DE-FOA-0001953 – Topic F FOA FAQ

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

DEADLINE FOR QUESTIONS TO ARPA-E CO: 5 PM ET, 7/16/2019

QUESTIONS AND ANSWERS

PLEASE REFER TO THE GENERAL FAQS SECTION OF ARPA-E'S WEBSITE (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. Full Application Phase Questions:

Q1. We are start-up company, researching in cooperation with Universities to developing a low power plasma system for the pyrolysis of methane into hydrogen and carbon black. Our technology readiness level is at TRL 2. Reading over the FOA raised a few questions for us, we are hoping you can help clarify.

Q1.a For what TRL range is this FOA intended for? i.e. Are research proposals acceptable leading to TRL 3/4? Or are only higher TRL for scaling up proposals being sought?

ANSWER: There is no specific TRL level required. However, it is expected that the proposed process will economically produce H_2 at scale *(> 10,000 tons/yr.)* and valuable carbon co-product when fully developed.

Q1.b Is an estimated range of carbon black quality an acceptable research objective? We anticipate producing carbon black, however, the particle size and grade/structures have yet to be determined. The FOA gives a wide range of quality/value products including metallurgical coke, carbon black, graphite, carbon nanotubes, and carbon fiber.

Q1.c Can the current market value of the commodity carbon products be assumed? Large scale production may affect the future market.

Q1.d What is the threshold for a carbon product to be considered "valuable"? Technical performance targets of the FOA give goal of carbon product price of < $5/kg. Most available carbon products would fulfill this goal, only the high end products such as carbon nanotubes would not.

ANSWER (Q1.b-d): In the context of H_2 production at scale, the volumes of co-produced carbon through methane pyrolysis would be very large (22 million tons of carbon / 1 quad of energy). Potential applications for the resulting carbon products have to be on a correspondingly large scale (i.e. construction sector or large-scale manufacturing industries), and produce carbon at competitive prices (less than 5$/kg) to penetrate such markets. These applications will also require the carbon materials to have useful macroscopic properties with regard to thermal, electrical, and/or mechanical performance. Applicants are expected to specify the size of the intended market and expected properties (i.e. electrical, mechanical) for the carbon co-product.

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Q1.e Must the methane pyrolysis be catalyst-based? The text of the FOA places emphasis on catalyst on page 85 and the Technical area of interest states "ARPA-E is specifically interested in integrated and scalable catalytic approaches".

ANSWER: Both non-catalytic and catalytic pyrolysis processes meeting the performance targets in Table 1 are acceptable.

Q1.f If a catalyst must be present, would alkali material for carbon nucleation site be acceptable as a catalyst.

ANSWER: There are no specific requirements for the catalyst composition.

Q1.g Must current methane pyrolysis conditions be maintained (20 bar, 800-1100 C)? The FOA states "Critical consideration should also be given to both (i) the separation techniques required to economically recover the targeted grades of carbon, and (ii) advanced monitoring tools (in-situ and ex-situ) to enable fundamental understanding of carbon-carbon bond formation, rearrangement, and intermolecular aggregation into valuable carbon products under current methane pyrolysis conditions (20 bar; 800–1100 oC), in ways that are applicable for real-time process monitoring and control (i.e. low latency)." Our conditions would be around 1 bar, and 1800 C.

ANSWER: Conditions of the pyrolysis process are flexible as long as the performance metrics listed in Table 1 (p.78) can be achieved.

Q1.h What microscopy techniques are acceptable? Areas specifically not of interest include many of the common characterization techniques including "Standard IR, Raman, UV-Vis, microscopy techniques for ex-situ analysis of poly-aromatic hydrocarbons."

ANSWER: The proposed analytical techniques should facilitate in-situ monitoring and probing for chemical and/or structural information to enable material development and process optimization.

Q1.i Should the H2A model of the system to be completed as part of the application? Or can running the H2A model for the system constitute a portion of the work plan?

ANSWER: Applicants are expected to utilize the methodology described in the H2A DOE model (centralized hydrogen production models) to project the performance metrics listed in Table 1 (p.78) for their proposed process. A working H2A process model and corresponding full techno-economic analysis are expected to be completed at the end of the project, not at the time of the submission.

QUESTIONS AND ANSWERS

Q2. We will be submitting a proposal for topic F: High Value Methane Pyrolysis. The proposal requires a Technology to Market plan, including a Techno Economic Analysis. The suggested length of the Technology to Market Plan is 2 pages. The Techno Economic Analysis can be a considerable document in and of itself consisting of 5-10 pages of text to accompany a model that may have upwards of 100 cell entries. How are we to reconcile the size of this analysis with the suggested page limit?

ANSWER: Referencing the Technical Volume template, the maximum length of the Technical Volume, Sections 1-5 is fourteen pages, with a suggested page budget for the Technology to Market presentation (Section 4) of two pages. Submissions to ARPA-E must be limited to the fourteen page maximum. Any additional pages will be redacted from the submission before being subjected to the merit review process. See also General FAQ 8.2.