U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Renewable Carbon Fibers

(RenewableCarbonFiber@go.doe.gov)

Informational Webinar for FOA Applicants

DE-FOA-0000996

February 13, 2014

DE-FOA-0000996
Renewable Carbon Fibers

Anticipated Schedule:

FOA Issue Date:	**February 3, 2014**
FOA Informational Webinar:	February 13, 2014
Submission Deadline for Concept Papers:	March 3, 2014, 5p.m. Eastern
Submission Deadline for Full Applications:	April 11, 2014, 5p.m. Eastern
Submission Deadline for Replies to Reviewer Comments:	May 9, 2014, 5p.m. Eastern
Expected Date for EERE Selection Notifications:	June 13, 2014
Expected Timeframe for Award Negotiations:	June 14 through August 15, 2014

Notice

- All applicants are strongly encouraged to carefully read the Funding Opportunity Announcement DE- FOA-0000996 **("Renewable Carbon Fibers FOA")** and adhere to the stated submission requirements.
- This presentation summarizes the contents of FOA. If there are any inconsistencies between the FOA and this presentation or statements from DOE personnel, the FOA is the controlling document and applicants should rely on the FOA language and seek clarification from EERE.
- If you believe there is an inconsistency, please contact RenewableCarbonFiber@go.doe.gov

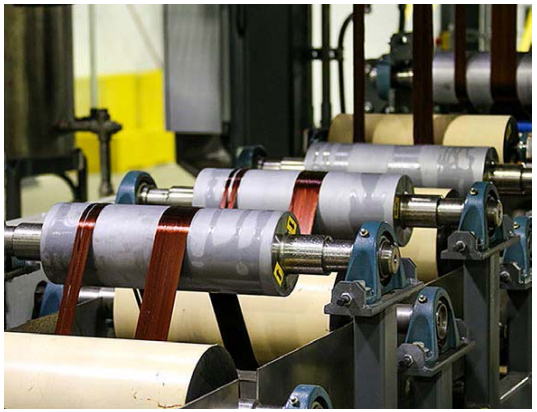
Agenda

1) FOA Description
2) Topic Area
3) Award Information
4) Statement of Substantial Involvement
5) Cost Sharing
6) Concept Papers
7) Full Applications
8) Merit Review and Selection Process
9) Registration Requirements

FOA Background

The Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy (EERE), seeks to enable a wide range of renewable energy and energy efficient technology advancements to ensure a clean and secure domestic energy future.

- EERE Clean Energy Manufacturing Initiative (CEMI), launched in 2013, has the goal of enhancing United States (US) competitiveness in clean energy technologies
- The mission of the Bioenergy Technologies Office (BETO) within EERE is to develop and transform biomass resources into commercially viable, high performance biofuels, bioproducts, and biopower through targeted research, development, demonstration, and deployment supported through public and private partnerships.



This FOA seeks to address both the EERE CEMI aims and to fulfill EERE BETO's mission by demonstrating a new technology pathway to produce high performance and low cost renewable carbon fibers.

FOA Description, Objectives and Goal

Carbon fiber composites are lightweight, yet strong and stiff, materials that can greatly improve vehicle fuel efficiency when incorporated into structural and non-structural components. The volatility of the raw material costs and the energy intensive processes used in the manufacturing contribute to high cost of carbon fibers (>$10/lb), which deter widespread use by the automotive industry.

The objectives of the Renewable Carbon Fibers FOA are to:

1. Identify and develop a cost-competitive technology pathway to high performance carbon fibers using biomass as a starting raw feedstock and bio-acrylonitrile (or bio-ACN) as a target product, and
2. Engage with industrial manufacturers of polyacrylonitrile that will benchmark and validate the bio-ACN with respect to the key technical performance attributes important for manufacturing lightweight automotive structural components.

The goal of this FOA is to enable technologies that can produce bio-ACN at a modeled cost of $1.00/pound or less, to enable the overall manufacturing of carbon fiber at less than or equal to $5.00/lb by 2020 that are suitable for vehicle structural components.

Topic Area

There is only one (1) Topic Area for this FOA

Topic Area 1: Converting raw biomass sugars, algal oils, or lignin, to high quality acrylonitrile.

- The first phase of the project will be focused on establishing the critical functions of the prototype system at bench scale.
- The second phase of the project will be focused on validating the prototype performance at a larger scale.

Phase I: Establishing Critical Functions
(Includes Stage Gate)

Phase II: Validating Prototype System

Topic Area 1, Phase I Objectives (Months 1-20)

1. Demonstrate one or more technologies that can effectively utilize sugars or lignin from biomass, or algal oils, to generate high quality intermediates (e.g. amino acids, 3-hydroxyproprionate, glycerol) with productivities that exceed 0.5 grams per liter per hour (g/L/h) and in batch or continuous process volumes no less than 1 liter.
2. Demonstrate one or more technologies that can effectively convert the intermediates derived from biomass into "carbon fiber ready" bio-ACN at 20% or higher conversion efficiency (based on theoretical yields).
3. Demonstrate one or more highly effective product recovery and purification technologies at each process interface to result in bio-ACN with very low levels (< 1 ppm) of chemical contaminants other than solvent(s) and/or purposeful additives that prevent spontaneous polymerization.
4. The ability of the Applicant to synthesize a single batch (50 g or more) of purified and stabilized bio-ACN for the purpose of the Stage Gate validation (point 5 below).
5. STAGE GATE REVIEW AND TECHNOLOGY VALIDATION: The ability of the Applicant to retain a PAN manufacturer or another partnering institution with the capability to test 50 g of bio-ACN and an equivalent amount of conventional ACN (as a positive control) for a set of predetermined 4-5 critical performance attributes that are indicative of manufacturability of the monomer. Both the bio-ACN and the conventional ACN will be subjected to testing and both chemicals must pass each test. The testing procedures for these critical performance attributes must be submitted at the time of the full application (see Section IV.D2 of the FOA) and shall remain in effect for the duration of the project. Each testing procedure must be measurable, independently verifiable, and generate unambiguous results that definitively categorize the (bio-)ACN as either acceptable or unacceptable. Each procedure must also contribute to the predictability of the overall quality of the resulting polymer (PAN) and carbon fiber composite.

Topic Area 1, Phase II Objectives (Months 21-40)

Note: Continuation into Phase II is subject to passing the Stage Gate Review and Technology Validation and contingent upon continuing DOE program priority and adequate funding.

1. Improve the selected Phase I cellulosic sugar or lignin conversion technologies to result in productivities that exceed 2 g/L/h in process volumes greater than 10 L.
2. Improve the selected Phase I intermediate conversion technologies to result in yields of "carbon fiber ready" bio-ACN at 50% or higher conversion efficiency (based on theoretical yields); at the end of the project, the catalyst chosen must also show industrially-relevant traits such as long catalyst operational lifetime, in addition to high specificity and regenerability.
3. FINAL DELIVERABLE: Develop and demonstrate the scalability of the conversion and separations technologies to generate a single batch of 500 kg or more of stabilized bio-ACN that meets all of the same specifications required for the earlier Stage Gate Review and Technology Validation.

Applications Specifically Not of Interest

- Applications that fall outside the technical parameters specified in Section I.B of the FOA, including but not limited to:
  - Applications that use food or feed carbohydrates, lipids or proteins (e.g. maize or wheat dextrose, beet sucrose, sugar cane or grain sorghum syrup, soybean oil or meal), and/or direct derivatives (e.g. amino acids from maize dextrose, glycerol from the transesterification of soybean oil);
  - Applications that do not seek to produce and to recover bio-acrylonitrile;
  - Applications that do not specify at least four critical performance attributes and associated metrology that are indicative of the acceptability of the acrylonitrile for existing carbon fiber manufacturing processes; and
  - Applications that do not have at least one letter of commitment from a PAN manufacturer and/or another partnering institution capable to producing white fiber that endorses the specified critical performance attributes and metrology, and has all of the facilities and expertise necessary to carry out the testing of the acrylonitrile for the Stage Gate validation.
- Applications that propose technologies that are not based on sound scientific principles (e.g., violates the Laws of Thermodynamics).
- Applications that do not describe a project schedule within the Workplan section of the Technical Volume or presents a project schedule that is incompatible with the Phase I, and Phase II timing and objectives (see Section I.B of the FOA).

Award Information

Total Amount to be Awarded	**Up to $12 million***
Average Award Amount	EERE anticipates making awards that range from $6 to $12 million
Types of Funding Agreements	Cooperative Agreements, Grants, Technology Investment Agreements, Work Authorizations, and Interagency Agreements
Period of Performance	40 months (20 months for Phase I, and 20 months for Phase II)
Cost Share Requirement	Cost share must be greater than or equal to 20% of total project costs EXCEPT THAT cost share must be greater than or equal to 10% of the total project costs if (1) the prime organization is a domestic non-profit entity, a DOE national laboratory, a domestic educational institution, or a state, local, or tribal government, and (2) the prime recipient incurs more than 50% of the total project cost.

*Subject to the availability of appropriated funds

Statement of Substantial Involvement

EERE has substantial involvement in work performed under Awards made following this FOA. EERE does not limit its involvement to the administrative requirements of the Award. Instead, EERE has substantial involvement in the direction and redirection of the technical aspects of the project as a whole. Substantial involvement includes, but is not limited to, the following:

1. EERE shares responsibility with the Prime Recipient for the management, control, direction, and performance of work under this award.
2. EERE reviews and approves in a timely manner project plans, including project management, testing and technology transfer plans, and recommending alternate approaches, if the plans do not address the critical programmatic issues.
3. EERE participates in project management planning activities, including risk analysis, to ensure EERE Technology Office requirements or limitations are considered in performance of the work elements.
4. EERE may intervene in the conduct or performance of work under this Award for programmatic reasons. Intervention includes the interruption or modification of the conduct or performance of project activities.
5. EERE promotes and facilitates technology transfer activities, including disseminating Technology Office results through presentations and publications.
6. EERE may redirect or discontinue funding projects that fail to fully and satisfactorily complete the work described in the Statement of Project Objectives as evaluated at the Go/No-Go decision points.
7. EERE participates in major project decision-making processes.

Cost Sharing Requirements

- Applicants must contribute a minimum of 20% of the total project costs for R&D projects. *Unless the project qualifies for the Cost Share Reduction.*
- ***Cost Share Reduction***: EERE has reduced the Recipient Cost Share Requirement to **10%** for R&D activities where:
  - The Prime Recipient is a domestic institution of higher education; domestic nonprofit entity; FFRDC; or U.S. State, local, or tribal government entity; and
  - The Prime Recipient performs more than 50% of the project work, as measured by the Total Project Cost

Cost Share Contributions

- Contributions must be:
  - Specified in the project budget
  - Verifiable from the Prime Recipient's records
  - Necessary and reasonable for proper and efficient accomplishment of the project
- Every cost share contribution must be reviewed and approved in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred

Allowable Cost Share

- Cost Share must be allowable and must be verifiable upon submission of the Full Application
- Refer to the following applicable Federal cost principles:

Entity	Cost Principles
Educational Institutions	2 CFR Part 220
State, Local, and Indian Tribal Governments	2 CFR Part 225
Non-profit Organizations	2 CFR Part 230
For-profit Organizations	FAR Part 31

Allowable Cost Share

- Cash Contributions
  - o May be provided by the Prime Recipient, Subrecipients, or a Third Party
- In-Kind Contributions
  - o Can include, but are not limited to: personnel costs, indirect costs, facilities and administrative costs, rental value of buildings or equipment, and the value of a service, other resource, or third party in-kind contribution

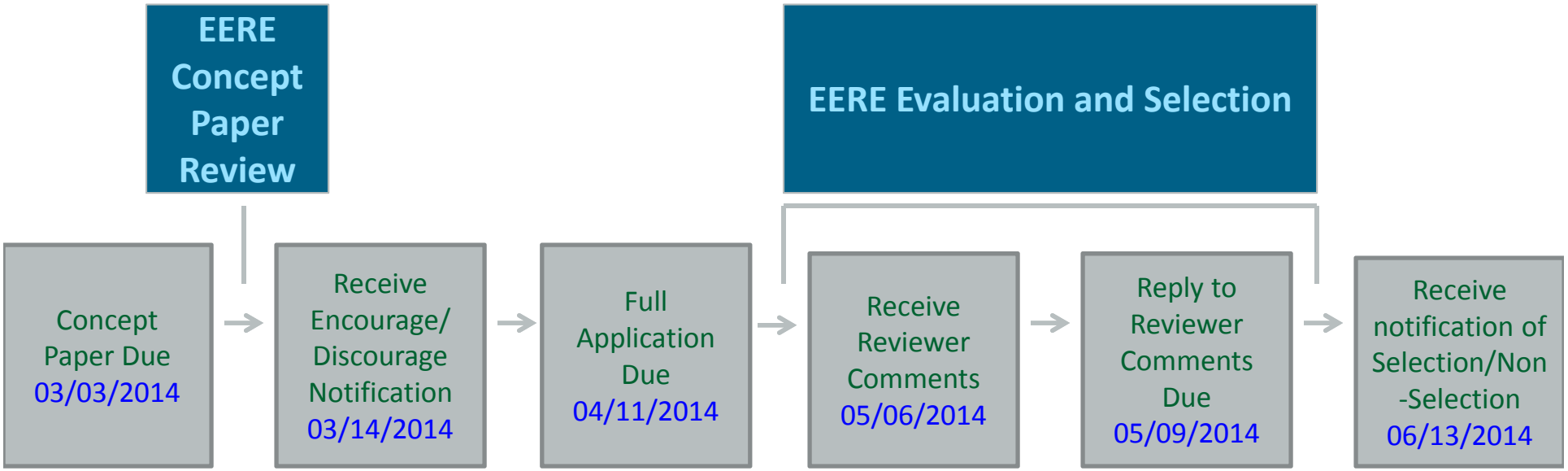
Unallowable Cost Share

- The Prime Recipient may not use the following sources to meet its cost share obligations including, but not limited to:
  - Revenues or royalties from the prospective operation of an activity beyond the project period
  - Proceeds from the prospective sale of an asset of an activity
  - Federal funding or property
  - Expenditures reimbursed under a separate Federal Technology Office
  - Independent research and development (IR&D) funds
  - The same cash or in-kind contributions for more than one project or program

Cost Share Payment

- Recipients must provide documentation of the cost share contribution, incrementally over the life of the award
- The cumulative cost share percentage provided on each invoice must reflect, at a minimum, the cost sharing percentage negotiated
- In limited circumstances, and where it is in the government's interest, the EERE Contracting Officer may approve a request by the Prime Recipient to meet its cost share requirements on a less frequent basis, such as monthly or quarterly. See Section III.B.7 of the FOA.

FOA Timeline



EERE anticipates making awards by 08/15/2014

Concept Papers

- Applicants must submit a Concept Paper
  - Each Concept Paper must be limited to a single concept or technology
- The Concept Paper must include a technology description (See Section IV.C of the FOA)
  - The technology description is limited to 3 pages
  - The Concept Paper can also include graphs, charts, or other data (limited to 2 pages)
- Concept Papers must be submitted by March 3, 2014, 5pm Eastern through EERE Exchange, and must meet the content and form requirements (See Section IV.C of the FOA).
- EERE provides applicants with: (1) an “encouraged” or “discouraged” notification, and (2) the reviewer comments
- A "discouraged" notification conveys EERE's lack of programmatic interest in the proposed project. An Applicant who receives a "discouraged" notification may still submit a Full Application.

Concept Paper Review

EERE evaluates the Concept Papers based on the following technical review criteria:

- **Criterion 1: Impact of the Proposed Technology Relative to State of the Art (50%)** This criterion involves consideration of the following factors:
  - Method used to identify current state of the art technology
  - If technical success is achieved, the proposed idea would significantly improve technical and economic performance relative to the state of the art.

- **Criterion 2: Overall Scientific and Technical Merit (50%)**

  This criterion involves consideration of the following factors:
  - The proposed technology is unique and innovative; and
  - The proposed approach is without major technical flaws.

Full Applications

- The Full Application includes:
  - **Technical Volume**: The key technical submission - info relating to the technical content, project team members, etc.
  - **SF-424 Application for Federal Assistance:** The formal application signed by the authorized representative of the applicant.
  - **SF-424A Budget & Budget Justification (EERE 159):** a detailed budget and spend plan for the project.
  - **Summary/Abstract for Public Release**
  - **Summary Slide**
  - **Administrative Documents:** E.g., U.S. Manufacturing Plan, FFRDC Authorization (if applicable), Disclosure of Lobbying Activities, etc

Full Applications: Technical Volume Content

- **Technical Volume: the key technical component of the Full Application**

Content of Technical Volume	Approximate % of Technical Volume
Cover Page	
Project Overview	5%
Technical Description, Innovation and Impact	25%
Workplan	50%
Technical Qualifications and Resources	15%
Technology Validation	5%

Full Application Eligibility Requirements

- Applicants must submit a Full Application by April 11, 2014
- Full Applications are eligible for review if:
  - The Applicant is an eligible entity (Section III.A of FOA);
  - The Applicant submitted an eligible Concept Paper;
  - The Cost Share requirement is satisfied (Section III.B of FOA);
  - The Full Application is compliant (Section III.C of FOA of FOA); and
  - The proposed project is responsive to the FOA (Section III.D of FOA)
  - The Full Application meets any other eligibility requirements listed in Section III of the FOA.

Who's Eligible to Apply?

Eligible applicants for this FOA include:

1. Individuals
2. Domestic Entities
3. Foreign Entities
4. Incorporated Consortia
5. Unincorporated Consortia

For more detail about each eligible applicant, please see Section III.A of the FOA for eligibility requirements

Multiple Applications

Applicants may submit more than one application to this FOA, provided that each application describes a unique, scientifically distinct project

Merit Review and Selection Process (Full Applications)

- The Merit Review process consists of multiple phases that each include an initial eligibility review and a thorough technical review
- Rigorous technical reviews are conducted by reviewers that are experts in the subject matter of the FOA
- Ultimately, the Selection Official considers the recommendations of the reviewers, along with other considerations such as program policy factors, to make the selection decisions

Technical Merit Review Criteria

Criterion 1: Technical Merit, Innovation, and Impact (50%)

Technical Merit and Innovation

- Extent to which the proposed technology or process is innovative and has the potential to advance the state of the art;
- Extent to which sufficient technical details are provided (including but not limited to relevant data, calculations, discussion and analysis of prior work in literature) to assess whether the proposed work is scientifically meritorious, revolutionary, and viable.

Impact of Technology Advancement

- Extent to which the technologies described can be applied to a wide range of biomass feedstocks produced in or could be produced in the United States and yet still produce consistently high quality acrylonitrile appropriate for carbon fiber manufacturing;
- Extent to which the identified 4 or more critical performance attributes and metrology as applied to bio-ACN are relevant and appropriate to provide assurances that the bio-ACN can be used in existing manufacturing process and can generate carbon fiber composites that meet the key tensile strengths and Young's modulus material properties required for lightweight vehicle structural components.

Technical Merit Review Criteria - Continued

Criterion 2: Project Research and Commercialization Plan (30%)

Research Approach and Workplan

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan will succeed in meeting the project goals.

Identification of Technical Risks

- Degree to which the applicant demonstrates understanding of the key technical risk areas involved in the proposed work, and the quality of the mitigation strategies to address them.

(continued on next slide…)

Technical Merit Review Criteria - Continued

Criterion 2, Continued

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and
- Comprehensiveness of commercialization plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, Data Management Plan and Open Source Software Distribution Plan , U.S. manufacturing plan etc., and product distribution.

Technical Merit Review Criteria - Continued

Criterion 3: Team and Resources (20%)

- Degree to which the Principal Investigator(s) and the proposed team members:
  - commit an appropriate amount of staff time to provide oversight and to carry out the proposed tasks successfully
  - exhibit complementary expertise and professional accomplishments that are relevant to all of the proposed tasks
  - indicate willingness to openly and routinely communicate and share data within the consortium during the entire period of performance
- Degree to which the combined facilities of the teaming organizations are appropriate, specific, and relevant to support the work;
- Degree to which the proposed consortium demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- Reasonableness of budget and spend plan for proposed project objectives.

Replies to Reviewer Comments

- EERE provides applicants with reviewer comments
- Applicants have from approximately 05/07/2014 to 05/09/2014 5p.m. Eastern to prepare a Reply to Reviewer Comments ("Reply") to respond to comments
  - Page Limit: 3 Pages, including charts, graphs, etc.
- Applicants are not required to submit a Reply. It is optional.
- To be considered by EERE, a Reply must be submitted by the deadline and submitted through EERE Exchange.
- Please see Sections IV.F. and V.A.3 of the FOA for additional information regarding Replies to Reviewer Comments

Selection Factors

The Selection Official may consider the merit review recommendation, program policy factors, and the amount of funds available in arriving at selections for this FOA

Program Policy Factors

- The Selection Official may consider the following program policy factors in making his/her selection decisions:
  - The degree to which the proposed project, including proposed cost share, optimizes the use of available EERE funding to achieve programmatic objectives
  - The level of industry involvement and demonstrated ability to commercialize energy or related technologies
  - Technical, market, organizational, and environmental risks associated with the project
  - Whether the proposed project is likely to lead to increased employment and manufacturing in the United States
  - Whether the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty
  - The degree to which the proposed project directly addresses EERE's statutory mission and strategic goals

Registration Requirements

- To apply to this FOA, Applicants must register with and submit application materials through EERE Exchange: https://eere-Exchange.energy.gov
- Obtain a "control number" at least 24 hours before the first submission deadline
- Although not required to submit an Application, the following registrations must be complete to received an award under this FOA:

Registration Requirement	Website
DUNS Number	http://fedgov.dnb.com/webform
SAM	https://www.sam.gov
FedConnect	https://www.fedconnect.net
Grants.gov	http://www.grants.gov

Means of Submission

- Concept Papers, Full Applications, and Replies to Reviewer Comments must be submitted through EERE Exchange at https://eere-Exchange.energy.gov
  - EERE will not review or consider applications submitted through other means
- The Users' Guide for Applying to the Department of Energy EERE Funding Opportunity Announcements can be found at https://eere-Exchange.energy.gov/Manuals.aspx

Key Submission Points

- Check entries in EERE Exchange
  - Submissions could be deemed ineligible due to an incorrect entry
- EERE strongly encourages Applicants to submit 1-2 days prior to the deadline to allow for full upload of application documents and to avoid any potential technical glitches with EERE Exchange
- Make sure you hit the submit button
  - Any changes made after you hit submit will un-submit your application and you will need to hit the submit button again
- For your records, print out the EERE Exchange Confirmation page at each step, which contains the application's Control Number

Applicant Points-of-Contact

- Applicants must designate primary and backup points-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations
- It is imperative that the Applicant/Selectee be responsive during award negotiations and meet negotiation deadlines, expected to take place between 06/14/2014 through 08/15/2014
  - Failure to do so may result in cancelation of further award negotiations and rescission of the Selection

Questions

- Questions about this FOA? Email RenewableCarbonFiber@go.doe.gov
  - All Q&As related to this FOA will be posted on EERE Exchange
    - You must select this specific FOA Number in order to view the Q&As
  - EERE will attempt to respond to a question within 3 business days, unless a similar Q&A has already been posted on the website
- Problems logging into EERE Exchange or uploading and submitting application documents with EERE Exchange? Email EERE- ExchangeSupport@hq.doe.gov.
  - Include FOA name and number in subject line
- A digital copy of the slides will be posted on EERE Exchange following today's webinar