Testimony of Dr. Charles F. McMillan
Laboratory Director
Los Alamos National Laboratory
Before the
House Armed Services Committee
Subcommittee on Strategic Forces
September 7, 2016

Chairman Rogers, Ranking Member Cooper, and members of the Subcommittee, thank you for inviting me to testify today. I am Dr. Charles McMillan, Director of Los Alamos National Laboratory. I am pleased to have the opportunity to discuss with the Subcommittee the status of the nation's nuclear weapons infrastructure.

The United States recently celebrated the 20-year anniversary of Stockpile Stewardship. The Stockpile Stewardship Program (SSP) has so far allowed the National Nuclear Security Administration's (NNSA) national security science laboratories to certify that our stockpile is safe, secure, and effective without a return to underground nuclear testing. This endeavor would not have been successful without the strong support for significant investments in infrastructure—both scientific and manufacturing—from this Subcommittee, Congress in general, and past and present Administrations. The SSP required construction of new supercomputers and experimental facilities such as the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT), the National Ignition Facility (NIF), and the Microsystems and Engineering Sciences Applications facility (MESA). These investments have helped the United States assure its allies and deter its adversaries by enabling successful certification of the nuclear stockpile.

As I have mentioned in past appearances before Congress, infrastructure is the backbone upon which this country's nuclear weapons enterprise is built. Many of the key elements of today's nuclear weapons mission infrastructure were designed and constructed during the Cold War. In a letter to Senate Armed Services on April 10, 2015, I stated that if our nation wishes to maintain its current leadership role in a rapidly changing world, investments in facilities and infrastructure must continue. I understand that nuclear weapons policy makers here are actively trying to maintain our nuclear capability against a strategic backdrop where many other nations are pursuing nuclear weapons modernization efforts.

Over the years, the NNSA, its laboratories, and production plants have been able to successfully execute upgrades to many of our existing facilities. Our track record, however, of building large replacement facilities has been challenging. Construction of large "Big Box," high-hazard, high-security nuclear facilities has become an extremely expensive and protracted proposition during the last 25 years. For example, Los Alamos has been trying to replace the mission capabilities of the 64-year-old Chemistry and Metallurgy Research (CMR) facility since the late 1980s. We are making some progress, but challenges remain. The last high-hazard plutonium processing facility, the Los Alamos Plutonium Processing Facility (PF-4), that was successfully brought online was constructed 38 years ago.

As a result of our difficulties in bringing new facilities online in a timely manner, we must continue to operate existing facilities longer than anticipated, while continuing to maintain these old facilities in a way that does not place our workers, the public, or our mission at unacceptable risk. This challenge is amplified as stockpile modernization efforts increase and budget and regulatory pressures mount. The laboratories and plants are regularly evaluating their infrastructure to balance current and future needs.

Because infrastructure funding is finite, I believe it is imperative that upgrades be undertaken with a very sharp focus on economically meeting mission need. Nuclear and radiological infrastructure by definition is going to be very expensive to design, construct, and maintain. Our job is not only to help the Government build what it needs to advance the mission, but also to provide the flexible space that can evolve with mission requirements. This can help reduce future costs for infrastructure maintenance and ultimately disposition.

In this testimony, I am going to talk about where we have been, where we are today, and where I believe we need to go with the infrastructure of our nation's nuclear enterprise.

Where we have been:
The facilities in our nuclear weapons enterprise can be binned into four categories based on hazards:

- Nuclear materials,
- Explosives and components,
- R&D/computing, and
- Light laboratory and office space.

Each category is a part of the system architecture that supports the national security missions of the laboratories and plants as well as the people required to successfully accomplish those missions.

Past facilities were often quickly acquired in the Cold War era, when funding was less constrained and the regulatory environment was less complex, resulting in relatively rapid acquisitions of facilities. The emphasis at the time was on the utility of the infrastructure being acquired and, as a consequence, many of these facilities now have difficulty meeting today's safety and security standards without frequent and expensive upgrades. Over the years, we have been able to use significant recapitalization funding to bring some of these facilities closer to current safety and security standards. Despite these investments, some of these same facilities are nearing the end of their useful lifespans; it will become more expensive to maintain and upgrade them rather than replace them.

It's important to note that the past now includes the very successful implementation of the tools of SSP. These technologically complex, one-of-a-kind facilities were not easy to bring online and, as the Subcommittee knows, they experienced challenges along the way. As an overall enterprise, we have seen successes: DARHT, NIF, MESA, and the subcritical

experiments at U1a. These tools and experiments have become integral to SSP, and the stewardship program has advanced substantially as a result of these capabilities.

Where we are today:
We have made progress on modernizing the infrastructure around the NNSA Enterprise. Modernization activities have commenced, based on the strong funding support from both the Congress and the Administration, in the areas of plutonium science and manufacturing, uranium science and manufacturing, supercomputing, and waste management. Each of these areas is key to ensuring the safety, reliability, and effectiveness of our nuclear deterrent.

Specific examples of modernization successes at Los Alamos include progress on our Plutonium Strategy—which entails further utilization of existing facilities, and designing smaller, incremental facilities to handle our required Plutonium operations—and in the areas of supercomputing and our production mission. I will address these areas below.

The Plutonium Strategy is an informative example, as it traces the evolution of thinking in recent years toward facility acquisition. This evolution started when the Laboratory faced a need to replace our aging Chemistry and Metallurgy Research (CMR) facility, originally constructed in 1952. The CMR facility provides capabilities to meet the high volume of analytical chemistry and materials characterization necessary to support plutonium-related missions, including pit manufacturing. The current CMR facility is scheduled to cease programmatic operations in 2019 due to age, programmatic limitations, and seismic issues.

As this Subcommittee knows well, the Congress and NNSA had initially planned to execute the CMR Replacement (CMRR) as a "Big-Box" facility. CMRR originally included the Nuclear Facility (NF), a Radiological Laboratory Utility Office Building (RLUOB), and equipment to outfit the facilities that could meet all the needs of the Enterprise. In 2012, the CMR Replacement Nuclear Facility (CMRR-NF) was deferred after the RLUOB structure was completed. The length of time it took to get the NF from planning to design, numerous changes to mission-space requirements, and continual increases to safety and security requirements drove significant, and ultimately unattainable, cost increases that resulted in a completely different approach to providing the required mission capabilities.

Realizing that attempts to put all necessary capabilities under one roof would have created a difficult path to success, Los Alamos staff and our NNSA partners developed a new strategy to phase in capabilities and adopted a modular approach to acquiring new infrastructure. The benefit to this approach is that it brings on capabilities closer to the time when they are needed. This modular approach also attempts to keep budget profiles reasonable and somewhat predictable. Consequently, a similar strategy is now being employed at other sites around the Enterprise.

That different approach is what we refer to today as the Plutonium Strategy. In the years since it was first proposed, we have made progress toward:

- Further outfitting the new RLUOB (Phase 1)
- Repurposing parts of the TA-55 Plutonium Facility with capabilities that we cannot put in the Radiological Laboratory (Phase 2)
- We have also started very early planning on modules that will connect our Plutonium infrastructure together and provide for extended life for the 38-year-old PF-4 Facility (Phase 3)

Although concerns remain around the future funding for elements of the Plutonium manufacturing capability, we are optimistic that continued engagement with NNSA and the Congress will deliver long-term solutions.

I also want to specifically mention some good news as it relates to our Plutonium capability. I am very pleased to report that we have successfully restarted more than 95% of all operations in PF-4 and completed the first pit production development unit in more than three years. Additionally, NNSA and Los Alamos have had early successes on the Plutonium Strategy by expediting and efficiently executing projects through effective application of provisions in DOE Order 413.3. These NNSA Critical Decision approvals allow for undertaking long-lead procurements and preparatory construction work early on in order to benefit the overall cost and schedule. Some of these successes stem from the lessons learned in getting the RLUOB operational from a cost, schedule, construction, and commissioning standpoint. I am also proud of this project because it is now a large-scale operating radiological facility that provides a demonstration test bed for how to scale up to our next high-hazard nuclear facility project.

We have also had success in reducing the overall footprint of legacy facilities. In particular, we are nearing completion on the demolition of two Cold War-era nuclear materials bunkers.

Supercomputing, which plays a large role in the annual nuclear weapons certification process, is another critical area for the Enterprise where we have made progress. Procuring, installing, and operating both capability and capacity supercomputing systems has been, and continues to be, a real positive in our infrastructure upgrading process. NNSA and the DOE Office of Science, I believe, have emerged as world leaders in bringing these complex machines online in a timely and cost-effective manner.

Because so much of the stockpile responsibility resides with Los Alamos, it is vitally important that our weapons designers have priority access to world-class capability and capacity supercomputing to continue assessment of our aging weapons systems and our life-extended weapons that are returning to active deployment. I would like to note the important partnership we have formed with Sandia National Laboratories to jointly develop the supercomputer assets at Los Alamos. This combined expertise is a solid

collaborative example of bringing two world leaders in supercomputing together for the benefit of national security.

We also have seen success at Los Alamos in NNSA efforts to recapitalize our production capabilities in Radioisotope Thermoelectric Generators (RTGs) and detonators. The RTG Assembly and Test Facility (RTG-ATF) re-established the capability to manufacture defense-related Radioisotope Thermoelectric Generators (RTGs), which had been lost since the closure of the Pinellas Plant in Florida. The RTG-ATF is a positive model for how facility re-purposing and new program design can be accomplished quickly and effectively. For approximately $22M total project cost, LANL re-established the capability to manufacture RTGs and produced its first RTGs using Pu238 heat sources in July 2015, twelve months ahead of schedule.

Los Alamos is the NNSA's production agency for Detonator Cable Assembly (DCA) manufacturing and surveillance. The DCA production requirements increased significantly in FY15 and are planned to increase fourfold through 2021. NNSA provided approximately $12M in additional defense programs funding in FY15, which LANL invested in facilities, process equipment, and technology upgrades. This investment is paying off: the latest production lot for the W76 LEP DCA saw a doubling of yield rates, a 50% reduction in total cycle time, and zero ergonomic injuries when compared to the previous production run.

Along with the successes noted above, there have also been continuing challenges. Construction of specialty nuclear facilities is not getting any easier from the standpoint of estimating, scheduling, project management, and actual work execution. LANL has recently realized issues with our TA-55 Reinvestment Project Phase II (TRP II) that may impact our project completion deadlines. LANL is currently working closely with the government and its parent companies to identify resources to move forward with a timely recovery plan for this project.

In addition to TRP-II, Los Alamos is also in the midst of a number of other line item construction projects, many of which are focused on waste handling. Though not necessarily glamorous, radioactive material and waste handling and processing require an effective support infrastructure, which is also expensive to build and maintain, but is vital to overall mission operations. We are diligently working to complete facilities focused on transuranic waste processing, and transuranic and low-level radioactive liquid waste handling.

Although I am pleased to report on our many successes, it is true at Los Alamos and across the NNSA Enterprise that many of the stewards of our stockpile continue to operate in buildings that are coming to the end of their useful lifespans. Each year that we continue to operate them, we either add to the list of deferred maintenance or are required to invest significant dollars into maintenance and upgrades. Despite maintenance, some of these facilities will inevitably become obsolete and fail. To use an imperfect analogy, these buildings are like older vehicles—though we continue to invest in repairs and maintenance, at some point the risk of failure will outweigh the economics and wisdom of such noble efforts. One of the things that keeps me up at night is the realization that essential

capabilities are held at risk by the possibility of such failures; in many cases, our enterprise has a single point of failure.

When we think about modernizing our nuclear weapons infrastructure, we predominantly focus on large projects like CMRR, the Uranium Processing Facility (UPF), or the new Kansas City Plant. It is sometimes forgotten that we will need to replace many other lower-profile but essential facilities that date back nearly to the Cold-War era. As I stated in a letter to Senate Armed Services Committee earlier this year, our nation has critical needs to replace aging facilities where we do research, development, and testing of high explosives (HE). These HE facilities were not designed to meet the safety and security standards of the 1990's, let alone current and future standards. As these facilities continue to age, I believe that the risk of failure is beginning to outweigh the economics of maintenance.

Where we need to go:
As we look to the future, I believe we must look across the full range of facility needs to ensure that the NNSA is able to deliver on its essential mission in a way that is safe, secure, and effective.

For smaller, lower-hazard acquisitions (such as light laboratory and office space), innovative acquisition processes can be enhanced and streamlined. I believe there are opportunities for the Enterprise in terms of how we handle General Plant Projects, third-party financing (TPF) arrangements, and public/private partnerships. The recently announced Administrative Support Complex (ASC) at Pantex is a precedent that illustrates effective use of third-party financing. I agree with the statement NNSA Administrator Klotz made at the Pantex ASC groundbreaking. He said that maintaining "the safety, security, and effectiveness of the nuclear weapons stockpile is critical to America's security," and that our workers "deserve a safe, functional, and adaptive workspace to carry out that mission." I believe that the NNSA laboratories could greatly benefit from the flexibility associated with using TPF and we are closely examining the successful approach taken by Pantex as our model going forward.

In your invitation letter, Mr. Chairman, you asked for suggestions on how we could improve our infrastructure position. The laboratories currently have the ability to use General Plant Projects (GPP) to undertake certain types of infrastructure projects under $10 million. Working closely with the NNSA site offices, the laboratories can use this limited authority to replace seriously dilapidated spaces. Today, we are using the $10 million authority we have to rehabilitate and repurpose existing structures. This strategy has allowed us to eliminate a significant number of old transportables that used to house technical staff. However, GPP funding limits have not changed since 2009. If the purchasing level were raised and indexed to keep up with inflation, we could make significant strides toward reducing deferred maintenance and creating quality workspace.

We are also actively exploring use of prefabricated buildings to create office space, light laboratory facilities, computing space, and even secure vault activities. These prefab buildings are well known in the commercial world and offer significant benefits in the areas of time, schedule, and cost.

The laboratories have opportunities for innovative public-private partnerships. In fact, several entities around Los Alamos are looking to develop light laboratory space adjoining the Laboratory. In partnership with our NNSA Site Office, we are looking to lease part of a new scientific building from private developers on terms that are favorable to the Laboratory and the Government.

The Los Alamos and Y-12 approaches toward smaller, less complicated nuclear acquisitions are a step in the right direction, but we must go further if we want to be responsive with major infrastructure projects. As a nation, we need to ensure that we are finding the right balance between risk and cost. With regard to projects, all relevant parties need to reach agreement on explicit programmatic and health and safety requirements early in the process. Furthermore, it is imperative that we adhere to these requirements rigorously throughout completion of these projects unless there is an extremely compelling reason to alter the requirements.

Closing:
In closing, I want to remind the members of the Subcommittee that all of our laboratories are currently hiring to replace the bright minds that served the nation so well through the Cold War and the first decades of Stewardship. As we hire the workforce of 2030, we need to wisely and prudently invest in our core infrastructure, as well as vibrant R&D capabilities that enable production, experiments, and computing to ensure that the next generation of Laboratory scientists, engineers, and technologists are able to successfully execute the mission. We cannot assume to know where budgets will go over time, but we must nevertheless invest in infrastructure that is worthy of the next generation of national laboratory scientists, engineers, and technologists.

Thank you Mr. Chairman for the opportunity to testify today. I would be happy to answer any questions.