

# LA-UR-13-21748

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Title: Nuclear Deterrence Summit

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Intended for: Nuclear Deterrence Summit, 2013-02-21 (Washington, District Of  
Columbia, United States)  
Web



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## 2013 Nuclear Deterrence Summit

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

Dr. Charles F. McMillan, Director  
Los Alamos National Laboratory

Good afternoon and thank you for inviting me, and my two distinguished colleagues, to discuss these important topics. My assigned topic is to address the Challenges the National Security Laboratories face today and into the future. From my perspective, there are three principal challenges, Pace, Programs and Priorities. In particular I'm talking about:

- **Pace** of change for the nuclear enterprise and the environment for deterrence
- Our nuclear weapons **Programs** primarily the Life Extension Programs and the capabilities we must have for the future
- Setting our **Priorities** in a time of extreme fiscal constraint

#### **Pace of Change**

I'll begin with change. As I see it, change is occurring in three important flavors that affect deterrence.

- Changes that nature is making
- Changes in technology and
- Changes in the geopolitical situation.

I am concerned that the time scales for our responses may be long when compared to the pace of these changes.

Let me take each in turn. First, changes **nature** is making on our behalf – whether we like it or not. Over the last decade, much has been made of the changes in plutonium. Plutonium is changing, if for no other reason than radioactive decay. Our studies on a subset of the types of Pu used in the stockpile have indicated that at this point we face no serious problems with Pu. As we consider reusing pits for many more decades, prudence requires ongoing study of these changes – the bar for certification is a high one – we must do the work necessary to clear it.

Given all the discussion about Pu, one might be tempted to think that is the only thing we see aging in the stockpile. It is not. I have taken part in the annual assessment process since we started doing them. As I have watched the changes occurring in these systems that have nothing to do with Pu, I have not seen them getting better over time, rather I have seen our concerns grow. These systems age more like people than like fine wines. The probability that I or my successors will come to these meetings and tell you

that things are getting better and better simply by managing the pits is vanishingly small.

As we face increasing budget pressure today, all of our experience as project managers tells us to do something to smooth out some of the mountains in the budget to ease cash flow – this means that there is pressure to slip Life Extension Programs to the right. While we may indeed have a little flexibility on timing, it's important to remember that Nature didn't get the memo on budget issues – the changes that are occurring in the stockpile will continue whether we have the budget to deal with them or not. I'm concerned that our actions may not keep pace with Nature's changes.

Second, the pace of **technical** change. If you'll indulge me for a moment, I'd like to do a bit of “show and tell.” This is the type of slide rule I first learned to use about 45 years ago.

- It's a 10" Pickett metal slide rule – because of aging (not Pu) the slide is a little sticky now, but with a bit of effort, I can still make it work. My father gave me one of these for Christmas in 1966 and taught me to use it. As a fifth grader, I was overjoyed at the prospects of getting three figure trial divisors. I used one of these things through high school. However, by the time I was in college, the HP35 had come along and wiped out the slide rule. While I'm sure I'm not the only person in this room to know to how use one of these, they were not stock-in-trade for the generation immediately behind me.
- I got this slide rule on e-Bay – I think it's about the only place I can get one that looks like this. However, I did find another – it's an app that runs on my iPhone. I wouldn't recommend using it to anyone – the slide on this one is a little sticky too, but it's there as an antique.
- However, the iPhone leads me to my second example of technology change – not just from mechanical computing to electronic computing but the changes in electronic computing over the course of my career.
- When I started my career 30 years ago, CDC 7600s were still in service and I used them. Does anyone in the room remember how fast a 7600 was? I went and looked on Jack Dongerua's web page for the LinPack benchmark – they ran at about 3 Mflops. Any guesses on how fast my iPhone is? Something in excess of 100 Mflops.
- Why does this matter? Yesterday, Steve Guidice reminded us that our current stockpile was designed in the 1970s and built in the 1980s.

**7600S (or maybe even early models) were the workhorse computers when the stockpile was designed.**

We're in a very different world today. I've given an example of the technical change that I've seen over my career. Most of us in this room are old enough that we each have our

own examples looking back. Turn around now and look forward at the technical changes we're going to experience going forward. I'm betting that what we've seen over the last 30 years can't hold a candle to what's coming.

Why does this matter for the stockpile? As Don Cook showed us yesterday, we are planning to extend the life of systems whose design DNA is closer to my slide rule than to my iPhone. These systems will need to provide deterrence in a world that will be a radically different technical environment than either the past or the present.

Finally **Geopolitical** change. When the cold war came to an end, it happened suddenly – most of us were surprised by the change – it wasn't widely predicted. It was a radical change for deterrence. Some would argue that we still have not really changed our stance in response to this change.

In the more recent past, consider the “Arab Spring” - a dramatic change in the Middle East. Again, a change that was not widely predicted and one that as Dr. Bar suggested yesterday could have a marked effect on nuclear stability and the practice of deterrence in the Middle East. It would smack of hubris to suggest that I have any insight whatsoever into coming geopolitical change. There are some that we may be able to predict, I suspect others will come as a surprise. Whatever the case, I will be surprised if, over the next 30-40 years there are no geopolitical changes that affect deterrence.

It is very difficult to predict how countries like Russia, China, India, Pakistan, and North Korea will manage their nuclear programs. This unpredictability makes it very difficult for me to say with any authority where our deterrence strategy needs to head.

The laboratories on this panel have the responsibility for managing for today, but maintaining the flexibility to anticipate potential changes, and provide innovative technical solutions for this country and the world.

### **Programs**

This brings me to my second topic – **Programs**. Programs are the work we do from year-to-year at the laboratories – what we have funding to do.

The most obvious aspect of our programs today are the Life Extension Programs (LEPs). I'm pleased to be able to tell you that as we have worked on the W76 LEP over the last few years, as we are working the B61 LEP today and as we study options for the future, we are successfully employing the “power tools” of stewardship to this work rather than the “hand tools” of the past.

I am confident that the stockpile today is safe, secure and effective. I am also confident that the time is now to take action to ensure that this statement remains true. Life extensions are work we must do. This is work where, as I said earlier in this talk, nature is dictating the pace.

We are able to do this work today because of the investments we have made in stewardship over the last 20 years – the ROI on our past investments has surpassed my expectations. The insights our design staff derive using our ASC computer codes are helping to resolve longstanding puzzles in our test history – puzzles that affect both our current stockpile as well as our options for life extension programs. Experimental facilities such as DARHT are providing data of a quantity and quality I have never seen before – data that are providing stockpile insights that we need today and for the future.

We succeed in the present because of prudent past investments. Life Extensions are a necessary component of our program today and, I believe, will be for the foreseeable future. However, LEPs by themselves do not make a complete program. In my view, a complete program must also include developing the tools that will be needed for the future. Tools that will allow us to accommodate radical technical change, tools that will allow us to support security and stability in spite of geopolitical change.

What might some of those tools look like? As someone asked yesterday, “how do we make wise investments in research that will pay off for national security rather than frittering away scarce resources?” Good question – a question that leads to my third topic.

### **Priorities**

I'd like to look at priorities from two angles – technical and national. From the technical angle, we're taking an approach similar to the one we used at the outset of stewardship. Over the last year, the government has asked the labs to look at the future challenges and propose tools that would let us meet those challenges.

As we've done this work, I see a consensus emerging that materials and novel approaches to manufacturing may well be the areas where investments in tools today will pay handsome dividends for the stockpile tomorrow.

On the facility front we also must innovate, I am concerned that in the current fiscal environment, it may no longer be practical to build large, high-hazard nuclear facilities. A new path forward is needed. Following the decision to delay construction on the

CMRR Nuclear Facility, I have challenged the team at Los Alamos to explore alternatives that would provide the capabilities of CMRR but do that in ways that would be simpler. Based on the work they have done over the last year, I believe we should look at designing and building small, individual facilities to meet specific tasks of supporting the stockpile.

It may seem easier to envision a large signature facility that does all things nuclear. But the reality is--- the time frames needed to build them have simply become too long.

To support this country's current path for the stockpile, the labs and the plants need access to modern Uranium and Plutonium facilities sooner rather than later.

Smaller, specialized facilities together with repurposing existing space would be one approach because the cost to the taxpayer would be smaller and the design approvals and construction would be simpler.

The second and even more important aspect of priorities are those of the nation. As several of our speakers yesterday mentioned, we have had the Perry-Schlesinger bipartisan commission, we have had the Nuclear Posture Review, we have had the debate surrounding the New Start Treaty. I would characterize the consensus that I saw emerge from these debates as fragile. It is a consensus that I fear is fraying in the gale of our fiscal crisis.

The lack of a clear path forward, a national consensus if you will, is leading to uncertainty --- the tyranny of the urgent may lead us to neglect the future in favor of today's most pressing needs. At Los Alamos today, I see this uncertainty – uncertainty that comes from our lack of clarity - causing young people within the nuclear enterprise to choose other options and leave.

We must avoid the temptation to focus only on the near term at the expense of the long term. It bears repeating: We succeed today because of the investments we have made over the last 20 years – Investments in people, investments in tools and investments in facilities.

### **Closing**

In our country, I believe we have done the background work needed to develop a well-defined path forward, not only in the policy debates I mentioned earlier but also in the 3+2 strategy Gen. Welch discussed yesterday. In my view, it's not more "homework" that is needed. It is commitment. Commitment to direction and funding.

I need this clarity to be able to offer a vision to my early-career workforce – the workforce that will be caring for our deterrent long after I've retired. They need to be able to see that they will be caring for a modern deterrent using modern tools in modern facilities.

The United States has made a decision to extend the life of our current systems for the foreseeable future – let's do that in ways that provide modern features that respond to the changes that are taking place. In the face of overwhelming fiscal pressure, I believe that we must maintain balance between the work that we must do on the deterrent today and the investments we must also make today to prepare for inevitable change.