



Status of Advanced Reactor Demonstration Programs

HALEU Webinar
April 28-29, 2020

Overview

- Advanced Reactor Demonstration Program Summary
 - Mission
 - Program Elements
 - Status
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- RFI/NOI and Consensus Responses
- Examples of HALEU Specific Responses
- FOA Contact Information

Advanced Reactor Demonstration Program (ARDP)

- 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 resistant
 - greater fuel utilization
 - improved thermal efficiency
 - able 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) for cost-shared cooperative agreements

ARDP FOA Execution

- The upcoming Advanced Reactor Demonstration (ARD) FOA contains 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
 - The ARC-20 awards to focus on a set of innovative and diverse designs that are lower in technology readiness level, with a commercialization horizon of 5-10 years (from 2035) beyond the Risk Reduction projects

Minimum Merit Review Criteria

1. Technical feasibility that demonstration operational in five to seven years
2. Likelihood that design can be licensed for safe operations by Nuclear Regulatory Commission
3. Use of certified fuel design or demonstration of clear path to certification within five to seven years
4. Affordability of design for full-scale construction and cost of electricity generation
5. Ability of team to provide cost share
6. Technical abilities and qualifications of teams desiring to demonstrate advanced nuclear reactor technology
7. Diversity of designs

ARD Solicitation Status

- February 2020 - NE engaged Industry via a Request For Information/Notice of Intent (RFI/NOI) to communicate DOE plans and solicit input from industry
 - Posed 22 questions relevant to the FOA approach
 - Detailed responses received from 33 entities
- DOE factoring RFI/NOI response information into the ARD FOA
- NRC response and involvement to date has been very helpful.
 - NE coordinating with NRC on FOA language while ensuring they retain licensing independence
 - Established a formal MOU addendum addressing roles
- Briefed and received feedback from Congressional staff
- Early May 2020 – ARD FOA issuance

RFI/NOI Questionnaire

- DOE wanted to know...
 - How to maximize solicitation effectiveness
 - Any missing information, ideas or issues
- Questionnaire contained 22 questions including:
 - Streamlining the process
 - Intended use of national laboratory capabilities
 - Intellectual property (IP) considerations and concerns
 - Foreign participation

Industry Feedback

- Government approach of using a single FOA is preferable to industry, including both Demonstrations and Risk Reduction activities
- NRC needs to be 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 nearly all respondents
- 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
- Industry prefers a payment for milestone approach
- Industry desires a Draft FOA to comment on before the official release
- Industry prefers graded implementation of cost share
 - Government should have higher percent early in project to cover higher risk and investor uncertainty

Industry Feedback

- Most respondents supported US work and supply chain requirements but indicated that foreign supply chains/financing were necessary for project success and early commercial viability
- IP protection needs to be extended 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
- Most respondents felt that 5-7 years to operation is aggressive, but feasible if other concerns are adequately addressed

Examples of HALEU Specific Feedback

- Many non-LWRs will need HALEU up to 19.75% U-235. Currently, there is no commercially available domestic HALEU supply.
- This demonstration program can help incentivize a domestic HALEU supply chain; however, DOE needs to support the development of this infrastructure, including transportation and fuel fabrication.
- Lack of timely and affordable commercial availability of HALEU and TRISO fuel particles with affordable price in US is the most critical market limitation. Federal funding needs to be made available to procure sufficient quantities for test and qualification immediately, then for first load of fuel of the demo.
- DOE should commit to making HALEU commercially available within 3-4 years from now.

Examples of HALEU Specific Feedback

- Recommend that DOE guarantee an interim supply of HALEU for the demonstration projects, given current lack of domestic commercial supply.
- For advanced reactors that utilize TRISO particles as their fuel, HALEU derived from EBR-II fuel recovery is not useable for two reasons. 1) the residual impurities and radioactive contamination impose the requirement for excessive transportation, handling, shielding, and protective equipment that will significantly add to the fuel fabricator's manufacturing costs. 2), the EBR-II HALEU, produced at the INL, cannot leave the site, so fuel fabrication would have to be performed there. There are no current plans for TRISO-based fuel manufacturing at INL.
- Suggest that DOE assess the future procurement of HALEU for a fuel bank similar to the international LEU fuel bank.

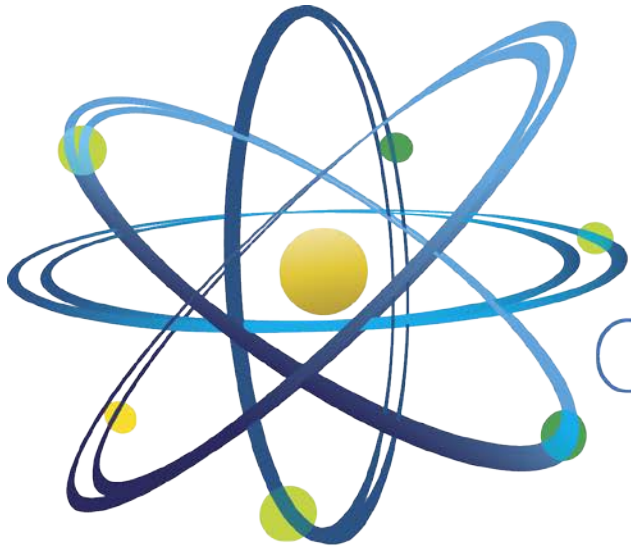
Examples of HALEU Specific Feedback

- DOE should ensure that adequate funding is provided to develop, manufacture, and license HALEU fuel designs to accelerate the licensing of advanced reactor technologies reliant on these fuel designs.
- DOE should make investments in kick starting a domestic enrichment capacity that is economically competitive for HALEU; licensing and constructing at least one commercial-scale HALEU feedstock shipping container design; establishing at least two fuel fabrication facilities licensed to handle HALEU and capable of accommodating a variety of fuel fabrication processes for initial cores.

FOA Information

- DOE intends to issue the ARDP FOA in early May 2020 and has established an FOA website:
<https://www.id.energy.gov/NEWS/ARDFO/ARDFOOpportunities/ARDFO.htm>
- DOE will plan for an Industry Day approximately three weeks after issue of the FOA.
- 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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