

## WHAT MAKES AN ARPA-E PROJECT? CHANGING WHAT'S POSSIBLE

### TRANSFORMATIONAL TECHNOLOGY

ARPA-E supports the development of advanced, transformational technologies for a secure, reliable, efficient, and sustainable U.S. energy system, seeking a technological lead and long-term economic competitiveness for the nation in this critical sector. While ARPA-E recognizes the importance and challenge of making continuous improvements to existing technologies, ARPA-E specifically looks for distinctly innovative approaches that move beyond existing conventions and limitations. These new approaches may draw from the translation of advanced technologies from other fields, or from recent scientific breakthroughs in the development of entirely new technological solutions. In its optimum form, an ARPA-E project enables solutions that were previously thought impossible and provides a credible path to making them commercially viable. Novelty alone is not sufficient for a successful ARPA-E project: proposed technologies must surpass not just the best commercially available technology but also other promising alternative technologies currently under development. ARPA-E expects applicants to know and understand the relevant technical field, and to quantitatively articulate the advantages (and recognize potential disadvantages) of their technology vis-à-vis the competition and the status quo.

### HIGH RISK

Ambitious projects carry inherent technical risk and ARPA-E fully recognizes that not every attempt to push beyond existing capabilities will succeed. In fact, if every project ARPA-E funds were to reach or exceed its targets, it would have failed by not setting sufficiently challenging goals. ARPA-E also believes that even failure, when properly analyzed and documented, offers critical insights that allow others to further advance the field.

While ARPA-E invites projects with high technical risk, it also seeks to manage project risks very rigorously. First and foremost, ARPA-E runs a rigorous solicitation and review process, ensuring that the proposed solutions are rooted in sound scientific principles and that the proposing team has the necessary expertise and balance to execute the proposed work successfully. Second, clear tasks and milestones, including definitive go/no-go junctures, are negotiated with each potential awardee. Finally, the ARPA-E program management team stays actively engaged with the project team through regular on-site visits and reviews of progress against milestones, noting that targets often shift as the project evolves.

### HIGH REWARD

To justify taking large programmatic risks, ARPA-E requires a sufficiently high potential reward, which in keeping with its mission, is defined as having a significant impact in reducing energy imports, improving energy efficiency, or reducing energy-related emissions. Estimated long-term impacts should be quantified in primary energy saved (in quadrillion BTUs, or Quads), energy imports eliminated (in million barrel of oil equivalent, or MBOE), or emissions avoided or mitigated (in millions of metric tons of CO<sub>2</sub> equivalent, while reductions of non-GHG emissions are also of interest). While ARPA-E recognizes that revolutionary advances in any field are exceedingly rare, it aspires that any new solution has the potential to transform the ways the United States produces, transfers, stores, distributes, and utilizes energy, while impacting a significant fraction of the full U.S. energy system.

### PATHWAY TO IMPACT

In addition to technological merit and the potential impact of a proposed technology, ARPA-E assesses the anticipated timelines and requirements for its continued development and deployment in the real world. Ultimately, a new technology can only have an impact if it is deployed at scale by the private sector. While the path to market for new technologies may be long and complex, ARPA-E looks for teams that are committed to pushing their own technology toward real deployment – understanding and addressing the challenges that are not only scientifically and technically interesting, but also practically and economically important. ARPA-E helps facilitate this process by pairing each team with a highly experienced technology-to-market advisor. The overarching objective is to prepare project teams for the next step in the development of their technology following the ARPA-E award.