U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

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Advanced Reactor Demonstration

Funding Opportunity Announcement

DE-FOA-0002271

INDUSTRY DAY

Jun 2 and 3, 2020

Overview

- Advanced Reactor Demonstration Program Summary
  - Mission and Objectives of Program
- Summary of Industry Responses to Request for Information/Notice of Intent (RFI/NOI)
- FOA Overview
  - Application Pathways
  - Merit Review Criteria
  - Policy Factors
- Key Take Aways

Advanced Reactor Demonstration Program (ARDP)

- A key pillar of the Office of Nuclear Energy mission is to establish an advanced reactor pipeline to improve the nation's economic and energy security posture
- In FY20, Congress appropriated $230 million (M) for the Department to establish a program to demonstrate multiple advanced reactor designs at various stages of technological maturity
- Primary objective: construct and demonstrate several advanced reactors with beneficial capabilities, such as:
  - Inherent safety features
  - Superior reliability
  - Lower waste yields
  - Proliferation resistance
  - Greater fuel utilization
  - Improved thermal efficiency
  - Ability to integrate electric & non-electric applications
- ARDP will support multiple advanced reactor demonstrations representing a variety of technologies and designs
- ARDP demonstration projects to be implemented via funding opportunity announcement (FOA) resulting in cost-shared cooperative agreements with U.S. industry partners

RFI/NOI Background

- Released Request For Information/Notice of Intent (RFI/NOI) on February 5, 2020 to communicate DOE plans and solicit input from industry stakeholders
  - Posed 22 questions relevant to program execution
  - Response deadline - February 26
  - Effective - Significant interest (33 responses received)
    - Industry Groups, Reactor Vendors, Utilities
    - Academia
    - National Laboratories
    - National Reactor Innovation Center (NRIC)
    - Nuclear Regulatory Commission (NRC)

Industry Stakeholder Feedback

- Government approach of using a single FOA is preferable to industry, including both Demos and Risk Reduction (and ARC-20) activities
- NRC needs to be a full partner and actively engaged
  - Industry would like NRC commitment to meet aggressive schedules for licensing
- HALEU supply for Demos and commercial deployment is a major concern for most respondents
- Concerns regarding consistent DOE funding due to federal government budget process
  - A single year of funding is not sufficient to attract investors or show that the government is an effective partner
- Preference for a payment-for-milestone approach
- Preference for a Draft FOA to comment on before the official release
- Preference for a graded implementation of cost share
  - Government should bear higher percent early in project to cover higher risk and investor uncertainty

Industry Feedback

- Most respondents supported U.S. work and supply chain requirements, but indicated that foreign supply chains/financing were necessary for project success and early commercial viability
- Intellectual Property (IP) protection extension for longer periods of time (~20-30 years)
- Respondents supportive of Congressional criteria but additional clarification of each criteria was needed
  - General consensus of adding: manufacturability, versatility, and evaluation of market and viability
- Consensus that 5-7 years to operation is aggressive, but feasible if other concerns are adequately addressed

Industry Feedback

- Other items:
  - DOE should help develop the domestic supply chain and find end customers
  - Give utilities incentives to deploy advanced reactors; no specific examples provided
  - Facilitate competition in foreign reactor markets
  - Concern regarding perceived DOE technology bias towards LWRs
  - Industry recommends multiple expert evaluation board members per category to preclude bias and Conflict of Interest (COI) issues
  - Single negotiated agreement (e.g. CRADA) for access to labs
  - DOE should have the ability to terminate non-performing awards and reinvest remaining funds in additional awards
  - Some vendors proposed selecting only reactor types with closed fuel cycles
  - Incorporate earned value management approach
  - Allow companies to participate on multiple applications as sub-awardees

DOE Response to Industry Feedback

- YES
  - Single FOA, which includes NRC inputs; includes information on DOE HALEU efforts; payment for milestone approach; IP protection; FOA technology neutral – no bias towards LWRs
  - U.S. work and supply chain, but permit foreign supply chains/financing
  - FOA uses Congressional criteria, along with several others
  - Multiple external evaluation board members per category to preclude bias and COI issues
  - FOA/award flexibility to terminate non-performing awards and reinvest remaining funds
  - Allow companies to participate on multiple applications as sub-awardees
- NO
  - Draft FOA due to schedule constraints
  - Graded implementation of cost share due to Congressional feedback
  - Recipients must develop their supply chain and find end customers
  - Single negotiated agreement (e.g. CRADA) for access to labs
  - Selection of only reactor types with closed fuel cycles
  - Earned value management approach

ARDP FOA Application Pathways

- The Advanced Reactor Demonstration (ARD) FOA includes the following funding pathways:
  - Advanced Reactor Demonstration (Demos) awards
    - $160M initial funding for cost-shared demonstration of two reactor designs that have potential to be operational in five to seven years following award finalization
  - Risk Reduction for Future Demonstration (Risk Reduction) awards
    - $30M initial funding to support 2-5 additional, diverse advanced reactor designs that have a commercialization horizon that is approximately 5 years longer than the Demos
  - Advanced Reactor Concepts-20 (ARC-20) awards
    - $20M for a new solicitation (to be known as ARC-20) for at least 2 new public-private partnerships focused on advancing reactor designs moving toward demonstration phase

Discrimination Between Reactor Technology Pathways

- NE expects the FOA to support advanced nuclear technology awards across the continuum of design maturity
- Advanced Reactor Demonstration awards (Demos) – Minimum 50% Industry Cost Share
  - Demos are expected to be the most mature designs (Technology Readiness Level (TRL) ~ 6)
  - Actively pursuing licensing or some form of authorization to operate
  - Near-ready to begin procurement or construction activities
  - Expected to be on a path to commercial operation and services
- Risk Reduction for Future Demonstration (Risk Reduction) awards - Minimum 20% Industry Cost Share
  - Expected to be preparing/maturing designs and technologies that are nearly, but not yet fully, ready for demonstration (TRL ~ 4-5)
  - Many identified risks that are likely to impede commercial potential
  - Broad range of acceptable projects that will address risks
- ARC-20 - Minimum 20% Industry Cost share
  - Innovative and diverse designs that are lower in TRL (~3)
  - Designs that are entering or already in the conceptual design phase.
  - Projects proposed under this pathway would address early design, engineering, and licensing tasks leading to solidification of concepts

Merit Review Criteria for Demos and Risk Reduction

1. Technical feasibility that the demonstration reactor can be operational within five to seven years from completion of award, and for Risk Reduction, to achieve a demonstration reactor in approximately 10-14 years, will be evaluated. The application will be evaluated on the feasibility and likelihood of success

2. The likelihood that the design can be licensed for safe operations by the NRC will be evaluated. The application will be evaluated on the identification of a clear and logical strategy addressing the efforts assuring the reactor design and selected site can be licensed by the NRC Affordability of design for full-scale construction and cost of electricity generation or production activities.

3. The feasibility that the project management processes applied to the project will lead to success in achieving initial operation within the demonstration timeline will be evaluated. The application will be evaluated on the existence of a clear and logical strategy to reactor construction and deployment

Merit Review Criteria for Demos and Risk Reduction

4. Affordability of the design for full-scale construction and cost competitiveness in the commercial market will be evaluated. The application will be evaluated on the strategy to identify and implement activities or methodologies that can assure the advanced reactor design can be competitive with other generating sources.

5. Technical abilities and qualifications of key personnel, organizations and teams to successfully accomplish the project, as well as to meet the cost share requirements, will be evaluated. The application will be evaluated on the team's capabilities, experience, financial solvency, and other factors

Policy Factors for Demos and Risk Reduction

a. Proposed cost share that exceeds minimum required amounts on the part of the Applicant may be given preferential consideration.

b. Diversity and versatility in reactor design may be considered, including to best optimize the selection of an appropriate mix of technologies to meet program goals.

c. Preference may be given for U.S. content, technology, expertise, etc.

d. Applications that have the potential to enhance U.S. nuclear infrastructure may be given preferential consideration. The Selection Official may also consider potential contributions of foreign expertise and supply chains.

e. DOE may consider foreign influence in the selection of application(s), including type and amount of foreign involvement in the project, as well as any foreign ownership, control, or influence (FOCI) issues.

Policy Factors for Demos and Risk Reduction

f. Whether the entity is located in an urban and economically distressed area including a Qualified Opportunity Zone (QOZ) or the proposed project will occur in a QOZ or otherwise advance the goals of QOZ. The goals include spurring economic development and job creation in distressed communities throughout the U.S.

g. Cost of the overall demonstration project will be considered. This may include a Budget Evaluation. If considered, the budget evaluation (not point scored) may be conducted after the merit review is completed on the most highly rated application(s).

h. Indirect Rates. Whether the Applicant and subapplicants have established indirect rates, including federally established indirect rate agreement(s) in place at time of application submission, such that these may be used in establishing any resultant financial assistance award on a timely basis to not delay the project.

i. Selections to balance and to optimize an appropriate mix of technologies to meet program goals.

Merit Review Criteria for ARC-20

- Criterion 1 – Technical Merit of the Reactor Concept
  - DOE will evaluate the technical merit of the proposed ARC-20 applications with respect to safety, operations, and economics. Advantages of the proposed advanced reactor concept relative to the current reactor technology will also be evaluated
- Criterion 2 – Furtherance of the Reactor Concept
  - The application will be evaluated as to the extent to which the proposed project answers feasibility questions, solves technical issues, addresses licensing challenges or demonstrate technical viability of concept features
- Criterion 3 - Applicant Team Capabilities and Experience, Including Management Capability as well as Approach
  - Applicant Team Capabilities and Experience will be evaluated as to the extent to which the Applicant provides objective evidence that it has the resources and abilities to complete successfully the proposed scope of the project and progress the proposed concept.
  - Current activities, relevance and depth of the organization's experience and capabilities, together with that of key personnel, will be evaluated as it relates to the likely successful completion of the project activities. In evaluating this criterion,

Policy Factors for ARC-20

- Pre-application engagement with the regulator, while not required, would be a positive consideration for an ARC-20 project.
- b. Selections to balance and to optimize an appropriate mix of technologies to meet program goals.
- Extent of industry cost-share (i.e., proposed contributions greater than 20%) may be given preferential consideration.
- Whether the entity is located in an urban and economically distressed area including a Qualified Opportunity Zone (QOZ) or the proposed project will occur in a QOZ or otherwise advance the goals of QOZ. The goals include spurring economic development and job creation in distressed communities throughout the U.S.
- Indirect Rates. Whether the Applicant and subapplicants have established indirect rates, including federally established indirect rate agreement(s) in place at time of application submission, such that these may be used in establishing any resultant financial assistance award on a timely basis to not delay the project.

Policy Factors for ARC-20

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Key Take Aways

- A key pillar of the Office of Nuclear Energy mission is to establish an advanced reactor pipeline to improve the nation's economic and energy security posture
- DOE and NRC are closely coordinated
- Multiple pathways based on technical readiness
- Permits U.S. and foreign supply chains/financing
- Increased emphasis on business planning and commercial viability
- Technology neutral position

The FOA is structured to assure that the Department selects the best applicant and most viable technology, and considers the attributes of the licensing strategy, the capabilities, and the partnerships formed that will help these designs to be competitive in the global market

FOA Information

- DOE has established and FOA website: https://www.id.energy.gov/NEWS/ARDFO/ARDFOOpportunities/ARDFO.htm

- Interested parties may submit questions regarding the ARDP and/or FOA in writing to: advancedreactordemonstration@id.doe.gov.

- DOE will make reasonable efforts to answer questions asked within three working days. Questions of general interest or deemed necessary for public dissemination will be made available.

Questions?

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