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Before the Energy Subcommittee
House Science, Space, and Technology Committee
February 12, 2025

Chairman Weber, Congresswoman Ross, honorable members of the House Committee on Science, Space, and Technology, I am Thom Mason, Director of Los Alamos National Laboratory. Los Alamos is 1 of 17 Department of Energy laboratories, which have a rich history of providing groundbreaking scientific discoveries and technological innovations that have made America stronger through economic and national security impacts. As during the Manhattan Project when we developed the atomic bomb, Los Alamos' multidisciplinary scientific capabilities are brought to bear on complex national security challenges. We have helped achieve Vannevar Bush's post-World War II vision for the US to lead the world in scientific discovery and innovation through government investment and to leverage this leadership for a stronger, more secure, and more prosperous America. I am focusing today's remarks on national security, the changes in our labs, and the adjustments in our national approach that we believe are necessary for US strength and global security.

The world has changed significantly since the Vannevar Bush approach was launched, moving from a bipolar (Soviet—US) to a tripolar (Russia—US—China) environment with additional complexity due to surrogate and independent actors, leading to an erosion of the strategic stability we enjoyed for the latter part of the Cold War and the early post-Cold War era. This geopolitical environment requires innovation to ensure strategic deterrence and address the potential for disruptive technologies to undermine our legacy deterrent.

Access to abundant electricity is a national security advantage, which is why the nation would benefit from increased nuclear power generation. Los Alamos and other labs have made contributions to nuclear reactor designs and better fuels, and the labs are positioned to support national goals at the intersection of reactor research and development (R&D), power generation, and nuclear nonproliferation.

The US has the world's dominant economy, but this economy is no longer larger than that of the rest of the world combined. Private-sector investments in R&D now greatly exceed US government investments. As private companies continue to lead the world in research and technologies critical to national security, the national labs need to develop even stronger partnerships for the future.

Historically, the US has led scientific and technical innovation at scale. This is no longer the case in many areas. Large-scale science often requires significant investments in infrastructure (think of the large accelerators producing x-rays or neutrons needed to

understand the fundamental properties of materials). The international community has closed the gap through team science with the US and in competition with us. I believe that we need to substantially increase our investment in the infrastructure that enables the US to regain its leadership in big science, beginning with core national security facilities.

US companies lead the world in artificial intelligence (AI), but that lead is measured, at best, in months. China outpaces the US in government funding of AI and is likely on the front foot for adapting this critical capability for national security purposes. Los Alamos has already seen the value of AI tools for accelerating our current mission work, R&D, and operations. We also see the potentially transformative impact of the most recent advances in AI, such as reasoning capabilities and AI agents, which could enable Los Alamos to deliver solutions at an unprecedented pace. The main lesson learned from our AI efforts over the past several years is that we are not operating at the required scale to meet the security needs of the nation. I believe we urgently need a national initiative to apply the best AI tools, systems, and approaches offered by US industry to the science and innovation that drives national security, especially in existential areas like weapons of mass destruction. At the same time, a bold AI initiative for American security and prosperity will guard against attempts by adversaries to use these powerful technologies to gain an advantage.

Over a decade ago, my predecessor, Charlie McMillan, testified that the pace of change over the next decade was going to be significantly faster than that of the century before. He came out of retirement to work on AI because he recognized that it would not merely allow us to do things incrementally faster, but 10 to 100 times faster, which would in turn enable us to do things in a completely different way. Although gains in efficiency will be most welcome, the opportunity to change the pace of scientific discovery is transformational. AI is to today as the Industrial Revolution was to America in the late 1800s because scientific discoveries often serve to increase the potential for breakthroughs in other areas and because the gains compound over time.

The country that wins the race in applying AI at scale will not be caught. This new way of doing things and the significance of the potential impacts represent a new era of national security. America is positioned to lead this era through bold action by leveraging the advantages of our private sector and the ability to do research at scale.

Delivering on Deterrence

The US must deliver a contemporary nuclear deterrent without re-creating the Cold War infrastructure, thereby avoiding environmental complications and excessive costs. We must expand our use of AI and other approaches to accelerate all steps in the management of our nuclear weapon development and production and to find solutions for deterrence gaps outside of the nuclear domain. The use of AI will accelerate high-resolution simulations, helping bridge gaps across scales and physics that cannot currently be

captured within a single simulation code. It will assist in the discovery of new molecules and materials, which will enable supply chain resilience and security. AI will also lead to the optimization of the design, development, manufacturing, and qualification process, enabling a more responsive stockpile.

To realize these gains, the government must robustly invest in computational hardware, data preparation, and workforce. Full-time access to on-premises classified computing hardware at scale is a must. We have started to see what can be done with modest-scale AI using our recently installed Venado supercomputer on unclassified applications. The results are impressive, and to have an immediate mission impact, we have committed to moving this computer to our classified environment. While these results are significant, an important lesson learned is that the scales of the model (computer) and the available quality data matter.

The announcement by DeepSeek showed what can be done by thinking about training models in a different manner. Although DeepSeek has shown impressive baseline training using smaller computers, they also demonstrated that the quality of scientific data used in model training matters.

The Department of Energy has some of the best unclassified and classified scientific data in the world. It now must be converted into a form that can be harnessed for AI applications.

Many of the scientific tools used to design, certify, and assess our stockpile and conduct the underlying research across a range of disciplines are ageing and in need of revitalization for today's mission. The Los Alamos Neutron Science Center (LANSCE), which is one of the nation's preeminent particle accelerator facilities, is an example. The front end of the accelerator beam line at LANSCE was once state of the art, designed by Los Alamos for fundamental science and later adapted for use in weapons research. Today, that beam line powers one of the critical tools in weapons certification, produces isotopes for medical treatment, and guarantees the safety of all aircraft avionics. However, LANSCE is more than 50 years old and presently requires six months annually for maintenance and start up, delivering less than 50% of the scheduled production beam-hour the other half of the year. The LANSCE Modernization Project (LAMP), which recently achieved Critical Decision-0, would replace the front end of the beam line, ensuring greater reliability for a tool that is required for so many critical activities.

Other facilities, such as our explosives research complex, also need replacing. This facility dates to the early days of the Cold War and provides critical scientific research into the fundamentals of energetic materials, supporting our warfighters, law enforcement, and commercial industry. However, the building is plagued by challenges, such as leaking roofs and a lack of heat in the winter and cooling in the summer.

These are just two examples of facilities that need modernization. There are instances, though, where we can take advantage of prior investments that have resulted in state-of-the art experimental capabilities. In a world of AI, verification and validation through experiments becomes even more valuable because experimental data is the raw material for training bespoke models. We are taking advantage of government investments in open science facilities by investing in new experimental capabilities at the Advanced Photon Source at Argonne National Laboratory, the Linac Coherent Light Source at Stanford, and the National Synchrotron Light Source II at Brookhaven National Laboratory. The ability to use these multi-billion-dollar facilities (rather than replicating them) helps us meet our mission needs in material evaluation and qualification and supports advancements in AI models.

Guarding Against Technological Surprise

In addition to the national labs' role in innovation, we must continue guarding against technological surprise. We know that AI will enable rapid technological development in ways that could bypass our strategic warning systems. Unlike the early days of the nuclear era where we could classify research and prevent the transfer of knowledge, we have reached a point where countries are advancing hardware and models despite actions we take. Given the pace of innovation, we should not be surprised at rapid advancements; however, in many cases, we only know about advancements because the developers wanted us to know.

For our country to know how adversaries may be using AI at scale, we must also be using the most recent frontier models. The US must be prepared to rapidly evaluate new technologies in classified settings and respond in short order. The best way to avoid surprise is to get there first.

In addition to leveraging an AI program established for our national security, the national laboratories can combine an AI effort with our unique infrastructures and experiences, acting as testbeds for national security and rapid countermeasure deployment.

Energy Dominance

The national labs have contributed to countless breakthroughs in energy production and stand poised to continue this tradition. One mission of Los Alamos is to help reduce the likelihood of nuclear weapons proliferation while supporting our national and economic security through the development of safeguards and proliferation-resistant nuclear energy technologies. We need to help expand technical options for US energy companies to compete domestically and globally and ensure that new technologies do not pose unwelcome proliferation concerns.

The same AI technologies used in the support of our nuclear deterrence mission can be used across the national laboratory complex to assist in addressing a host of energy

challenges. Our country needs to rapidly develop and approve new small modular reactor (SMR) designs, and we need better electrical-grid modeling to help properly site AI data centers. These challenges need to be solved to ensure American economic and national security dominance into the next century.

Protecting Space Access

As the need for all manner of satellites continues to increase, it is imperative that we maintain our edge in this arena. AI will be needed to accelerate our development of novel aerospace materials for flight vehicles, sensing and communications equipment, and to better project the errant flight paths of space debris. Los Alamos has been at the forefront of space technology since the first US satellite. We partner with the significant national security organizations in this area as well as with most of the private sector firms. Our goal is to assist in keeping the US in front of all competitors by supporting both the national security and commercial entities in this country. For example, we have already demonstrated the value of machine learning in forecasting space weather to mitigate the risks that solar activity poses to satellite communications.

Partnerships

Private industry in the US is outpacing the government in R&D investments. We must embrace the opportunities from AI created by industry to achieve national security objectives on much shorter timescales and potentially in more creative ways. This can only be done in partnership with US industry, as demonstrated at Los Alamos by our partnerships with OpenAI, Nvidia, and other US companies.

DOE and NNSA have unparalleled experience in these mission-driven public-private collaborations. Through the Exascale Computing Project (ECP), DOE worked with industry partners to co-design and develop critical components of the computing platforms that power today's leading Al models. Many of the key technologies being built into the massive AI training data centers were developed as part of the ECP.

This type of partnership is a win-win for our country. The government gets access to leading models while industry works with the laboratories to train their models on the best scientific data available in the world.

Offensive Footing

Much conversation over the past several years has focused on protecting access to technologies through export controls and to laboratories through greater entrance restrictions. As I learned over four years of work with National Academy of Science's Roundtable on Science, Technology, and Security (https://nap.nationalacademies.org/catalog/27976/national-science-technology-and-security-roundtable-capstone-proceedings-of-a), we must guard against efforts to

undermine our open research ecosystem. However, winning the competition for talent and ideas also demands efforts to increase the pace of our activities. We must double down on collaboration with allies who share our values and adhere to the norms of research to ensure we stay on the cutting edge in the fields of AI, nuclear power, materials, and space science.

Unfortunately, the "open science" international culture that we value and benefit from has been infected by countries that do not follow community standards and seek disproportionate advantages. We must continue to protect our work and technologies.

This does not mean that we should cut ourselves off from the rest of the world. Strict export controls and access requirements only slow our adversaries' technological advancements. In the end, these restrictions drive our adversaries to accelerate their own indigenous capabilities and technological advancements. Export controls and restrictions on access can be valuable tools to limit harms, but their ability to influence competition is strongly dependent on the degree to which we are in a position of technological leadership.

The delays created by restrictions may buy us months, but if we are not taking advantage of these months to accelerate our own advancements, it does not matter. If we are to lead the world in energy production and technology development for our economic and national security, the government must invest boldly in science. China's rapidly growing investments on science and technology does not distinguish between public and private or between military and civilian. This is leading to a shift in scientific leadership in the world. The Australian Strategic Policy Institute, which tracks research over 64 critical areas, recently showed that China now leads in 57 of the 64 areas—an increase from 3 areas in 2003–2007. The US, which led in 60 areas from 2003–2007, now only leads in 7. Should the US want to regain this leadership, the government must fund scientific research at the national labs in those areas where the end uses or timelines preclude private investments. The labs, in turn, should partner with industry and universities to leverage their advances and accelerate our pace of innovation.

We are facing a future with new and complex challenges. With decisive action and renewed commitment to leadership in science, we can help ensure a secure and prosperous America.

Thank you, Mr. Chairman, for the opportunity to present to the Committee today.