



**U.S. Department of Energy
Advanced Research Projects Agency – Energy**

**Announcement of Teaming Partner List for a potential
Funding Opportunity Announcement:**

**Optimizing Nuclear Waste and Advanced Reactor Disposal Systems
(ONWARDS)**

The Advanced Research Projects Agency – Energy (ARPA–E) is considering a program to promote advanced nuclear energy by addressing significant challenges on the back end of advanced nuclear reactor (AR) fuel cycles. Specifically, the potential program would seek to develop and demonstrate technologies that will significantly improve the *disposal impact* of used nuclear fuel (UNF) and other waste streams stemming from the implementation of AR fuel cycles. This R&D would enable proliferation-resistant fuel cycles for ARs with an emphasis on minimizing the impact of fuel cycle wastes.

Overall goals for the potential program include:

- an order of magnitude reduction in waste volumes or repository footprint with no weakening of safeguards standards
- development of safeguards technologies for AR UNF processing for which there is no existing economically and/or technically viable solution for in-process fissile mass measurement of better than 1% accuracy
- proliferation-resistant recycling of uranium (U) and transuranic (TRU) materials for new AR fuel stock that produce less than 0.1% actinides in waste stream
- high durability waste forms for AR UNF (e.g., TRI-structural ISOtropic particle (TRISO) fuel, metallic fuel, molten salt fuel) across multiple disposal environments

Three technological areas have been identified as offering the most likely avenues to achieving substantial improvements in disposal impact for AR fuel cycles. A fourth category is included to capture breakthrough technologies that do not fit into the three listed technological areas, but that could nonetheless significantly improve the disposal impact of UNF. These four categories are:

- i) **Process solutions:** This technology area includes process improvements that significantly minimize waste volumes, improve intrinsic proliferation resistance of actinide separations, increase resource utilization efficiency, and bolster commercialization.
- ii) **Safeguards solutions:** This technology area includes improved sensor and data fusion technologies that will allow for accurate and timely accounting of nuclear materials.



- iii) Waste form solutions: This technology area includes waste forms solution for AR fuel cycles with a particular emphasis on waste forms for waste streams from pyroprocessing of UNF or spent fuel from Molten Salt Reactors (MSRs).
- iv) Other solutions: This category is provided for technologies which do not clearly fall into the above three categories. A compelling case must exist that the technology will deliver significant improvements to the fuel cycle disposal impact.

Since the exact nature of the back end of future AR fuel cycles is both undetermined and likely to evolve over time as ARs are deployed and technologies are updated, **technologies that can span multiple AR fuel cycles and disposal concepts while achieving otherwise high performance would be of significant interest to this potential program.** Further, while this potential program would require proposed technologies be specific to AR fuel cycle concepts, technologies with backwards compatibility with existing commercial light-water reactor (LWR) fuel cycle wastes would also be of significant interest.

ARPA-E held a workshop on these topics on December 2, 2020. Information from this workshop can be found at the event webpage (<https://arpa-e.energy.gov/events/reducing-impact-used-nuclear-fuel-advanced-reactors-workshop>).

As a general matter, ARPA-E strongly encourages outstanding scientists and engineers from different organizations, scientific disciplines, and technology sectors to form new project teams. Multidisciplinary and cross-sector collaboration spanning organizational boundaries enables and accelerates the achievement of scientific and technological outcomes that were previously viewed as extremely difficult, if not impossible. Furthermore, ARPA-E strongly encourages involving industry partners to advise and collaborate with these project teams, with the goal of achieving successful industry adoption and integration of the innovative technologies these projects teams develop.

A Teaming Partner List is being compiled to facilitate the formation of new project teams. ARPA-E intends to make the Teaming Partner List available on ARPA-E eXCHANGE (<https://ARPA-E-foa.energy.gov>), ARPA-E's online application portal, in April 2021. Once posted, the Teaming Partner List will be updated periodically, until the close of the Full Application period, to reflect new Teaming Partners who have provided their information.

Any organization that would like to be included on the Teaming Partner List should complete all required fields in the following link: <https://arpa-e-foa.energy.gov/ApplicantProfile.aspx>. Required information includes: Organization Name, Contact Name, Contact Address, Contact Email, Contact Phone, Organization Type, Area of Technical Expertise, and Brief Description of Capabilities.

By submitting a response to this Announcement, respondents consent to the publication of the above-referenced information. **By facilitating this Teaming Partner List, ARPA-E does not endorse or otherwise evaluate the qualifications of the entities that self-identify for placement on the Teaming Partner List.** ARPA-E will not pay for the provision of any information, nor will it compensate any respondents for the development of such information. Responses submitted to other email addresses or by other means will not be considered.

This Announcement does not constitute a Funding Opportunity Announcement (FOA). No FOA exists at this time. Applicants must refer to the final FOA, expected to be issued May 2021, for instructions on



submitting an application, the desired technical metrics, and for the terms and conditions of funding.