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R&D Policy Explainer: Advanced Research Projects Agency-Energy

Mission and Purpose

The Advanced Research Projects Agency-Energy ([ARPA-E](#)) mission is to advance “high-potential, high-impact energy technologies that are too early for private-sector investment.” Housed within the Department of Energy, ARPA-E has a particular focus on industries and technologies that are related to the use, generation, and storage of energy. The work of ARPA-E is closely aligned with U.S. competitiveness, national and energy security, energy innovation, and environmental stewardship goals. To accomplish its mission ARPA-E has a highly selective application process that awards successful applicants with funding, active program management, and execution strategy.

Funding and Founding

The U.S. is the world leader in cutting edge technology and innovation, which has largely originated out of the private sector but also through government research and development. One applied research program is the ARPA model, a private-public partnership that leverages government funding to support private entrepreneurship that is aligned with specific national objectives. ARPA advances innovation by lessening barriers to entry that stunt innovation in critical issue areas such as defense, health, and energy. The longest-tenured ARPA program, the Defense Advanced Research Projects Agency (DARPA), has led to creation of GPS and the internet. Recognizing the potential of ARPA to provide next-generation breakthroughs in the energy sector, Congress passed the America Competes Act in 2007 which established ARPA-E.

Investment and Partnership Model

ARPA-E's primary mission is to encourage high-risk, high-reward innovation that might not occur without support. Its long-term aim is to establish bridges between private investors and proven technologies. ARPA-E utilizes two models to direct its resources to their highest-value use and ensure that its partners are able to employ their technology in meaningful ways. After the initial investment ARPA-E helps its partners to “transition from proof-of-concept prototypes to commercially scalable and deployable versions of the technology.” ARPA-E allows previous awardees to participate in its Technology-To-Market ([T2M](#)) and Seeding Critical Advances for Leading Energy technologies with Untapped Potential ([SCALEUP](#)) programs.

Technology-To-Market

Technology-To-Market (T2M) is the collaborative strategy process that ARPA-E implements with all project teams to ensure research and development are responsive to market needs. The T2M process has four steps that outline the types of support that T2M teams can provide to their partners: Scope, Manage, Advise, Partnerships. T2M advisors work with the project team to define the scope and impact that their technology could have. During this step the T2M team will provide market insights that will guide the development of market strategies. The T2M team will then manage the project by monitoring progress



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toward jointly-created project milestones. As the project progresses the team will offer tailored market strategies to begin to deploy the technology and help facilitate partnerships with potential stakeholders such as government organizations, private investors, and corporations.

SCALEUP

SCALEUP supports new technology commercialization by helping entrepreneurs position themselves for successful transition to larger markets and attracting private investment. The SCALEUP process requires that participants acquire a letter of intent from a commercialization partner to demonstrate the presence of market interest. They will then craft a value proposition and compelling commercialization strategy. If selected, project teams will engage in a cost share negotiation and then enter a collaboration period that usually runs for a total of three years. SCALEUP provides funding and strategy support for proven technologies in order to ensure that they make it to market. The post-development support that SCALEUP offers protects new technology startups from falling into the capitalization trap.

ARPA-E In Action

ARPA-E has enjoyed a number of successes and continues to be an important player in the race for clean and energy efficient technologies. Since 2009, it has provided more than [\\$3.4 billion](#) to aid in the research and development of energy technologies. It measures its impact along a number of indicators, all of which point to the success of their model. Since its [inception](#) “135 new companies have formed; 321 licenses have been issued for ARPA-E tech; 291 have partnered with another government agency; and 204 teams have together raised more than \$11.4 billion in private-sector follow-on funding.”

ARPA-E has been influential in bringing many technologies to life including a [magnetic energy storage system](#) which expands solar and wind storage capacity. The technology uses “superconducting magnets that could store significantly more energy than today’s best magnetic storage technologies at a fraction of the cost.” This increases reliability while reducing the need for overgeneration, making renewable energy a much more attractive consumer choice and a more efficient process for suppliers.

ARPA-E is also currently developing a [technology](#) that would allow for radioactive waste to be transmuted from a “long-lived isotope I-129 (half-life of 15.7 million years)...to short-lived isotope I-128 (half-life of 25 minutes).” This technology could dramatically reduce the impacts of nuclear waste disposal as well as pave the way for technologies that could recycle used nuclear fuel (UNF).

Why it Works

ARPA-E is not limited to a particular industry or technology and it allows a specific focus on high-risk, high-reward technologies. Because of this, a wide range of potentially disruptive technologies are able to exist where they might not have been able to if they only had private funding. Additionally, because of the managerial support and market research that ARPA-E provides, teams are able to consider wide-ranging applications for their designs and [reach markets](#) that were otherwise closed or unknown. Program



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directors at ARPA-E serve for limited terms, so ARPA-E can maintain its advantage by generating a flow of new perspectives and innovative thinking. These are both important in technological entrepreneurship.

Why it is Important

Born out of the “America Competes Act,” ARPA-E is a critical component of maintaining America’s lead in energy innovation as well as providing Americans with clean, affordable, and sustainable energy solutions. ARPA-E does not duplicate or overstep the private sector's role in research, development, and innovation. Rather it subsidizes the risk that prevents innovation from occurring. In this way it encourages private entrepreneurship and sets up companies to transition to private markets. ARPA-E fills the gap between invention and investment and acts where the private sector is unwilling or unable. Security, environmental, and economic priorities compete in the energy debate but thoughtful innovation can contribute to solutions in multi-faceted issue areas. A prosperous, safe, and responsible America will need to maintain its energy advantage and be a global leader in energy efficiency. ARPA-E is a well equipped and proven advocate of American ingenuity and ground-up solutions.