program and proposed materials need to meet the requirement of novel composition, microstructure, or macrostructure. Section I.D. of the FOA states the category specific design constraints of thermal conductivity, plasma erosion and tritium solubility are provided to ensure any new materials developed will maintain integrated performance compared to current baseline. An inability to meet one of the constraints may not necessarily disqualify a material product from being used in the first wall of new fusion concepts but the tradeoffs must be addressed in the submission. If the Applicant proposes a material solution that requires changes in current fusion system design and deviates from existing baseline constraints, detailed technical justification and letters of support from industry are expected to be provided as reasonable assurance that equivalent performance metrics proposed are adequate and appropriate.

**Q6. THE ARPA-E FOA CHADWICK SEEKS FOR INNOVATIONS IN THE FUSION REACTOR FIRST WALL.**

**THE ANNOUNCEMENT DOCUMENT LISTS VERY SPECIFIC LOAD CONDITIONS FOR HEAT LOADS (10 MW/M<sup>2</sup>), EROSION RATES, ION FLUXES 10<sup>22</sup> ION/M<sup>2</sup> S AT 650 DEGREE C. THEY ALSO SUGGEST TARGET VALUES FOR IMPROVEMENTS. THE ACCEPTABLE BASELINE VALUES REFER TO LITERATURE.**

**IT IS MY EXPERIENCE THAT THE LOAD CONDITIONS DEPEND ON THE REACTOR DESIGN. 10MW/M<sup>2</sup> SEEMS EXCESSIVELY HIGH FOR A REACTOR FIRST WALL (PERHAPS DIVERTOR, BUT NOT FIRST WALL). WITH A PROPER DESIGN ION FLUXES CAN BE MINIMIZED TO THE FIRST WALL. THE QUESTION IS, CAN A PROPOSAL INCLUDE DESIGN CHOICES LEADING TO ALTERNATIVE LOADING CONDITIONS AND HENCE DIFFERENT CONSTRAINTS AS WRITTEN IN TABLE 2, RESULTING IN ALTERNATIVE MATERIAL CHOICES?**

**ANSWER:** See answer to question 5.

**Q7. I HAVE A QUESTION RELATED TO THE ARPA-A CALL "CREATING HARDENED AND DURABLE FUSION FIRST WALL INCORPORATING CENTRALIZED KNOWLEDGE (CHADWICK) ANNOUNCEMENT TYPE: INITIAL ANNOUNCEMENT FUNDING OPPORTUNITY NO. DE-FOA-0003240 CFDA NUMBER 81.135".**

**IS DEVELOPMENT OF FIRST WALL SYSTEMS WITH LIQUID METAL MATERIALS SUCH AS LITHIUM, TIN-LITHIUM, TIN, ON THE PLASMA FACING COMPONENT WITHIN SCOPE OF THIS CALL?**

**ANSWER:** See answer to question 5

**Q8. ---REDACTED---. IN THE PAST FOR DOE AWARDS, WE HAVE PROVIDED COST SHARE IN-KIND SUCH AS LAB EQUIPMENT, BACKGROUND TECHNOLOGY OR OTHER RESOURCES. WOULD ONE OF THOSE BE CONSIDERED ACCEPTABLE COST SHARE?**

**ONE COMMERCIAL PARTNER ASKED HOW IP WOULD BE DIVIDED AND WHETHER INFO SUBMITTED WOULD BECOME OPEN SOURCE.**

**ANSWER:** 1. Please refer to the DE-FOA-0003240 CHADWICK funding opportunity announcement section III. B ("Cost Sharing").

2. Please refer to the answer to question 2.20 in the general questions section of the ARPA-E website titled "General Questions on Funding Opportunities". Please also refer to DE-FOA-0003240 CHADWICK funding opportunity announcement Section VIII.A-C.

**Q9. I AM SUBMITTING THESE QUESTIONS REGARDING THE SUBJECT FOA IN ACCORDANCE WITH THE FOA INSTRUCTION.**

**QUESTIONS:**

- 1. INFORMATION REGARDING "FUNDING REQUESTED" IS TO BE INDICATED IN THE CONCEPT PAPER TITLE BLOCK. HOW WILL ARPA-E USE THE DATA PROVIDED REGARDING "FUNDED REQUESTED"? IS THIS TREATED AS A ROM AND VARIATION IN THE FINAL PROPOSAL IS ACCEPTABLE?**
- 2. SUB-RECIPIENTS: CAN ARPA-E FUND TEAMING PARTNERS UNDER AN OTA BE TREATED AS SUB-RECIPIENTS, OR WILL PRIME AWARDEE FUND ALL OF THE TEAMING PARTNERS THEMSELVES VIA SUBCONTRACT OR OTHER ARRANGEMENT?**
- 3. PAGE LIMIT: DOES THE 5 PAGE LIMIT FOR THE CONCEPT PAPER ALSO APPLY TO A PROGRAM COMPRISING BOTH CATEGORY A AND CATEGORY B COMPONENTS? THE PAGE LIMIT MAY CONSTRAIN CLEAR DESCRIPTION OF SUCH MORE COMPLEX PROGRAM.**

**ANSWER:** 1. Please refer to the answer to question 2.9 in the general questions section of the ARPA-E website titled "General Questions on Funding Opportunities".

2. Please refer to the DE-FOA-0003240 CHADWICK funding opportunity announcement section I. D. 4("Category and Team Logistics")."
3. In order to maintain the "objective process" required by federal regulation at 2 CFR 200.205 ("Federal awarding agency review of merit proposals"), concept papers should be submitted with the content and form described in the FOA. For more information on content and form of concept papers, please see DE-FOA-0003240 CHADWICK funding opportunity announcement section IV. C ("Content and Form of Concept Papers")

**Q10. I AM THE LEAD PI ASSEMBLING A TEAM TO RESPOND TO THE CHADWICK CALL. --- REDACTED--- IS OUR PRIVATE FUSION COMPANY PARTNER, AND WE PLAN TO USE DIII-D TO CHARACTERIZE SPECIFICALLY THE PLASMA-MATERIAL INTERACTION IN ALLOY LIBRARIES THAT WE DEVELOP. ---REDACTED--- MENTIONED THAT WE NEED TO WRITE TO THIS EMAIL ADDRESS TO RECEIVE GUIDANCE ON HOW TO INCLUDE DIII-D IN OUR PROPOSAL. I WOULD APPRECIATE YOUR GUIDANCE ON THIS MATTER.**

**ANSWER:** Please refer to the DE-FOA-0003240 CHADWICK funding opportunity announcement section III.A.2 ("Eligibility Information")

**Q11. I AM INTERESTED IN PUTTING IN A CONCEPT PAPER TO CATEGORY C WITH A UNIVERSITY. MY UNDERSTANDING WHEN READING THE CALL IS THAT A CONCEPT PAPER FOR CATEGORY C IS FOCUSED MORE ON THE CAPABILITIES AND SKILLS OF THE INDIVIDUAL ENTITIES MAKING UP THE CONCEPT PAPER TEAM? SO, FOR EXAMPLE, THE PAPER WOULD BE MORE FOCUSED ON INFRASTRUCTURE THAT CAN SUPPORT DATA MANAGEMENT AND COMPUTATIONAL WORK AND SKILLS SUCH AS NEUTRON IRRADIATION ANALYSIS AND LIFE CYCLE ASSESSMENT AND TECHNO-ECONOMIC ANALYSIS EXPERTISE?**

**IS MY UNDERSTANDING OF THE CATEGORY C CONCEPT PAPER SUBMISSION GUIDELINES CORRECT? WOULD THERE BE ANY OTHER RECOMMENDATIONS ON WHAT ARPA-E IS EXPECTING TO BE INCLUDED IN THE CATEGORY C CONCEPT PAPER?**

**ANSWER:** Yes. Refer to Section 1.D.4 for Category C team responsibilities.

**Q12. I HAVE A QUESTION REGARDING THIS FOA. PAGE 24 OF THE DOCUMENT (PAGE 28 OF THE PDF FILE) STATES THAT THE PRIME RECIPIENT MUST PROVIDE 20% COST SHARE. UNDER THE REDUCED COST SHARE REQUIREMENTS THERE IS THE FOLLOWING PARAGRAPH PERTAINING TO FFDRC'S**

**"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. HOWEVER, ANY ENTITY (SUCH AS A LARGE BUSINESS) RECEIVING PATENT RIGHTS UNDER A CLASS WAIVER, OR OTHER PATENT WAIVER, THAT IS PART OF A PROJECT TEAM RECEIVING THIS REDUCTION MUST CONTINUE TO MEET THE STATUTORY MINIMUM COST SHARE REQUIREMENT (20%) FOR ITS PORTION OF THE TOTAL PROJECT COST."**

**WHICH I UNDERSTAND TO MEAN THAT FFDRC DOING >80% OF THE WORK AS THE PRIME NEEDS TO PROVIDE 10% COST SHARE. CAN YOU PLEASE CONFIRM OR CLARIFY? AS AN FFDRC ORNL CANNOT PROVIDE COST SHARE.**

**ANSWER:** Please refer to the answers to questions 3.6 and 4.16 in the general questions section of the ARPA-E website.

**Q13. I AM CONTACTING YOU TO INQUIRE ABOUT THE CHADWICK FOA. HERE ARE A FEW QUESTIONS FOR YOU.**

- 1. CAN I (PI) DIRECTLY SUBMIT A CONCEPT PAPER, NOT THROUGH A GRANT ADMINISTRATOR OF OUR INSTITUTION?**
- 2. SHOULD I INCLUDE THE ESTIMATED BUDGET IN THE CONCEPT PAPER?**

**ANSWER:** 1. Please refer to the answer to question 3.2 in the general question section of the ARPA-E website.

2. Please refer to section IV.C.1. (“Content and Form of Concept Papers”) and section V.A.1. (“Criteria for Concept Papers”) of the FOA.

**Q14. FOR EACH PI OR CO-PI OF A CONCEPT PAPER FOR THE CHADWICK CALL, COULD HE/SHE BE INVOLVED WITH OTHER CONCEPT PAPERS?**

**ANSWER:** Please refer to section III.C.4. (“Limitation on Number of Submissions”) of the FOA. Also refer to the answer to question 6.13 in the General Questions section of the ARPA-E website.

**Q15. ARE FOREIGN NATIONALS (NOT US CITIZENS OR PERMANENT RESIDENTS) WORKING AT US UNIVERSITIES ELIGIBLE TO APPLY FOR THE CHADWICK GRANT APPLICATION?**

**ANSWER:** Please refer to section III.A.3. (“Foreign Entities”) of the FOA.

**Q16. WE HAVE THE FOLLOWING QUESTIONS REGARDING THE CHADWICK FOA:**

- 1. CAN WE ADD A PARTNER TO THE TEAM BETWEEN THE CONCEPT PAPER AND THE FULL APPLICATION?**
- 2. OUR TEAM INCLUDES A FOREIGN INSTITUTION (\*\*REDACTED\*\*), AND WE HAVE SOME FINANCIAL QUESTIONS. IT IS SPECIFIED IN THE FOA THAT ONE REQUIREMENT FOR AN ORGANIZATION IS TO BE ABLE TO ACCEPT "FINANCIAL ASSISTANCE". IS THIS DIFFERENT THAN A GRANT? ALSO, DOES DOE HAVE A RULE FOR ACCEPTABLE RATE OF OVERHEADS FOR FOREIGN INSTITUTIONS? \*\*REDACTED\*\* THEIR OVERHEADS ARE ROUGHLY SIMILAR TO THE ONES FROM .**

**ANSWER:** 1. Please refer to the answer to question 7.11 in the General Questions section of the ARPA-E website. For a definition of “federal financial assistance” please refer to the “Definitions” section of the Uniform Grant Guidance at 2 CFR 200.1.

2. Please refer to the answer to question 4.11 in the General Questions section of the ARPA-E website.



Q17. MY NAME IS \*\*\*REDACTED\*\*\* AND I AM AN ASSISTANT PROFESSOR OF NUCLEAR ENGINEERING AT\*\*\*REDACTED\*\*\*. I HAVE A QUESTION REGARDING THE CHADWICK FOA AND WOULD GREATLY APPRECIATE YOUR ASSISTANCE IN CLARIFYING IT.

WITHIN TABLE 2 OF THE FOA DOCUMENTATION, THE CRITERIA FOR ACCEPTED TRITIUM DIFFUSIVITY IS OUTLINED AS GREATER THAN  $1.6E-8 \text{ M}^2/\text{S}$  AT  $650^\circ\text{C}$ , WITH A GOAL TO ACHIEVE A TWOFOLD IMPROVEMENT, SPECIFICALLY GREATER THAN  $3.2E-8 \text{ M}^2/\text{S}$  AT THE SAME TEMPERATURE. THIS SPECIFICATION RAISES A QUERY FROM A TRITIUM RETENTION STANDPOINT, WHERE A LOWER TRITIUM DIFFUSIVITY WOULD SEEMINGLY BE PREFERABLE TO MINIMIZE TRITIUM RELEASE INTO THE ENVIRONMENT. COULD YOU KINDLY ELUCIDATE THE UNDERLYING PHYSICAL REASONING FOR ESTABLISHING A HIGHER DIFFUSIVITY TARGET IN THIS CONTEXT?

**ANSWER:** Tritium is a fuel for fusion power plant and should not be trapped inside the first wall. There will be other fusion plant systems responsible for tritium removal and minimize release that are outside the scope of this program.



## II. Full Application Phase Questions:

**Q18. OUR GROUP AT \*\*\*REDACTED\*\*\* WAS APPROACHED BY 9 INSTITUTIONS FOR PLASMA-MATERIALS TESTING & EVALUATION FOR THEIR SUBMISSION OF CONCEPT PAPERS IN RESPONSE TO THE ARPA-E CREATING HARDENED AND DURABLE FUSION FIRST WALL INCORPORATING CENTRALIZED KNOWLEDGE (CHADWICK) FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) DE-FOA-0003240. THESE 9 INSTITUTIONS SUBMITTED UNDER CATEGORY A, AND IN FAIRNESS TO ALL, WE SUPPLIED A GENERIC DESCRIPTION OF OUR FACILITY AND COST ESTIMATE TO EACH OF THE APPLICANTS. WE HAVE NOW LEARNT THAT \*\*\*REDACTED\*\*\* HAVE BEEN ENCOURAGED TO SUBMIT A FULL PROPOSAL.**

**OUR ROLE WOULD ESSENTIALLY BE THE SAME IN ALL OF THESE PROPOSALS. THAT IS, TO PROVIDE PLASMA-MATERIALS-INTERACTION AND DISPLACEMENT DAMAGE ON CANDIDATE FUSION MATERIALS. ON READING THROUGH THE FOA, WE MADE THE DECISION TO ALSO APPLY UNDER CATEGORY C, AS A CAPABILITY TEAM, AND WE HAVE ALSO BEEN ENCOURAGED TO APPLY.**

**WE THEREFORE SEEK GUIDANCE ON HOW TO PROCEED WITH BEST EFFICIENCY.**

- 1. SHOULD WE APPLY UNDER JUST CATEGORY-C AND INFORM OUR CATEGORY-A PARTNERS TO POINT TO OUR APPLICATION AS A CAPABILITY TEAM?**
- 2. OR, SHOULD WE APPLY TO CATEGORY C AND ALSO PARTNER WITH ALL \*\*\*REDACTED\*\*\* CATEGORY A APPLICANTS?**

**THE ANSWER TO THESE QUESTIONS IS IMPORTANT AS PATH B) CARRIES A SIGNIFICANT AMOUNT OF DUPLICATION OF PAPERWORK. \*\*\*REDACTED\*\*\* WOULD NEED TO SUBMIT MATERIALS FOR \*\*\*REDACTED\*\*\* PROPOSALS THAT WOULD ESSENTIALLY RECEIVE THE SAME AMOUNT OF FUNDING AS PATH A). THE REPORTING REQUIREMENT OF ARPA-E WOULD LIKEWISE ALSO DEMAND THE SAME.**

**ANSWER:** Applicants are encouraged to submit proposals that minimize redundant scope or duplication of work.

**Q19. HI, MY NAME IS \*\*\*REDACTED\*\*\* AND I AM A RESEARCH ADMINISTRATOR FROM \*\*\*REDACTED\*\*\* UNIVERSITY. I AM ASSISTING WITH A CHADWICK PROPOSAL AND I'M WONDERING IF A PIER PLAN IS REQUIRED WITH THE SUBMISSION?**

**ANSWER:** No.

**Q20. I HAVE SOME QUESTIONS REGARDING THE CHADWICK FOA, IN ADVANCE OF THE SECOND DEADLINE FOR QUESTIONS PRIOR TO THE FULL APPLICATION DEADLINE:**

- 1. IS IS ALLOWABLE AT THIS STAGE TO ADD CO-PIS FOR THE FULL APPLICATION WHO WERE NOT NAMED IN THE CONCEPT PAPER? THE REASON FOR ADDING THEM IS TO DIRECTLY ADDRESS THE REVIEWERS' COMMENTS ON THE CONCEPT PAPER.**
- 2. ARE UNFUNDED COLLABORATORS (E.G., IN ADVISORY ROLES) ALLOWED?**

**ANSWER:** Please refer to the answer to question 7.14 in the General Questions section of the ARPA-E website.

**Q21. WE ARE WONDERING WHETHER IT IS ALLOWED TO CHANGE THE CO-PI (LISTED IN THE WHITE PAPER) AS THE PI. IF SO, COULD YOU PLEASE ADVISE HOW TO PROCEED?. I NOTICED WE SHOULD SUBMIT THE FULL PROPOSAL FROM A WHITE PAPER.**

**ANSWER:** Please refer to the answer to question 7.14 in the General Questions section of the ARPA-E website.

**Q22. MOD1 OF THE FOA FOR THE CHADWICK PROGRAM (DE-FOA-0003240) CLEARLY REMOVED REFERENCE TO LIFE-CYCLE ANALYSIS (LCA). THIS IS A SUBSTANTIAL CHANGE IN SCOPE AND WOULD BENEFIT FROM BROADER EXPLANATION. CAN YOU EXPLAIN THE REASON FOR THIS CHANGE AND HOW WE CAN INTERPRET THIS CHANGE?**

**ANSWER:** The change is to clarify that fusion power is a carbon-free power source and the environmental impact costs of fusion materials extraction and waste disposition should be reflected in the technoeconomic analysis (TEA). It is not intended to remove scope but to clarify that the analysis should be focused on technical performance and economic feasibility of the technology.

**Q23. AS NOTED IN THE BUSINESS ASSURANCES & DISCLOSURES FORM (BADF), SECTION 3 REQUIRES DISCLOSURE OF CURRENT, PENDING, AND PAST SUPPORT (WITHIN THE LAST 5 YEARS) IS INTENDED TO ALLOW THE IDENTIFICATION OF POTENTIAL DUPLICATION, OVERCOMMITMENT, POTENTIAL CONFLICTS OF INTEREST OR COMMITMENT, AND ALL OTHER SOURCES OF SUPPORT AS SHOWN IN THE SCREENSHOT BELOW:**

**(3) CURRENT, PENDING, AND PAST SUPPORT.** Mandatory. No page limit.

Disclosure of current, pending, and past support (within the last 5 years) is intended to allow the identification of potential duplication, overcommitment, potential conflicts of interest or commitment, and all other sources of support.

The Applicant and every other member of the Project Team (including, without limitation, the PI, Co-PI, Key Personnel and every other "covered individual" at the Applicant and any other member of the Project Team) must provide a list of **all** sponsored activities, awards, and appointments (including faculty, visiting, adjunct, or honorary), whether paid or unpaid; provided as a gift with terms or conditions or provided as a gift without terms or conditions; full-time or part-time; cash or in-kind; foreign or domestic; governmental or private sector; directly supporting the individual's research or indirectly supporting the individual by supporting students, research staff, space, equipment, or other research expenses. Involvement in any foreign government-sponsored talent recruitment programs must be disclosed in this section.

Complete the following table for each disclosure. If additional tables are required, please include the tables in an addendum to this form. If the Applicant and all members of the Project Team have not received any such support and have no applicable pending support, check the box marked "None" below.

**If NONE, check here**

Entity Name (Applicant or Project Team Member):	
Individual Name and Role on the Project Team (e.g., PI, Key Personnel, etc.):	
Contact Information (telephone and email address):	
Sponsor of the Activity or the Source of the Award Funding:	
Award or Activity Status (e.g., pending, awarded, ended):	
Date of Submission (if still pending):	
Title of Award or Activity:	
Brief Description/Abstract of Award or Activity:	
Total cost or value of the Award or Activity (including cost share, if any):	
Award or Activity Period (Start and End Dates):	

**AS MORE AND MORE SPONSORS ARE UTILIZING SCIENCV TO PROVIDE THIS INFORMATION, IS IT ACCEPTABLE TO ARPA-E FOR ENTITIES TO PROVIDE THE PAST SUPPORT IN THE BADF TABLES AND APPEND A CURRENT & PENDING (C&P) DOC FROM SCIENCV FOR THE PENDING AND CURRENT PROJECTS? I ASK AS THE INFORMATION REQUESTED IN THE TABLE IS ALREADY PROVIDED IN SCIENCV C&P TEMPLATE, AND SOME FACULTY (LIKE MINE) HAVE 20+ CURRENT AND PENDING PROJECTS AND 10+ PAST PROJECTS. THIS WOULD REDUCE DUPLICATIVE WORK AS WELL AS PROVIDE THE PI CERTIFICATION AS REQUIRED BY SCIENCV.**

**ANSWER:** Providing the information in another format is acceptable, as long as all the information requested in the BADF is included and presented in a manner that is easy for the reviewer to understand.

**Q24. I AM CONTACTING YOU TO SEEK HELP IN DETERMINING WHAT STEPS I NEED TO TAKE IN ORDER TO BE PART OF THE TEAM - THE CURRENT IDEA IS THAT I PARTICIPATE USING A LEGAL ENTITY THAT IS A SMALL BUSINESS INCORPORATED IN THE UNITED KINGDOM. CAN I APPLY FOR A WAIVER FROM THE REQUIREMENT TO BE US BASED ? WOULD THE MECHANISM OF SUBCONTRACTING VIA ONE OF THE US BASED CONSORTIUM PARTNERS BE HELPFUL, WOULD THAT CHANGE THE REQUIREMENTS (WAIVERS ETC) ON THE APPLICATION ?**

**ANSWER:** Please review Section III.A (Eligible Applicants) and Section IV.G (Funding Restrictions) for more information about the eligibility to participate on an ARPA-E award.

**Q25. IS IT FINE TO APPEND THE NSF CURRENT AND PENDING (OTHER) SUPPORT TEMPLATE TO ANSWER SECTION 3 OF THE BAD-F?**

**ANSWER:** Attachments describing other current and pending support are acceptable as long as they provide the information required in the BADF. Please review the BADF to ensure that all requested information is available in the available attachment prior to submitting your application.

**Q26. I WOULD LIKE TO KNOW IF ARPA-E AGREES FOR THE USE BY THE UNIVERSITY OF NON-FEDERAL SPONSORED PROJECT AS COST SHARE. OF COURSE THE PROPOSAL BUDGET WOULD BE ACCOMPANIED BY WRITTEN APPROVAL FROM THE NON-FEDERAL SPONSOR..**

**ANSWER:** Please review section II.B.3. (Reduced Cost Share Requirement) of the FOA for information on cost share requirements.

**Q27. ARE FFRDCS WHO ARE NOT THE LEAD ORGANIZATION REQUIRED TO COMPLETE A SF424A AND BUDGET JUSTIFICATION WORKBOOK? THE FOA ONLY CITES THAT SUBRECIPIENTS/CONTRACTORS MUST COMPLETE THE WORKBOOK IF INCURRING GREATER THAN OR EQUAL TO 10% OF THE TOTAL PROJECT COST; HOWEVER, THE BUDGET JUSTIFICATION WORKBOOK STATES THAT FFRDCS MUST ALSO COMPLETE THE WORKBOOK IF INCURRING GREATER THAN OR EQUAL TO 10% OF THE TOTAL PROJECT COSTS.**

**ANSWER:** Section III.d.3. (third component: budget justification workbook/SF-424a)' of the FOA states applicants are required to complete the budget justification workbook/SF424a excel spreadsheet." Please see this section of the FOA for information on the budget information required for submission.

**Q28. MOD1 OF THE FOA FOR THE CHADWICK PROGRAM (DE-FOA-0003240) CLEARLY REMOVED REFERENCE TO LIFE-CYCLE ANALYSIS (LCA), AND A PREVIOUS FAQ ADDRESSED THIS CHANGE, INCLUDING**

**"THE CHANGE IS TO CLARIFY THAT FUSION POWER IS A CARBON-FREE POWER SOURCE AND THE ENVIRONMENTAL IMPACT COSTS OF FUSION MATERIALS EXTRACTION AND WASTE DISPOSITION SHOULD BE REFLECTED IN THE TECHNOECONOMIC ANALYSIS (TEA). IT IS NOT INTENDED TO REMOVE SCOPE BUT TO CLARIFY THAT THE ANALYSIS SHOULD BE FOCUSED ON TECHNICAL PERFORMANCE AND ECONOMIC FEASIBILITY OF THE TECHNOLOGY."**

**HOWEVER, THERE CONTINUES TO BE A SUGGESTION OF BROADER LCA-RELATED ACTIVITIES IN THE GUIDANCE ON TECHNOLOGY-TO-MARKET:**

**"THE TECHNOLOGY-TO-MARKET COMPONENT ALSO ENCOURAGES ENGAGEMENT WITH COMMUNITY-BASED ORGANIZATIONS FOR TWO-WAY DIALOGUE SURROUNDING WASTE STREAMS ORIGINATING FROM THESE MATERIALS AND ENGAGEMENTS WITH OTHER INDUSTRY STAKEHOLDERS."**

**IS THIS GUIDANCE STILL RELEVANT GIVEN THE CHANGE IN PRIORITY OF LCA ACTIVITIES AND THE GUIDANCE TO FOCUS ON TECHNICAL PERFORMANCE AND ECONOMIC FEASIBILITY?**

**ANSWER:** Yes, the original guidance is still relevant. The technical performance and economic feasibility of any material used for fusion first wall are to be assessed by technoeconomic analysis (TEA) that include the impact, classification, and cost of potential radioactive waste streams.

**Q29. OUR UNIVERSITY IS SUBMITTING A PROPOSAL WITH A FOR PROFIT ENTITY WHO CANNOT DISCLOSE DETAILED BUDGETARY INFORMATION TO US WITHOUT A NON-DISCLOSURE AGREEMENT IN PLACE. IS IT POSSIBLE FOR OUR UNIVERSITY TO SUBMIT OUR PROPOSAL WITH A REDACTED BUDGET FOR THIS PARTICULAR SUBRECIPIENT AND THAT SUBRECIPIENT TO SEND THE DETAILED BUDGET TO ARPA-E DIRECTLY?**

**ANSWER:** Please refer to the response to the ARPA-E website FAQ page General Question 10.11.

**Q30. I HAVE THE FOLLOWING LIST OF QUESTIONS:**

- 1. CAN YOU EXPLAIN WHAT, IF ANY, DATA FROM PAST ARPA-E PROGRAMS YOU INTEND TO SHARE WITH CHADWICK PARTICIPANTS AND HOW MUCH THERE IS (E.G. MATERIAL COMPOSITIONS, PROCESSING ROUTES, PERFORMANCE, NEUTRONICS...) AND IF YOU INTEND TO SHARE DATA, HOW MUCH DATA THERE IS (DOZENS/HUNDREDS/THOUSANDS OF DATAPOINTS)?**
- 2. SECTION 2.4 MENTIONS THE FINAL DELIVERABLE IN THE CONTEXT OF THE EXPERIMENTAL VALIDATION PLAN (5TH BULLET POINT) AND THEN AGAIN IN THE CONTEXT OF THE ANTICIPATED PRODUCT (6TH BULLET POINT). DOES THIS REFER TO THE SAME DELIVERABLE (E.G. DEMO PARTS OF FINAL CANDIDATE MATERIALS) OR TWO DIFFERENT ONES (E.G. FINAL CANDIDATE MATERIAL SAMPLES AND DELIVERABLES FROM INDIVIDUAL TASKS, E.G. LIST OF COMPOSITIONS TO TEST AFTER THE COMPUTATIONAL MATERIALS DESIGN STEP)?**
- 3. WE WANT TO INVOLVE A PRIVATE US FUSION COMPANY IN AN ADVISORY CAPACITY (NO FINANCIAL TIES TO PROJECT) TO HELP WITH COMMERCIALISATION. THEY DO NOT WANT THEIR INVOLVEMENT KNOWN, HOWEVER. IF WE MENTION THEIR NAME IN THE APPLICATION OR SUBSEQUENT PROJECT REPORTS, WILL THEIR INVOLVEMENT AND IDENTITY STAY CONFIDENTIAL (APART FROM THE REVIEW PROCESS)?**

**ANSWER:**

1) ARPA-E will not share data from any other programs that is not otherwise publicly available. Assumptions related to existing databases should be clearly articulated in the proposal. Data access rights for CHADWICK program are described in DE-FOA-0003240 Section VIII.C. The Applicant may also review the teaming partner list on eXCHANGE to identify previous performers and validate assumptions related to other ARPA-E programs.

2) They refer to the same deliverable. The deliverable of the program for Category A and B is a piece of final candidate material that can be used for fusion first wall application. Experimental validation plan should describe the activities related to testing this final candidate material to confirm the targets of this program are met.

3) ARPA-E cannot opine on what it means to participate in an “advisory capacity.” Please see the answer to question #29 in this FAQ for information on managing budgets for application partner organizations. If an award is made, anonymity will not be able to be maintained for any entity participating in the project

**Q31. ACCORDING TO THE FOA, AT LEAST 5% OF THE FEDERAL GRANT MUST BE ALLOCATED TO TT&O ACTIVITIES. SHOULD F&A COSTS (OR THE SO-CALLED OVERHEAD OR INDIRECT COSTS) BE INCLUDED IN THE TT&O BUDGET? AS YOU MAY KNOW, F&A IS TYPICALLY REQUESTED BY MOST UNIVERSITIES AND RESEARCH INSTITUTIONS.**

**ANSWER:** Please see the answer to question 10.17 on the ARPA-E General Questions webpage which says, in part, “All TT&O expenditures must be allowable under the applicable Federal cost principles.”

**Q32. WE ARE FINALIZING OUR FULL PROPOSAL FOR THE CHADWICK PROGRAM, AND HAVE A QUESTION:**

**WAS A MATERIALS DATABASE COMPILED FROM CERTAIN PROJECTS ON REFRACTORY ALLOYS WITHIN THE ULTIMATE PROGRAM, AND IF SO, WILL IT BE POSSIBLE TO HAVE ACCESS TO THIS DATABASE DURING THE CHADWICK PROGRAM?**

**WE WOULD BE INTERESTED IN EVALUATING THESE REFRACTORY ALLOYS DURING THE MATERIALS DISCOVERY PHASE OF OUR PLANNED PROJECT.**

**ANSWER:** Please see the answer to question Q30 above.

**Q33. PER FOA GUIDANCE AND Q&A, IF A FFRDC IS THE LEAD ORGANIZATION, ARPA-E EXECUTES A FUNDING AGREEMENT DIRECTLY WITH THE FFRDC AND SEPARATE COOPERATIVE AGREEMENT WITH THE REST OF THE PROJECT TEAM. CAN YOU EXPLAIN HOW FUNDS ARE DISTRIBUTED IN THIS SCENARIO? FOR EXAMPLE, IS THE TOTAL AWARD SENT TO THE FFRDC WHO THEN DISTRIBUTES FUNDS TO THE REST OF THE PROJECT TEAM? OR DOES THE FFRDC RECEIVE ONLY THEIR PORTION OF FUNDS AND ONE INSTITUTION FROM THE PROJECT TEAM RECEIVE THE REMAINING AWARDED FUNDS AND DISTRIBUTE FUNDS TO THE OTHER TEAM MEMBERS?**

**ANSWER:** Please see the answer to question 7.10 on the ARPA-E General Questions webpage.





**Q34. OUR PROJECT TEAM INCLUDES A NATIONAL LAB. THE NATIONAL LAB IS REQUESTING FEDERAL FUNDS ON THIS PROPOSAL.**

**SHOULD OUR PROJECT 5% TT&O REQUIREMENT CALCULATION INCLUDE THE NATIONAL LAB'S PORTION OF FEDERAL FUNDS? OR, DO WE SUBTRACT THE NATIONAL LAB'S PORTION FROM THE TOTAL BUDGET AND THEN CALCULATE 5% TT&O FROM THE REMAINING AMOUNT?**

**ANSWER:** Please see budget submission guidance provided in the FOA under section IV.D.3., "Third Component: Budget Justification Workbook/SF-424-A."

**Q35. WE HAVE A NATIONAL LAB/FFRDC SUBAWARD AND THE LAB'S SUBAWARD BUDGET IS GREATER THAN 10% OF THE TOTAL BUDGET OF THE PROPOSAL.**

**DOES THE FFRDC/NATIONAL LAB SUBAWARD WITH SUBAWARD GREATER THAN 10% OF OVERALL BUDGET NEED TO SUBMIT THEIR OWN SF424A JUSTIFICATION WORKBOOK FOR THEIR SUBAWARD BUDGET? (TAB F OF WORKBOOK INDICATES THEY DO NEED TO DO THEIR OWN SF424A JUSTIFICATION WORKBOOK, BUT WE HAVE SOME CONFUSION ON OUR END.)**

**ANSWER:** Please see budget submission guidance provided in the FOA under section IV.D.3., "Third Component: Budget Justification Workbook/SF-424-A".