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Chairman Lummis, Ranking Member Swalwell, and members of the Committee: Thank you for the opportunity to appear before you today. It is an honor to provide this testimony on the U.S. Department of Energy (DOE) and its national laboratories.

INTRODUCTION

My name is Thomas E. Mason, and I am Director of Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee. I am also a member of the National Laboratory Directors Council (NLDC), an organization formed by the directors of the 17 DOE labs.

The NLDC seeks to promote advances in the DOE missions of science, energy, nuclear security, and environmental management; increase the effectiveness of DOE and its labs through collaboration and coordination on high-level, strategic issues and concerns of broad interest; and provide a forum for presenting the Secretary of Energy and DOE senior management with consensus views on matters that affect the labs and their ability to contribute to the DOE mission. While I am speaking today on my own behalf, my participation in the NLDC has enlarged my perspective on the lab system. That perspective informs my views on the topics that you are considering today.

Many of these topics have already been raised at NLDC meetings, and I want to thank the Information Technology and Innovation Foundation (ITIF), the Center for American Progress (CAP), and the Heritage Foundation for focusing attention on them and stimulating a broader discussion. As the authors of "Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy" point out, the national labs play an important role in innovation, competitiveness, and the national research and development (R&D) ecosystem. Improving the labs' ability to deliver on their mission assignments and produce useful innovations that ultimately benefit the U.S. economy is a key to realizing the maximum return on the federal investment in R&D.

OVERVIEW OF ORNL

I want to begin by describing ORNL and its missions in science, energy, and national security to provide some context for my remarks.

ORNL is DOE's largest science and energy laboratory, with an R&D portfolio that spans the range from fundamental science to demonstration and deployment of breakthrough technologies for clean energy and national security. Our mission explicitly includes both scientific discovery and innovation, so we place a high value on translational R&D—the coordination of our basic research and applied technology programs to accelerate the deployment of solutions to compelling problems.

Most of our R&D is supported by various components of DOE, including the Office of Science, the Office of Energy Efficiency and Renewable Energy (EERE), the Office of Nuclear Energy, and the National Nuclear Security Administration (NNSA). In any given year, however, 15–25% of our funding is supplied by other federal agencies, state and local governments, and private-sector customers. Our major federal Work for Others (WFO) customers include the U.S. Department of Defense, the U.S. Department of Homeland Security, the Nuclear Regulatory Commission, and the National Aeronautics and Space Administration (NASA).

Nonfederal sponsors represent only a small part of our WFO portfolio (just over 10% in fiscal year 2012), but we use a number of other mechanisms to work with industry. One of the most popular is the Cooperative R&D Agreement, or CRADA, which was established by the Federal Technology Transfer Act of 1986. A study released in January 2013 by the American Energy Innovation Council, titled "Unleashing Private-Sector Energy R&D," described CRADAs as one of the most important mechanisms available to industry for joint research projects with national labs.

ORNL is also one of the eight national labs piloting DOE's new Agreement to Commercialize Technology (ACT), an alternative to traditional WFO arrangements that is designed to make it easier for private companies to work with us. We expect this new mechanism to provide a more flexible framework for negotiation of intellectual property rights to facilitate moving technology from the labs to the marketplace.

User facility agreements provide industry with access to forefront scientific facilities, at ORNL and other laboratories, where both proprietary and nonproprietary research can be conducted by scientists and engineers from other DOE labs, universities, and industry. Oak Ridge is home to eight designated user facilities, including the world's most powerful source of pulsed neutrons for research, the Spallation Neutron Source; one of the world's most capable research reactors, the High Flux Isotope Reactor; one of five DOE Nanoscale Science Research Centers, the Center for Nanophase Materials Sciences; and what is now the second most powerful supercomputer in the world, a Cray XK7 called Titan, which is the flagship system at the Oak Ridge Leadership Computing Facility (OLCF).

One of the signature roles of the national labs is the design, construction, and operation of these distinctive facilities, and substantial value results from the co-location of these resources with one another and with research programs that both draw on them and drive their development. For example, ORNL has used both CRADAs and cost-share agreements supported by EERE to work with Caterpillar and Honeywell on a new cast stainless steel alloy, CF8C-Plus, that is already helping diesel engine manufacturers achieve goals for higher efficiency. Neutron scattering measurements of residual stresses in weld joints between alloy turbine wheels and steel shafts

have been made at the High Flux Isotope Reactor, setting the stage for improving design and manufacturing processes for vehicle turbochargers. We have also established an Industrial Partnerships Program to provide companies with access to the high-performance computing resources of the OLCF. These resources, developed by DOE's Office of Science to drive discovery science, are being leveraged by large and small companies to accelerate innovation in energy technologies, from new turbomachinery for carbon capture and sequestration to aerodynamic components for the trucking industry.

As I mentioned earlier, we place a high value on translational R&D at ORNL. In my view, this is something that national labs are particularly well positioned to achieve, not only because of the co-location of research facilities, but also because of the labs' ability to assemble and deploy multidisciplinary teams to focus on compelling problems, often using their research facilities to find solutions. This has not gone unnoticed by our competitors in the global innovation economy. At a recent meeting of the American Association for the Advancement of Science, I heard a talk by the director of the Institute of Policy and Management of the Chinese Academy of Sciences. When the speaker was asked to offer his impression of how China was doing in cultivating innovation compared to the United States, he said that he felt they were making progress in stimulating industry to be more innovative and beginning to build world-class universities, but they still had no equivalent of the national labs. They are, however, working to address this. I mentioned that ORNL's Titan is the world's second most powerful supercomputer. The number one machine is China's Tianhe-2, which is currently located in Changsha. China is making plans to move Tianhe-2 to Dongguan, where it is building a spallation neutron source. In addition, there is discussion on shifting a number of institutes of the Chinese Academy of Sciences to an area north of Beijing, where a new synchrotron will serve as the same kind of "anchor facility" that is a feature of most DOE labs.

RECOMMENDATIONS REGARDING POTENTIAL IMPROVEMENTS TO DOE-LAB RELATIONSHIP, MANAGEMENT PRACTICES, AND OVERSIGHT FUNCTIONS

The government-owned, contractor-operated (GOCO) model is the fundamental basis of the DOE-lab relationship, and I believe that it has served the nation well. It was adopted by the Atomic Energy Commission in the early days of the national lab system, and its intent is neatly captured by a clause found in some early management and operation (M&O) contracts: "It is the intent of the Commission and the Contractor that this agreement shall be carried on in a spirit of partnership and friendly cooperation with a maximum of effort and common sense in achieving their common objectives."

The flexibility of the GOCO model has supported the evolution of the national lab system in response to changing national priorities and concerns. To give a recent example, a couple of years ago we launched an effort at ORNL to position the lab for a period of increasing budget pressure. This effort included a major workforce restructuring plan that eliminated 440 positions, a sweeping redesign of our employee benefits package, and a series of projects to streamline our operations. As a result, we were able to reduce our overhead rates by approximately 7% at the start of fiscal year 2013. Our ability to take this kind of action is due to the flexibility provided by the GOCO model, and to the "spirit of partnership and friendly cooperation" that is a key element of our relationship with DOE's ORNL Site Office.

That being said, the report from the ITIF/CAP/Heritage Foundation working group is correct in stating that a number of opportunities exist for updating and improving the GOCO model.

RESPONSE TO "TURNING THE PAGE" RECOMMENDATIONS

The working group's report presents a set of recommendations that are generally well thought out, and I look forward to exploring their implementation. My response is organized to align with the three major categories in the executive summary of "Turning the Page."

Transforming lab management from DOE micromanagement to contractor accountability

As a lab director, I am naturally interested in the recommendations on transforming lab management. I believe that work over the past several years to build robust contractor assurance systems lays a solid foundation for a new look at lab stewardship, and a wide-ranging discussion of how best to improve lab effectiveness and accountability by focusing on outcomes would certainly be valuable.

Unifying lab stewardship, funding, and management stovepipes with innovation goals

The working group's proposals for unifying lab stewardship, funding, and management stovepipes with innovation goals highlight the importance of a clearly aligned organizational structure. In fact, Energy Secretary Ernest Moniz has already made a commitment to integrating the Department's science and energy missions to move more easily from basic research through technology demonstration. I believe the recommendation to bring the R&D programs managed by the Office of Science and the energy offices under one under secretary merits serious consideration. Implementation of this recommendation would recognize that fundamental science and applied technology are conducted on a continuum that is not well served by artificial distinctions. Substantial integration between basic and applied programs already occurs at the lab level, and this could be further enhanced by drawing on models such as the Energy Innovation Hubs, which, in our experience, are well suited to the national lab environment and foster strong and valuable connections between labs, universities, and industry. In addition, this restructuring should facilitate the extension of some of the best practices in contract management, laboratory planning, and program management developed by the Office of Science to the energy programs.

As the working group's report points out, laboratory-directed R&D (LDRD) is a critical tool for driving innovation. Additional flexibility in the use of LDRD funds could help the labs in moving innovations toward eventual deployment. Under DOE's current interpretation of its directive on LDRD, however, the use of these funds for technology maturation is prohibited. As a result, the only funds available for technology maturation are royalties from previously licensed inventions. It is notable that the number of invention disclosures and patents from LDRD projects is disproportionately larger than that from programmatically supported projects; in fiscal year 2013 to date, LDRD projects at ORNL, which are funded at the level of less than 3% of the overall lab budget, are the source of 13% of our invention disclosures.

The working group also recommends removal of the 8% cap on LDRD funds. For ORNL and most of the labs under this Committee's jurisdiction, the cap on LDRD is not a concern; the

funds come from our overhead budget, which must support a number of other key functions, and this limits our investment. At the NNSA labs, where LDRD is an even more significant component of their open research portfolio, there are concerns about moves to further limit LDRD expenditures.

Moving technology to market with better incentives and more flexibility

My comments on the summary recommendations on "moving technology to market with better incentives and more flexibility" are as follows.

- **Expand ACT agreements.** Implementation of this recommendation would offer the labs a more customizable tool for work with a variety of industries; it would also provide a pathway to flexible pricing for proprietary use of user facilities and special capabilities and might well be the best way to accomplish this.
- **Allow labs to use flexible pricing for user facilities and special capabilities.** As noted above, this recommendation could be addressed through expansion of ACT.
- **Allow labs autonomy in nonfederal funding-partnership agreements.** Because a WFO agreement is effectively a modification of a lab's M&O contract, it is probably not realistic to eliminate DOE approval of such agreements. It should, however, be possible to streamline the WFO approval process by having DOE approve broad areas of potential engagement as appropriate scope for each lab. Labs could then manage within that scope, making use of the form of agreement that best suited a new partner's needs, and present any proposed WFO outside that scope to DOE for consideration. This approach could be used for both federally funded and nonfederal WFO.
- **Add weight to technology transfer in the expanded Performance Evaluation and Measurement Plan (PEMP) process.** For those labs whose R&D portfolios intersect the commercial world, implementation of this recommendation would increase emphasis on technology transfer, particularly if the labs also receive more flexibility in establishing and executing a variety of partnerships. Appropriate metrics would need to be developed to ensure that credit is given for a variety of forms of industry engagement (not just licensing deals and revenue). In addition, a note of caution is warranted here: as Sherwood Fawcett, then chairman of the Battelle Board of Trustees, remarked in testimony before the House Committee on Science and Technology in May 1985, "In general, the process of commercializing intellectual property is very complex, highly risky, takes a long time, costs much more than you think it will, and usually fails." Care must be taken to properly account for the high failure rate of any new technology venture in establishing technology transfer metrics.
- **Execute consistent guidelines on conflicts of interest.** Many labs have already taken action to address concerns about conflicts of interest as they work to establish appropriate mechanisms for fostering an entrepreneurial culture and developing productive industry collaborations. For example, ORNL employees are encouraged to be entrepreneurial, but our policy is that outside activities to be undertaken by a research staff member must be reviewed by the Office of General Counsel and a Research Conflict of Interest Advisory Council, and then approved by the Deputy Director for Science and Technology. A reaffirmation of the value of entrepreneurial activities by Congress and the Secretary of Energy would send a strong signal to the Department and the national labs in support of these activities.

CLOSING REMARKS

The working group's goal of ensuring that the national labs remain effective and continue to deliver national benefits to the taxpayers is one that we all share. The public funding that comes to the labs is based on the promise of a return to society in the form of discovery and innovation leading to clean and affordable energy, improved standards of living, a more secure future, and a vibrant economy. This promise is fully realized when the science and technology developed at the labs makes its way into the commercial world.

Our work to realize this promise means that rather than "largely running on autopilot," as suggested in "Turning the Page," DOE and its labs have already made substantial changes designed to accelerate the development and deployment of innovation to the marketplace. Most recently, Energy Secretary Ernest Moniz has stated his commitment to improving the management and performance of the Department—a commitment that, as I mentioned, includes plans to more closely integrate DOE's science and energy programs to drive the innovation process.

That being said, greater efficiency in transferring national lab discoveries and innovations to the market would strengthen the case for the investment of taxpayer funds in the national labs, and I welcome the opportunity to participate in the broad discussion of how best to move forward in attaining it.

Thank you again for the opportunity to testify. I welcome your questions on this important topic.