2014 NUCLEAR DETERRENCE SUMMIT PROCEEDINGS

Ensuring a Viable Future for the Weapons Laboratories: Overcoming Management, Funding, and Policy Challenges

Dr. Paul Hommert, Director
Sandia National Laboratories

Good afternoon, ladies and gentlemen,

Thank you, Kennette Benedict, for the introduction. Welcome everybody. Before I begin my remarks, I also want to thank Ed Helminski and his team for continuing to host this conference, which I think has been increasingly interesting every year. It has also provided a good opportunity for some of us in the somewhat narrow world of the nuclear enterprise to talk from different dimensions.

I'm going to expand on the topic of ensuring a viable future for the weapons laboratories by giving you my sense of some of the dynamics that we experience in the current environment. We shouldn't forget an issue that has been touched upon to some extent today and yesterday—this is the deterrence business, and the geopolitical environment is quite complex. My colleagues from Los Alamos and Lawrence Livermore hosted an event a few weeks ago, *Strategic Weapons in the 21st Century,* which offered a very good chance to see the international complexity as we have moved from a bilateral nuclear weapons environment during the Cold War to a multilateral nuclear weapons environment in the world of today. A subcomponent of that international complexity is, of course, the role of the U.S. deterrent from an extended deterrence standpoint, and today the word "extended" carries increased complexity for the concept of deterrence relative to the past. While deterrence and the geopolitical environment, along with the debate swirling around them, are policy issues and my area is not policy, they affect the realities within which my Laboratory has to operate. And I believe that the debate on those issues will continue, as it should, because our world is very complex.

In addition, we operate within a constraining fiscal environment. We understand that reality, and I'll talk more about its impact on us in a moment. For now, let me just give you a point of reference: Considered in constant dollars, my FY14 budget in the weapons program, which many would say is large, is actually less than my Laboratory's weapons budget in 2005 when we were in the midst of executing the W76 life extension program (LEP). Today, Sandia is engaged in three Phase 3

(full-scale engineering development stage) modernization programs simultaneously; we were working on one such program in 2005. Simply put, that is a fact. Today, we have to find a way to operate in a constrained budget environment. But 2005 was not that long ago. Inside the budget process, which we experienced quite a bit in the fall, lie the complexities of the congressional budget process itself. As an example, in less than two years that we've been working on Phase 3 of the B61 LEP, there have been three different events related to the congressional budget process that have caused us to de-staff and re-staff the program. Of course, this is not ideally the way you'd run a program; yet again, we appreciate the challenges that can face us, and we adapt. And the final thing I would want to highlight is that we are faced with an undeniable reality: The weapons are aging. It is often hard to talk about that topic in great detail, and the landscape is complex, but we should not think that devices that were put out in the 70s and 80s are going to be in the same condition in 2030. And to a certain extent, that reality forces our hand on modernization.

When you pull all this information together, you will know that the national security laboratories are operating within a fairly complex and dynamic environment. In this context, it doesn't surprise me to observe a fair amount of confusion about the program. One of my favorite examples of confusion refers to the cost of the program. I've heard of many different numbers floating out there, and I cannot help being amazed. I know what the cost is. The NNSA overall cost for the program is $7.1B (not including management reserve), and within that amount, Sandia's share of the incremental cost is $2.65B to execute the B61 LEP over 11 years. Sandia's cost has not changed since the day we submitted the cost estimate, but I will say more about the B61 LEP later.

So, given the environment just described, how are we ensuring that we can deliver the mission today and, even more important, that we can deliver it tomorrow? I must know that I have the staff and the overall capability to deliver in 2030 and 2035 because the decisions we make now influence the future as well. Since 2011, we have been operating with a *Strategic Plan* for moving the Laboratory forward. The plan has five basic elements on which I will touch briefly next.
The first element is a recognition that, since 2011, we have known that we would have to do three modernization programs simultaneously. That was, of course, a steep road to climb.

We had to prepare the institution for that task and all its many different components. The task involved leadership changes. It involved collocation of our staff. It involved a heavy reliance on the tools of stewardship, which had to play their significant part after many years of having been developed. It involved a necessary, yet difficult, upgrading of our overall program management skills. The B61 will soon be fully managed under the Earned Value Management System (EVMS),

which is new for us. EVMS is a way of quantitatively measuring where one is in project execution regarding schedule and cost. With EVMS, we can tailor assessments to look at cost and schedule performance indicators on a monthly basis, and we can make immediate, early changes if necessary, applying more or fewer resources to each particular element of the project, as required. Furthermore, we relied a lot on parent reach-back to help us with those kinds of things. We had to probe our quality system. We had to learn how to work more effectively and strategically with our supply base and, important in our case, with the Kansas City Plant. All these elements had to reach a whole new level of achievement if we were going to be able to deliver on the work scope that we're doing right now.

Obviously, the real value of what we do must be judged by final overall results, and we've got a lot of work yet before us. But I feel that we are already able to see encouraging results. You know, sometimes I think people don't appreciate this, but with the B61 LEP, we are now about 75% complete on design. We are going to fly that bomb in a little over a year now. Of course, everything is not quite there yet since we are at the end of the first development build. But that flight test is only a little over a year away. And we are on schedule and on cost adjusted to the appropriated budgets we have received from Congress. And the effort has been significant.

By late fiscal year 2015, we'll be at a 95% design point on the B61, and we will continue with a heavy emphasis on qualification in fiscal years 2016 and 2017. And I would also say that, as we learn more about design, we expect to be able to eliminate some of the follow-on tests on subsequent development builds on the B61 and thus provide margin to the cost expectations. I will wrap up my remarks on the first element of our guiding *Strategic Plan* by saying that we feel we have moved the institution to where it needs to be so that we can execute the life extension programs with which the nation has entrusted us.

The second element of our *Strategic Plan*, and I must add that all five elements are interrelated, is that we recognize the need to evaluate and attack cost and operational performance very aggressively. Indeed, I've heard a lot of people here talk about indirect costs and related topics. We are dealing with pension liabilities, health care costs, oversight model, and other issues which, if not actively managed, would cause us to have an unsustainable position. I will not take the time to discuss those components today, but we've spent considerable effort on them since they drive our indirect cost base. And I'm often told that it's complicated to talk about indirect costs, that they are opaque. But let me share with you that I have a simple metric to answer the question, "What does a design engineer working on a weapons program or working on another program cost the

institution?" And I'll just give you some numbers as a backdrop. On average, we've given our workforce a yearly raise of approximately 2% or 2.5%. So, our increase in labor costs from fiscal year 2011 to 2012 was 2.9%; from 2012 to 2013, 1.7%, which is a value below the raise percentage; and from 2013 to 2014, 1.2%, which is, once again, below the raise percentage and less than the year before. These observations tell me that, as opaque as all indirect costs might be, we must be doing something that's bending that cost curve down. We will continue to have that pressure, and we look at indirect costs very regularly.

The next element of our *Strategic Plan* is very important to us internally, but I will not spend a lot of time on it today. I'm referring to our focus on the practice of engineering at the Laboratory. We have a reputation as an engineering laboratory, and I believe it is well deserved. That reputation speaks to the work of my professional R&D staff. But quite frankly, at times we weren't as good as we could have been. And so, we have worked toward ensuring a common engineering environment with expectations clearly defined. Let me give a simple example. When new engineers come into the Laboratory, they may be expected to work on something for the Department of Defense one day, and the next day they might be working on the weapons program. Are these people going to use different tool sets for the different engineering jobs? Do the programs on which they work have different quality expectations? We were faced with many of the problems suggested by these questions. The issue ultimately is that hidden costs are involved to enable those people to move from one part of the Laboratory to another. That's why we have developed common tool sets and spelled out the necessary experience and the expectations of doing engineering at the Laboratory.

The fourth element of our guiding *Strategic Plan* is very important to the long-term future of our institution. We did a lot of work in the last couple of years to understand our mission space and the relationship among our mission areas because, as some of you know, my Laboratory is very diverse as are, indeed, my colleagues' laboratories. Our activities are roughly 50% for the weapons program and 50% for the Department of Defense and other customers. We needed to understand these facts strategically to be able to staff the institution appropriately, as I will discuss in a moment.

So, we invested a lot of effort into what we call understanding our foundational capabilities. We have defined nine key capabilities, but I will mention only a few of them: high-reliability engineering; micro and nano electronics and systems; safety, risk, and vulnerability analysis; cyber technology; and the ability to do reverse engineering. In this effort of deciding on our key capabilities, we developed a sense of knowing which ones should be shepherded as we go forward. That kind of focus was very important to us.

Then we backed from that activity to take a look at the mission areas we are working. If we concluded that we were working in a mission area that did not reinforce and pull on our key capabilities, then we knew that we could deemphasize that area in the portfolio of the Laboratory. In the end, we centered on five key mission areas. The first one is, obviously, nuclear weapons. Then comes reducing global nuclear dangers, the work we do in nonproliferation, treaty monitoring, and securing nuclear facilities. The next area is one we call nuclear assessment and warning, which refers to the work we do in the non-cooperative world of nuclear weapons. Cyberspace is another area. Finally, an extremely important area is one we call synergistic defense products, which refers to a set of products we work on for the Department of Defense; those products are very similar to the products for the nuclear weapons program. Radar would be a classic example in this regard.

Furthermore, we have three additional mission areas that we view as leveraging foundation in a different way, which is not as directly tied to our nuclear weapons mission area. I will not spend a lot of time going through those areas. But I want to emphasize again that we needed clarity in our own minds on how to ensure that we are fully focused on the demands for delivering the foundational nuclear weapons mission.

The fifth element in our plan is, indeed, the most important one for us, namely, our people. To execute the demanding modernization programs with which the nation has entrusted us, we knew we would have to attract and retain new staff, the future stewards of our stockpile. So, let me just give you some numbers. Since fiscal year 2010, we hired 423 PhDs and 528 Masters in the advanced degree science and engineering fields—typically for us, two-thirds engineering and one-third science degrees. They have an average undergraduate GPA of 3.65. Fifty-seven percent of those individuals are early career, meaning that they have been roughly less than three years out of school or, perhaps, out of postdoctoral work. Working at Sandia might be their first professional experience. And the remaining 43% of the new hires have an experience of greater than 5 years. I personally didn't think we could climb that staffing hill as effectively as we have done so. I feel pretty good about the new generation of hires, but they have a different social contract. They do not have a defined benefit pension plan anymore. They are encountering an operational environment of a complexity that they might not have anticipated, and this thought ties back to previous discussions regarding the NNSA and oversight models. Yet they are fundamentally attracted to the Laboratory by the nature of our work. I have to say that we've used the Laboratory Directed Research and Development (LDRD) program, and I know that, at Los Alamos, Charlie McMillan has done the same very effectively. We've used LDRD as a critical element, particularly in Ph.D. recruiting. Without the LDRD, we

would not have attracted some of the talent that we've been able to bring into the Laboratory. And what I've been saying may sound like a lot of hiring. I can tell you that, in the same period, that is, since fiscal year 2010, the overall size of Sandia grew by only about 2.5%. We have tried to keep the Lab size stable, and that was possible by knowing how to shift personnel among the mission areas that I referred to a minute ago.

We continue to monitor the five elements of the *Strategic Plan* that I have just finished describing to you. They are about changing the state of the Laboratory and moving it into the future. Obviously, on a day-to-day basis, we have to deliver on every program commitment we've made, on its cost and on its schedule, and on its quality expectations.

The one area that I haven't yet talked about and I wish to mention is the complexity of our operations. Although our operations are not dominated by nuclear operations, as they are for my colleagues from Los Alamos and Lawrence Livermore, they still have quite a range. And I can tell you that we still have more progress to make on the safety culture of our institution although we have been much focused on it. I believe that, as far as safety is concerned, we are still not where we need to be. If one were to consider the lagging indicators, we look very good. Days away case rates and similar metrics look very good for us, but we still have more progress to make about ensuring that some significant events do not occur. Indeed, safety is an area needing a cultural evolution at institutions like ours. Rest assured that, as far as Sandia is concerned, safety is an evolving area of improvement on which we are focused.

So, let me wrap up my remarks by talking about the challenge of the future. For my institution—and I think, in some way, for our three laboratories—I have a concern that the weapons program is a little out of balance right now. Let me give you a feel for that. I have 700 people working on the B61 life extension today. And I have less than ten people, I will repeat, less than ten people doing advanced and exploratory work. Now, all this is not as bad as it sounds because, in our other mission areas, we are doing a wide range of innovative work, which we pull back into the weapons program. Radio-frequency integrated circuits and radiation-hardened electronics are examples of such innovative work, which receives our careful attention. However, having said all that, less than ten people doing advanced and exploratory work is not a good thing. All right, so I'm not complaining about this situation, and in fact, I'm not even surprised by it in some sense, given the pressure on my institution to execute the life extension programs. But this lack of balance cannot continue for too long before it should be restored. And whether the work is advanced or exploratory, keeping a balanced program is a very substantial challenge to us, considering the budget

limitations and the entire scope of the work. And I think that all of us recognize that challenge and try to work through it as best we can.

I just hope that I have given you a quick sense of what has been in our focus. With that, I'm concluding my remarks. Thank you for your attention.