REQUEST FOR INFORMATION

DE-SOL-0008246

University, National Laboratory, Industry, and International Entities Input to the Office of Nuclear Energy's Competitive Research and Development Work Scope Development

April 13, 2015

Office of Nuclear Energy

Office of Innovative Nuclear Research

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1 Introduction

The primary mission of the Office of Nuclear Energy is to advance nuclear power as a resource capable of meeting the Nation's energy, environmental, and national security needs by resolving technical, cost, safety, proliferation resistance, and security barriers through research, development, and demonstration as appropriate.

NE's program is guided by the four research objectives detailed in its Nuclear Energy Research and Development Roadmap:

- Develop technologies and other solutions that can improve the reliability, sustain the safety, and extend the life of current reactors.
- Develop improvements in the affordability of new reactors to enable nuclear energy to help meet the Administration's energy security and climate change goals.
- Develop sustainable fuel cycles.
- Understand and minimize the risks of nuclear proliferation and terrorism.

NE strives to promote integrated and collaborative research conducted by national laboratory, university, industry, and international partners under the direction of NE's programs. NE funds research activities through both competitive and direct mechanisms, as required to best meet the needs of NE. This approach ensures a balanced R&D portfolio and encourages new nuclear power deployment with creative solutions to the universe of nuclear energy challenges. The competitive portion of NE's R&D portfolio is executed through the Nuclear Energy University Program (NEUP) and Nuclear Energy Enabling Technologies Crosscutting Technology Development (NEET CTD). NEUP utilizes up to 20 percent of funds appropriated to NE's R&D program for university-based infrastructure support and R&D in key NE program-related areas: Fuel Cycle Research and Development (FCR&D), Reactor Concepts Research, Development and Demonstration (RCRD&D), and Nuclear Energy Advanced Modeling and Simulation (NEAMS). NEET CTD supports national laboratory, university and industry led crosscutting research.

2 Requested Information

1) DOE is seeking ideas in the areas of research, information, comments, feedback, and recommendations from interested parties for future work scopes for the major NE-funded research programs. This input may lead to a more robust R&D program that reflects the communities' ideas and could identify new work scopes. Although the focus of this Request For Information (RFI) is to obtain input to and identify potential new work scopes for future Funding Opportunity Announcements in the areas listed below, DOE also seeks input on creative, innovative and transformative work that aligns with NE's mission.

Fuel Cycle Research and Development (FC R&D) Program. The mission of the FC R&D program is to develop used nuclear fuel management strategies and technologies to support

meeting the federal government responsibility to manage and dispose of the Nation's commercial used nuclear fuel and high-level waste and to develop sustainable fuel cycle technologies and options that improve resource utilization and energy generation, reduce waste generation, enhance safety, and limit proliferation risk.

The program vision is that by mid-century, strategies and technologies for the safe, long-term management and eventual disposal of U.S. commercial used nuclear fuel and any associated nuclear wastes have been fully implemented. Additionally, it is desired that advanced nuclear fuel and fuel cycle technologies that enhance the accident tolerance of light-water reactors and enable sustainable fuel cycles are demonstrated and deployed. Together, these technologies and solutions support the enhanced availability, affordability, safety, and security of nuclear-generated electricity in the United States.

Current challenges include the development of high burnup fuel and cladding materials to withstand irradiation for longer periods of time with improved accident tolerance; development of simplified materials recovery technologies, waste management (including storage, transportation, and disposal), and proliferation risk reduction methods; and development of processes and tools to evaluate sustainable fuel cycle system options and to effectively communicate the results of the evaluation to stakeholders.

Reactor Concepts Research, Development and Demonstration (RC RD&D) Program. The mission of the RC RD&D program is to develop new and advanced reactor designs and technologies that broaden the applicability, improve the competitiveness, and ensure the lasting contribution toward meeting our Nation's energy and environmental challenges. Research activities are designed to address the technical, cost, safety, and security issues associated with various reactor concepts. The four technical areas are Light Water Reactor Sustainability (LWRS), Small Modular Reactors (SMR), Advanced (Non-Light Water) Reactor Concepts (ARC) and Advanced Small Modular Reactors (Adv SMRs). In addition, R&D for the manufacturing of radioisotope power systems for national security and space exploration missions is supported through the Space and Defense Infrastructure Program.

Nuclear Energy Advanced Modeling and Simulation (NEAMS) Program. The mission of the NEAMS program is to create modern computer simulation codes and methods that give the user state-of-the-art physics models that can take advantage of powerful multi-processing computers in order to better understand the behavior of nuclear reactor and fuel systems during normal operations and/or transient events. In particular, NEAMS is aimed at creating an advanced mechanistic toolkit that is applicable to a wide range of reactor designs for use by industry, academia, and the national laboratories. The NEAMS Toolkit will help engineers and scientists form new insights into the safety and economics of current and next generation reactor and fuel systems. It will provide much higher fidelity than current methods and incorporate well-defined and validated prediction capabilities.

This will be achieved by employing advanced software environments and modern high-performance computers to create a set of engineering-level codes in which fuels and materials continuum properties are informed by first-principles modeling of materials at the atomistic and meso-scale. A set of simulation tools will be developed that promote interoperability of codes with respect to spatial meshing, materials and fuels models, and achieve a common

"look and feel" for setting up problems and displaying results. The toolset to be developed aims to achieve scalability in terms of computing power and the types and couplings of the physics that dominates the system behavior.

The Department of Energy's (DOE) Office of Nuclear Energy (NE) conducts crosscutting nuclear energy research and development (R&D) and associated infrastructure support activities to develop innovative technologies that offer the promise of dramatically improved performance for advanced reactors and fuel cycle concepts while maximizing the impact of DOE resources.

Nuclear Energy Enabling Technologies (NEET) Crosscutting Technology Development (CTD). NEET CTD competitively awards high-priority R&D to universities, national laboratories, and industry, leading to the development of innovative solutions to unique and crosscutting nuclear energy challenges. The subprogram works in close coordination with NE's other R&D programs to ensure that developed technologies and capabilities address critical technology gaps as part of an integrated solution offering the potential of revolutionary improvement in safety, performance, reliability, economics, and proliferation risk reduction. Additionally, NEET CTD strategically invests in competitive, nuclear energy-related infrastructure enhancement at national laboratories; ensuring researchers have access to state-of-the-art R&D capabilities. The capabilities developed through NEET CTD advance the state of nuclear technology, improving its competitiveness, and promoting continued contribution to meeting our Nation's energy and environmental challenges.

Replies to this request should follow the general organization of Section 2 of this RFI and information should be as succinct as possible. Respondents are encouraged to provide input on any areas of interest of this RFI.

2.1 Cover Page

Responses shall include a cover page containing the following information:

- RFI title
- Names, phone numbers, and e-mail addresses for the principal points of contact
- Company or affiliate name and address
- Date of submittal

2.2 NE Work Scope Recommendations

Clearly define your proposed work scope, and how it relates to any part of NE's mission described in this RFI. Describe any defined goals in achieving the desired outcomes, along with appropriate metrics to assess how well those goals have been achieved.

2) What would be the estimated cost of the work scope?

3) Would the work scope be more focused on immediate NE program needs, or more creative, innovative and transformative?

4) Would the work scope require multiple partners?

5) What would be a reasonable schedule duration and key milestones?

2.3 Other Information

Provide any other relevant information you feel is important not otherwise already covered including comments or suggestions.

3 Participant Eligibility to Respond to RFI

Information is being sought from educational institutions, National Laboratories, utilities, private industry, international entities, and any other interested party.

4 Program Guidelines

This market research request is done under the Federal Acquisition Regulation (FAR), Parts 10 – Market Research and FAR subpart 15.201(e) – Requests for Information.

5 Intellectual Property Rights

Participants are advised that their RFI response package should be submitted without any restrictive markings. However, if restrictions are required in order to fully explain a response, the participant is responsible to mark the cover page and any and all submittal documents appropriately. Respondents are strongly discouraged from placing any restrictive markings on submissions as they may limit DOE's ability to use the submitted information.

6 Communications Protocol

Responses must be submitted through www.NEUP.gov to be considered. You must create an account to access the submission site. Submit electronic submissions through the "Applications" function at www.NEUP.gov. If you have problems completing the registration process or submitting your response, call 208-526-1507 or send an email to NEUP@inl.gov.

Participants are advised that any indication of interest, in the affirmative, is not meant to imply nor in any way impart an obligation on the part of the Government that an award will be forthcoming for the offered work or project.

7 Schedule

7.1 Submission Time and Date

The DOE will continually accept packages in response to this RFI No. DE-SOL-0008246. However to be considered for the 2016 grant opportunities a response will be required no later than **8:00 p.m. ET, June 19, 2015.**

This announcement does not impose any obligation on the Government nor does it signify any intent for a contract or other form of award.

8 Disclaimers

a. DOE does not plan to send individual acknowledgements or replies to respondents to the RFI. However, DOE may conduct one-on-one meetings with entities that respond to this request if clarification or additional information is required to improve the DOE's understanding of the comments provided. If DOE decides to hold one-on-one meetings, applicable interested parties will be contacted. The decision to meet with a company one-on-one has no bearing on the worthiness of its RFI submittal or on any future offerings.

b. This is a request for information only. It has no direct relation to other DOE Funding Opportunity Announcements or solicitations. DOE does not presently intend to solicit or award any kind of contract or financial assistance award; this RFI is issued only with the intent of obtaining information.

c. Any response to this RFI is voluntary and does not commit to Government to any expense or obligation. This request does not impose any obligation on the Government or signify a firm intention to enter into a contract. No costs associated with responding to this RFI or participating in any subsequent meetings will be borne by the Government.

d. DOE does not intend to publish the results of the responses to this RFI.