Testimony of

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On

Bridging the Valley of Death: ARPA-E's Role in Developing Breakthrough Technologies

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Good morning, Thank you for granting me the opportunity to testify today. My name is Lane Genatowski. I joined the Energy Department in 2018 as Senior Advisor to the Under Secretary for Science and subsequently was appointed and confirmed as Director of ARPA-E. Currently, I work with several partnerships for growth with innovative technology companies in energy and environmental sensors.

Prior to my time at the Department of Energy and after law school, I spent five years as a lawyer working with power and energy companies before commencing a series of positions of increasing responsibility in the financial services sector. In addition, before joining the Energy Department, I co-founded and ran a small investment fund focused on the common stock of regulated US electric and gas utilities.

Questions Addressed

How does ARPA-E help to accelerate the development of cutting-edge technologies?
How might Congress reform ARPA-E to further align ARPA-E with DOE's main mission?

How ARPA-E helps to accelerate the development of cutting-edge technologies

The Advanced Research Projects Agency-Energy (ARPA-E) advances high-potential, high-impact energy technologies that are too early for private-sector investment by funding projects that are developing entirely new ways to generate, store, and use energy.

Focused Programs – **More than Money**. The award of grant funding is important but not more so than the help and guidance provided by the science and marketing staff of ARPA-E. There are several different types of research funding programs; however, the type of program that sets ARPA-E apart are its Focused Programs and how they operate as they incorporate the ARPA-E approach. It is this process that I would like to highlight this morning - the flexible integration of grant funding with the experienced and talented ARPA-E staff from the start of a Program that delivers the result.

ARPA-E provides support and guidance regarding things such as experimental design, budget, staffing, and Project modification, at all stages of the Focused Program process of what could be viewed as the creation of special purpose research ventures (Programs), each focused on a specific goal.

Request for Information. After an active internal ARPA-E conversation concerning a new topic, approaches, costs, and need or market demand for the "solution", the process starts with a Request for Information ("RFI") which is prepared and distributed by ARPA-E to a broad group of scientists, engineers, and potential users seeking input on

a. new sources of energy or methods of storing or transmitting energy
b. advanced separation technologies, if required
c. methods of recovery and recycling, if appropriate

To avoid duplication of effort with other parts of DOE, an ARPA-E RFI for example specifically notes that, "[w]ork focused on basic research aimed purely at discovery and fundamental knowledge generation is not of interest."

Workshop. After examination of RFI replies and internal consultations, a workshop is usually held to hear directly from experts, manufacturers, and consumers in the field as to what advances they think are needed or possible and their views on how they would propose to achieve them. Cost targets are always a focus.

Pre-Award Guidance. Short written descriptions of proposed research are submitted by Workshop participants and an ARPA-E review board selects a set of proposed projects to be encouraged to respond to a Funding Opportunity Announcement. Where appropriate, Grantee teams may be encouraged to adjust their composition or objectives.

Funding Opportunity Announcement. If appropriate, ARPA-E issues a Funding Opportunity Announcement ("FOA"), which is the way ARPA-E informs potential grant applicants that federal funds are available to support research that is focused on overcoming certain technical barriers around a specific energy topic.

Project selection and award negotiation. ARPA-E reviews FOA responses and allocates and negotiates grants to Project teams that are deemed worthy. The ARPA-E grants are paid as reimbursements after the appropriate cost share is borne by the Grantee.

Active Project Management. Importantly, when Projects commence they are assigned an ARPA-E team to assist from a scientific, financial, and business perspective at every step along the way toward the attainment of the goal. All parts of ARPA-E are available to assist applicants and awardees through the entire process, as needed.

SCALE-UP. In 2019, in an effort to be more effective in getting new technologies into the market, nine completed ARPA-E Projects were selected to go through the SCALEUP process with greater focus and support on making the leap to commercialization with finance, marketing, and design for manufacture being a focus. This was right at the start of COVID's impact. As far as I can ascertain, all nine of the awardees are going concerns with their tech in the market now.

Impacts

Scientific and Commercial. ARPA-E has sponsored numerous projects with positive impacts, both scientific and commercial. For example, ARPA-E points out on its website that many of its Project teams have continued to advance their technologies. For example:

154 new companies have formed;

405 licenses have been issued for ARPA-E tech;

340 have partnered with another government agency; and

230 teams have together raised follow-on funding to continue to advance their technology.

ARPA-E also points out that projects have also helped to advance scientific understanding and technological innovation through publication of 7,318 peer-reviewed journal articles and 1,120 patents issued by the U.S. Patent and Trademark Office.

The specifics regarding ARPA-E's success at launching awardee projects into the economy, such as acquisition price are confidential or not available to me as an ex-Director. However, I have been provided a few high-level statistics that I believe are indicative of generally positive results experienced:

ARPA-E Funding	$3,76B
Projects	1,569
Follow on funding	$12.1B
Corporate Exits	29
Valuations at Exit	$21.8B

How may Congress reform ARPA-E to further align with DOE's main mission?

I was last Director on January 20th, 2021, so my insights may be dated; however, I think that ARPA-E's basic operational practices and structure fit the purpose.

In 2021 ARPA-E's reauthorization was included in the FY 21 Omnibus Appropriations bill. The bill amended the ARPA-E statute to better align ARPA-E with the Department's mission. Specifically, tasking ARPA-E with development of solutions "**to address the energy and environmental missions of the Department."** And adding to ARPA-E's goals.:

- **The management, clean-up, and disposal of radioactive waste and spent nuclear fuel; and**
- **improve the resilience, reliability, and security of infrastructure to produce, deliver, and store energy;**

Regarding nuclear waste this has led to programs that deal with and characterize nuclear waste – **ONWARDS** which looks to characterize and recycle nuclear waste from Advanced Reactors (to develop and demonstrate breakthrough technologies that will facilitate a 10x reduction in AR waste volume generation or repository footprint) and **CURIE** which looks to recycle existing waste to Advanced Reactors.

Other measures of a more operational nature that could be considered are:

The Deputy Director of Technology and Deputy Director of Commercialization could have equally important roles within ARPA-E to propose, design and administer Projects and Programs.

Consider adding an IMPACT metric around students supported/trained through funding provided. Workforce development is a critical area that might benefit others in addition to ARPA-E.

Consider having the Tech2 Market Group organized around major industry domains (e.g., energy, metals/mining, agriculture, etc.), Their core responsibility could include market intelligence and maintaining relationships with commercial decision makers and research leaders in companies in their domains.

Consider a separate outreach function for financial investors, incubators, and accelerators like ARPA-E's current government outreach function. The core objective of this would be to get better information and earlier than would otherwise be the case by connecting financial sector teams with industry, academia, and government.

Thank you and I look forward to your questions.