

U.S. Senate Committee on Energy and Natural Resources
April 28, 2022 Hearing: The Applegate, Cantor, and Wang Nominations
Questions for the Record Submitted to Dr. Evelyn Wang

Question from Ranking Member John Barrasso

Question: ARPA-E recently awarded \$36 million to 11 companies “seeking to increase the deployment, and use of, nuclear power as a reliable source of clean energy and limit the amount of waste produced from Advanced Nuclear Reactors.” The Office of Nuclear Energy has authority to fund such technologies. Please share the ways in which you will coordinate with program offices to avoid duplicative funding.

Answer: If confirmed, I will work to ensure that ARPA-E is supporting technological transfer and not duplicating efforts within the applied offices or across the Department of Energy complex. I understand that ARPA-E has practices in place to help manage overlap and duplication during its program development cycle, as noted in Government Accountability Office (GAO) review in February, 2022 ([GAO-22-104775](#)). If confirmed, I will work to continue the below practices, and strengthen them as appropriate.

- **Pre-program consultation:** ARPA-E often coordinates with DOE’s applied offices and the Office of Science on the development of its workshops, programs, and the selection of its research projects and creation of its programs. Technical staff from such offices are often invited to events such as workshops, kickoff meetings, and annual meetings where appropriate.
- **Reviewers:** Technical staff from the applied offices and the Office of Science routinely act as reviewers of ARPA-E’s proposed projects with the goal of developing and de-risking advanced energy technologies. ARPA-E technical staff also act as reviewers for the applied offices, and where appropriate have attended merit reviews and other events.
- **Applicant:** Once a FOA is issued, applicants are required to disclose in their applications whether they submitted the same or similar concepts to other Federal agencies, or private investors.
- **Recipients:** ARPA-E recipients are also required to disclose in their quarterly performance reports any new funding received from public or private sources. This ensures transparency and enables ARPA-E to make appropriate funding determinations.

Question from Senator James E. Risch

Question: ARPA-E has had great success creating cutting edge technology for a broad set of energy applications. How do you see ARPA-E engaging with the new Office of Clean Energy Demonstrations to ensure the technology gets to the end users?

Answer: The Department of Energy (DOE) facilitates coordination between DOE Research & Development (R&D) programs, including ARPA-E, through a variety of Departmental activities at the Program Office levels, including joint participation in research workshops, strategic planning activities, solicitation development, and program review meetings, including the set-up of the new Office of Clean Energy Demonstrations (OCED).

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These activities will in the future facilitate cooperation and coordination between the Office of Clean Energy Demonstrations (OCED), and ARPA-E, with the goal to explore potential hand-offs of technology and knowledge transfer between the two offices. While I do not believe this mechanism has been formalized, I anticipate that upon successful completion of an ARPA-E project, further scaling and demonstration would be needed to further advance the technology towards commercialization, particularly in large capital energy applications such as turbines or reactors. Those technology projects could be potential candidates for at-scale demonstrations that OCED will be responsible for managing.

Questions from Senator Steve Daines

Question 1: Dr. Wang, CCUS technology is an important tool for the reduction of carbon emissions. This committee has passed and signed into law numerous CCUS related bills that have direct instructions to DOE. One of those bills created a large-scale pilot project at an existing coal or natural gas plant. I believe Montana is uniquely qualified to host one of these DOE projects. Will you commit to working with me on finding ways for DOE to be more involved with CCUS development in Montana?

I agree that Carbon Capture Utilization and Sequestration (CCUS) is an important technology area and tool to address carbon emissions. If confirmed, I would look to see how ARPA-E can better support the innovation and commercialization of these technologies in places like Montana and across the country.

Question 2: Dr. Wang, pumped hydro-storage can be used to help make intermittent energy act more like baseload and help stabilize the grid. How can DOE promote storage technologies like pumped hydro to better secure the grid?

I agree that energy storage is essential for a modernized, resilient, and reliable grid. I understand that ARPA-E has been working to develop solutions that can provide 10 to 100 hours of storage at a levelized cost of storage of 5 cents/kWh or less under the Duration Addition to electricitY Storage (DAYs) program. If confirmed as Director of ARPA-E, I would work closely with the applied offices to understand the additional research and needs for storage technologies, including the Water Power Technologies Office's investment and research into pumped hydro-storage.

Question 3: Dr. Wang, hydropower and nuclear energy have provided the vast majority of carbon-free electricity for the United States for decades. Both also provide consistent baseload power. Unfortunately, for many, when they discuss 'green-energy' they mean only 'wind and solar', forgetting the role that nuclear and hydro already play in carbon-free electricity generation. Further, we have already seen certain areas move to close nuclear plants or propose to breach hydro-dams. What role do you think nuclear power and hydropower should play in the future of energy production?

I believe that nuclear and hydropower can and should play a significant role in the future of energy production. They provide important dispatchable and firm energy. I also believe that there is potential for ARPA-E to

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advance additional technological innovations to help enhance power production, minimize environmental disruption, and improve the economic viability of new technologies.

Question 4: Dr. Wang, do you believe we should increase hydropower production?

Yes, and I believe there are technological advancements that would increase our ability to harness hydroelectric power in a way that is environmentally sustainable and that lowers the levelized cost of energy.

Question 5: Dr. Wang, do you believe we should increase nuclear energy production?

Yes. I believe that nuclear energy will play a key role in any zero-emission grid. I also believe there will need to be additional innovation and technology to help ensure new nuclear facilities are cost effective and safe. For instance, ARPA-E is currently supporting nuclear innovation through the Optimizing Nuclear Waste and Advanced Reactor Disposal Systems (ONWARDS) program to help support next generation advanced nuclear reactors with a 10X reduction in waste volume.

Question 6: Dr. Wang, do you believe we should invest in new coal, oil, and natural gas power plants that are paired with CCUS technology?

I believe that abating carbon emissions from new fossil facilities will be critical, and that Carbon Capture Utilization and Sequestration (CCUS) is an important technology where there is still a need for innovation and technologies to make the facilities economically viable. This is a prime area of research for ARPA-E, including on materials development and carbon utilization.

Question 7: Dr. Wang, in-stream hydrokinetic power allows for small scale, low impact hydropower generation. How can DOE work to increase the use of in-stream hydrokinetic power?

I understand this has been an area of exploration through ARPA-E's Submarine Hydrokinetic And Riverine Kilo-megawatt Systems (SHARKS) program, which aims to accelerate the market adoption of hydrokinetic turbine designs for tidal and riverine currents. If confirmed, I would work closely with the applied offices, including the Water Power Technologies Office to understand the current efforts and challenges around in-stream hydrokinetic power and how programs like SHARKS can help address technology gaps.

Question 8: Dr. Wang, there have been recent calls to ‘electrify everything’. In many parts of the country, including the Pacific Northwest, we are already facing a near term shortage of electricity to meet peak demand. Do you believe that a dramatic move to electrify numerous industries without the similar investment in baseload energy will have a negative impact on grid reliability?

It is critical to maintain and enhance grid reliability and ensure adequate flexible and dispatchable power. I believe that a modernized and resilient grid also requires enhancements to the grid in terms of incorporating new resources, bidirectional flows, and enhancements in grid software and management. If confirmed, I would seek to work closely with the Office of Electricity to understand current efforts to improve grid resiliency, including through deployment provided under the Bipartisan Infrastructure Law, and how existing and future ARPA-E research can enhance those efforts. For instance, I understand that ARPA-E recently launched its third

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challenge under the Grid Optimization (GO) Competition, which will examine new models for emerging technologies such as storage, consumer participation (bid-in demand), and distributed energy resources (DERs). I would look forward to partnering with my colleagues across the Department on the implementation of new models and operations to improve grid resilience.

Question 9: Dr. Wang, nuclear energy, including advancements in small modular nuclear reactors, can help increase baseload energy with smaller and smaller physical and environmental footprints. Will you commit to work with me and affected stakeholders to bring new technologies to Montana?

I agree that small modular reactors can help provide firm dispatchable power to the grid. If confirmed, I would look to see how ARPA-E can better support the innovation and commercialization of these technologies in places like Montana and across the country.

Questions from Senator James Lankford

Question 1: The federal government spends hundreds of billions of dollars annually on R&D efforts that are fragmented across agencies, and the results are not always available to entities wanting to build on those results. This fragmentation and lack of consistent public access to the results of those research investments could slow down the advancements we are looking to spur. A 2019 GAO report looked into the issue of public access to determine if agencies were taking appropriate steps to coordinate across agencies and enable researchers to benefit from previous work. That report included a whopping 37 recommendations to 16 agencies, demonstrating that there is a lot of work to make results accessible to those who might be able to use them to reach the next big breakthrough. Dr. Wang, getting results into the hands of those who can take it the next step, or commercialize it, is critically important. What do you believe we can do differently to ensure we don't leave promising research stranded?

Answer: Recognizing these issues, in 2019 ARPA-E released a Funding Opportunity Announcement (FOA) titled "Seeding Critical Advances for Leading Energy technologies with Untapped Potential (SCALEUP)", which provides a vital mechanism for the support of innovative energy R&D that complements ARPA-E's primary R&D focus on early-stage transformational energy technologies that still require proof-of-concept. The goal of the program is to help ARPA-E-funded technologies, past and present, transition from proof-of-concept prototypes to commercially scalable and deployable versions of the technology and be well-positioned for investment from the private sector. ARPA-E's authorizing statute directs the Agency to develop linkages between its sponsored applied research and the marketplace. These linkages are central to realizing the public's return on technology investments.

An enduring challenge to ARPA-E's mission is that even technologies that achieve substantial technical advancement under ARPA-E support are at risk of being stranded in their development path once ARPA-E funding ends. The SCALEUP FOA builds upon ARPA-E-funded technologies to demonstrate technical performance at market relevant scales. Stranding promising ARPA-E-funded technologies in their development pathways leaves substantial intellectual property developed with American taxpayer dollars vulnerable to adoption by foreign competitors, who can and do capture it for continued development – and economic benefit – overseas. This harms national competitiveness, as U.S. industries often lose the lead on the development, scaling, and manufacturing of technologies necessary to compete in rapidly evolving global energy markets.

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These scaling energy technology projects will meet ARPA-E's statutory direction to achieve the above goals by "accelerating transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty." If confirmed, I would look to see how ARPA-E can use SCALEUP and collaborate with DOE's applied offices to transition even more promising research to commercially scalable and deployable versions of the technology.

Question 2: There is often a lot of talk about how much funding for any given purpose – from R&D to education and healthcare – is “enough” to reach an objective. I believe this overlooks that it matters not just *how much* we spend, but *what* we spend it on.

- Dr. Wang, what do you believe we can do to spend our existing resources for ARPA-E smarter?
- How can we better evaluate and prioritize which areas of research will yield the most impactful technological advances and breakthroughs?

Answer: Based on my experience as an ARPA-E awardee, the agency is constantly looking at solving problems in new and different ways and re-evaluating the state of the art in energy technologies. At the core of this model is the team, particularly the Agency's term-limited program directors. These individuals are leaders in their respective fields and come to ARPA-E for limited three-to-five-year terms. These limited terms instill a sense of urgency to succeed and regularly provide a fresh re-evaluated perspective on technologies and current market conditions. This term-limited approach also helps enable a collaborative and competition-free culture, which is of extreme importance to maintaining an environment where all perspectives and opinions are welcomed and valued. ARPA-E program directors drive the agency, determining answers to “what problem should be solved, and why,” and “what should that solution look like to achieve impact.” These answers lead, via much pressure testing and outreach, to metric-driven focused programs that create carefully researched funding solicitations.