ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR FISCAL YEAR 2009

WEDNESDAY, APRIL 16, 2008

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 1:58 p.m., in room SD–138, Dirksen Senate Office Building, Hon. Byron L. Dorgan (chairman) presiding.

Present: Senators Dorgan, Feinstein, Reed, Domenici, Bennett, Craig, and Allard.

DEPARTMENT OF ENERGY

NATIONAL NUCLEAR SECURITY ADMINISTRATION

STATEMENT OF THE HON. THOMAS P. D'AGOSTINO, ADMINISTRATOR

ACCOMPANIED BY:

ADMIRAL KIRK DONALD, DEPUTY ADMINISTRATOR FOR NAVAL REACTORS

MAJOR GENERAL BOB SMOLEN, DEPUTY ADMINISTRATOR FOR DEFENSE PROGRAMS

OPENING STATEMENT OF SENATOR BYRON L. DORGAN

Senator DORGAN. We're going to call the hearing to order. We appreciate, very much, all of you being here, and especially to our witnesses, we're pleased that you've joined us.

We're starting a couple of minutes early, we will have a vote that starts at 2:15 in the Senate, so the committee members will leave here probably at 2:20, we'll go vote, and come back. So, we will have a brief interruption, for which we apologize.

We are here to take testimony from the National Nuclear Security Administration (NNSA) on the fiscal year 2009 budget request of three NNSA programs—weapons activities, naval reactors and the Office of the Administrator. We'll cover the budget request of the Defense Nuclear Nonproliferation Program in a separate hearing in 2 weeks' time.

Today we have two panels. Administrator Tom D'Agostino will be our witness on the first panel. He will be joined by Admiral Donald—the Deputy Administrator for Naval Reactors, and by General Smolen, Deputy Administrator for the Defense Programs, to help respond to questions.

Our second panel will consist of the three National Weapons Laboratory Directors—Dr. Mike Anastasio of Los Alamos, Dr.

George Miller of Lawrence Livermore, and Dr. Tom Hunter of Sandia.

The three Directors play an important role in the stewardship and the certification of our nuclear weapons stockpile, and I appreciate them being willing to respond to our request to come to Washington.

The total NNSA budget request for fiscal year 2009 is nearly $9.1 billion, by far the largest program in the Department of Energy, making up about 36 percent of the Department of Energy's budget.

Within that budget request, $6.6 billion is for weapons activities, $1.2 billion for nuclear non-proliferation programs, $828 million for naval reactors and $404 million for the Office of the Administrator.

The naval reactors budget seeks $47 million above fiscal year 2008 enacted level, the primary driver of that is to support work in Idaho on naval spent nuclear fuel. The reactors program is highly respected, rarely draws much attention from the Congress or the public, and in many ways, that's a very good thing. And Admiral Donald, I commend you and your organization for your work, and appreciate your being here today.

The Weapons Activity Programs stand in contrast to the Naval Reactors Program in both size, and also in the sense that it does draw a significant amount of attention from the Congress, and from the public. Given the program's focus on the safety, security and reliability of our nuclear weapons, that's a good thing. In fact, I would say Congress and the American people should continue to pay an even greater amount of attention to issues that surround nuclear weapons.

The $6.6 billion budget for weapons activities represent the single largest program in this Energy and Water bill. It's larger than the investments in the Corps of Engineers, for example, the Office of Science, or the funding to clean up the former nuclear weapons complex.

The $6.6 billion weapons activities request in the President's budget is $321 million above the fiscal year 2008 enacted level. That is the largest proposed increase, other than the Office of Science.

A small, but telling, illustration is that the Department's budget proposes to cut $200 million from the effort to clean up the former nuclear weapons complex that created the special nuclear material in our current stockpile. That means this Department will unfortunately fail to meet regulatory milestones to clean up radioactive-contaminated waste. We had a hearing about that recently.

Yet, in the same budget, the administration creates a new account to fund $77 million for the NNSA to tear down non-contaminated buildings. And I can support the efforts to tear down unneeded buildings, but it's clear the administration is prioritizing that budget by failing to meet its legal obligations in the other area, on which we've held a hearing just recently.

I mentioned that the Weapons Activity Program attracts public attention. Two areas that I want to mention are the Complex Transformation and the Reliable Replacement Warhead (RRW). NNSA currently has its Complex Transformation-preferred alternative out for public comment. I commend NNSA for holding nu-

merous public meetings on the plan, and for extending the written comment period. That makes a lot of sense to me.

Two basic comments I hear from people are that the Complex Transformation-preferred alternative fails to close any site-through consolidation, and that significant investment in infrastructure are being proposed that may or may not be needed. I hope we can explore some of those areas in questioning today.

The other NNSA issue that draws considerable attention is the proposed Reliable Replacement Warhead. The premise behind RRW is that we can produce a new nuclear weapon that is, in many cases, smaller, safer, reliable, and less costly than the current stockpile. I understand that premise, but I do have some significant concerns about a program that is not set in a construct of an overall strategic defense policy, analyzing the impact of such a program on our international nuclear non-proliferation efforts.

Last year, the Armed Services Committee, through the leadership of Congresswoman Tauser, in the House, created the Congressional Commission on Strategic Posture of the United States. This is a congressionally appointed panel to review the role of nuclear weapons in our national strategic defense.

This subcommittee supported that effort, and also called on the administration to submit a comprehensive nuclear weapons strategy for the 21st century. The idea behind both of these directives is that we need to understand the role nuclear weapons will play in our country's future, and develop a national policy that is reflective of that understanding.

The RRW, I believe, skips that step. If the RRW is pursued without such a broad policy review, it will have the de facto effect of creating that national policy.

For that reason, I supported, ultimately, in conference, zeroing out the funding request for the RRW in fiscal year 2008. Furthermore, it's not my intention to fund the administration's $10 million request for RRW in the fiscal year 2009. I believe we must wait for the work of the congressionally appointed panel and the next administration's Nuclear Posture Review before we move forward with a program that has such significant national and international policy implications.

Having said that, I want to make another comment, as well. In addition to recommending that we not fund, in my chairman's mark, the $10 million, I believe very strongly that we need to retain our critical skills at our national laboratories. They are a national treasure for a lot of reasons, but especially those that are engaged in programs dealing with safeguarding our—and making certain that—our stockpile is certifiable and reliable. It's very important that we retain the key personnel and not have our national laboratories losing the kind of strength—intellectual strength—that I fear would happen if we don't adequately fund them. The question isn't whether we should fund them; I believe I would join my colleague from New Mexico in feeling very strongly that we want to have a strong funding base for our national laboratories. But, I exclude from that, at this point, the specific funding for a program called RRW until other conditions are met. And they may or may not be met in the future.

I want to make one additional comment, and that is, Senator Domenici has served on this panel for a long, long, long time, as chairman and ranking member, and he has been tireless in his efforts to promote a good number of public policies that have become law and have advanced the interests of this country. We agree on many things, disagree on a few things here and there, but it's been a pleasure to work with him, and this will be his last spring—I was going to say spring cleaning, but that wouldn't be the case——

Senator DORGAN. This will be his last set of spring hearings that we hold for the agencies under our jurisdiction. And I did want to take the opportunity to say to Senator Domenici how much I appreciate working with him, and let me call on him for an opening statement.

OPENING STATEMENT OF SENATOR PETE V. DOMENICI

Senator DOMENICI. Thank you very much, Mr. Chairman. As the time grows near for this terminating date, I find that there is more and more business that I see out—that we haven't finished. But I have kind of concluded that that's the way it's going to be any time in my life, so this is as good a time as any to leave it to somebody else after January or February of this coming year. However, there are a number of things we ought to try to get done.

I'm sorry that we don't agree on the RRW, because it seems to me that we've made this too complicated. The truth of the matter is you look out in the world and, you know, in Europe, England, Russia, the United States—we're the countries with big nuclear arsenals. And all of them, except us, have already done their RRW, or are heavily engaged in it. They have new weapons, new structures, new weapons, new weapons systems. Many of them are already being done for 30 and 40 year out—that they'll be good for 30 or 40 years—meaning, to me, that they have already have accomplished what we might have accomplished with an early-on RRW.

But, we'll get there, and in due course, the things that were included in it that we were going to try to do, we've got to hope, very much, that they will get done. Because, what we were talking about was not more weapons, but less. We weren't talking about bigger weapons, but rather smaller ones, we were talking about weapons that are safer, in all respects. That's what RRW would have done had it proceeded. That's why I say, it will get done, whether it's RRW or another way, let's hope, but within the next 3 or 4 years, we'll see our way clear to do that.

Senator, I very much appreciated your opening remarks. I think you're going to be—this subcommittee is kind of one that most people didn't pay attention to for a long time. I think the fact that we will get you as chairman, coming from outside of the domain of the laboratories, I think you will bring some Senators into the web of trying to listen and understand the importance of this subcommittee. I felt, many times, that too few Senators cared very much about what was going on in this subcommittee.

I recall, for the lab directors, when we started—now it seems like it should just be yesterday, but it was a long time ago—when we started Science-based Stockpile Stewardship. I told you all in New Mexico many times that I regretted that, when we made the

change and started moving in that direction rapidly, and funding it, and doing the things we ought to do, that I found myself on the floor of the Senate with, literally, no one paying attention, nobody challenging the work we had done, and no votes occurring. We produced the bill, many times, without a single vote on the floor, Senator. And it was Harry Reid and I, and we'd go down there, and sometimes Harry would have to go somewhere, and I'd be alone, and we'd pass the bill. And we're now finding that the issues are very important issues, and a lot more people ought to be involved one way or another. I hope you can get them involved, because that will make for it being better for everybody.

The past 15 years we have accomplished quite a bit in adapting to the 21st century security demands, and making much scientific investments in the laboratories. Critics of the weapons program have claimed that nothing has changed, that we have not moved beyond the cold war. It couldn't be more wrong.

From my vantage point, a lot has changed. In 1992, the Bush administration initiated a moratorium on nuclear testing, after Congress voted, the administration implemented it, and it still holds today. In response, Congress and the Clinton administration worked in a bipartisan manner to establish a Science-based Stockpile Stewardship I just alluded to it. I'm proud to say that we accomplished our goals, and in the process, made the United States the world leader in high-performance computing—just an incidental item—but it was caused by Science-based Stockpile Stewardship's requirements, which drove and made demands upon the industry, and they produced.

In terms of weapons policy, there's been a considerable shift. In 2004, President Bush set a goal of cutting nuclear stockpile in half by 2012. With support from Congress in dismantling efforts, that goal was met in 2007, 5 years early. Having reached that target, the President ordered an additional 15 percent cut.

Today we have the smallest deployed stockpile since the Eisenhower administration, and we are on-schedule to meet the arms reduction laid out by the Moscow Treaty in 2002, by the Bush administration.

Recognizing that the cold war is over, the administration has also reduced the role of nuclear weapons in our strategic defense, consistent with the Nuclear Posture Review of 2001. I support the premise that we can make even further reductions in our stockpile, by maintaining our scientific expertise, with the right production capabilities to reverse course, if necessary. We did not need to keep a large number of warheads—we don't need to keep a large number in reserve.

I also believe that so long as we must maintain our stockpile, we must make every effort to deploy the safest, most secure technology possible. In terms of production and handling, we should also work to eliminate hazardous material that possesses significant threats to our workers and to our environment.

Nobody can predict how long we will need a stockpile. So long as we have nuclear weapons, we must manage them and the weapons complex responsibly. We must continue to look for ways to do things better, to stop doing things so we—make us irresponsible.

Mr. Chairman, this budget provides a modest amount of funding—$10 million—for the RRW design. I've stated most of what I would want to say, and you have most of what you would say. The requested funds would pay for an analysis, not weapons production. I support completion of the study as soon as possible, to provide policy makers with the facts needed to make an informed decision regarding our nuclear deterrent, but I understand your position, and I have not yet decided whether I would challenge you with a vote on the floor. Perhaps after you have done it, we'll talk a little, and maybe I wouldn't do that. But at this point I feel rather strongly about it, and sorry that we could not reach agreement.

As I said, France, Russia, the United Kingdom., and China—I didn't say before—are all in continual process of replacing and updating their weapons, investing in new infrastructure, and facilities that will operate through the middle of the century—I indicated that a while ago—even as our U.S. stockpile continues to decrease.

I'd like to close with a comment from the—on the NNSA complex, the transformation effort. I have sent formal comments to NNSA regarding their transformation proposal. While I will spare the subcommittee any full review, I believe the proposal misses the mark on science investment for the laboratories, and lack of investment in high-performance computing at Sandia National Laboratories. This is a capability that cannot be taken for granted.

I'm extraordinarily proud of what the labs and their staff have done in support of the United States national security mission, beginning with the Manhattan Project, the cold war, the international threat and the reduction efforts, the Science-based Stockpile Stewardship Program—the labs have always provided answers to the toughest questions facing our Nation, and will continue.

In my final year, I will push NNSA to better define its scientific mission, and develop a strategy for investment in scientific excellence. Science and engineering is the lifeblood of the laboratories, and serves as our best recruiting tool to attract world-class scientists to support our national security needs.

Mr. Chairman, I appreciate your providing the laboratory directors this opportunity. It's a rare occasion that we would have all three before us, and I thank you for making it happen.

Thank you.

Senator DORGAN. Senator Domenici, thank you very much.

Senator Craig has agreed to waive his opening statement, Senator, I appreciate that very much. A vote will start momentarily, and we will have to recess in about 10 minutes.

So, what I would like to do, is ask Administrator D'Agostino to make his statement, and then we will see whether we get to questions. We'll have a brief recess and come back and finish the hearing.

Administrator D'Agostino, let me say that we appreciate your work, we know you've assumed the reins in a very challenging time, we appreciate the work of Admiral Donald and General Smolen, and appreciate your being here. You may proceed.

STATEMENT OF HON. THOMAS P. D'AGOSTINO

Mr. D'AGOSTINO. Thank you, Mr. Chairman. I appreciate being here, Senator Domenici, Senator Craig, as well. I appreciate the op-

portunity to discuss the President's fiscal year 2009 budget request for the NNSA and your active commitment and engagement in our program itself.

We have a number of fundamental national security responsibilities for the United States, and I'm here to discuss the NNSA overall mission. I'm pleased to have with me, as you've noted, Deputy Administrator Admiral Kirk Donald, and Major General Bob Smolen for Defense Programs, and particularly pleased that the lab directors are here. As you know, it's been many years since they've had an opportunity to testify, and I think having the lab directors—provide them an opportunity to talk about something so important as our stockpile, is an opportunity that Members of Congress ought to get firsthand. So, I appreciate, sir, you calling them here.

NNSA is examining how to proceed, which addresses evolving national security needs in a manner that anticipates significant changes in the future, in how we manage our national security programs, our physical assets, and our people. The fiscal year 2009 request will go a long way towards making significant progress in many areas of focus, including those that we have embarked upon already in 2008.

We anticipate that our request of $9.1 billion will enable us to accomplish the following: First, begin the process of changing from a cold war nuclear weapons complex, to a 21st century national security enterprise, which includes shrinking the size of the nuclear weapons complex, and consolidating special nuclear materials at fewer sites, increasing funding for critical facilities that are needed to support a nuclear deterrent, including funding for a chemistry and metallurgy research replacement facility, increasing funding for cyber-security by 22 percent over the amount provided in 2008, improving cost savings associated with supply chain management—building upon the already $5 million of savings we've documented in 2007, we anticipate having those savings multiply to about $30 million in 2008, and envision taking cost savings even further in 2009.

Second, this program will further advance nuclear non-proliferation and radiological terrorism and activities to counter nuclear terrorism, including continuing our planned increases in budget requests for non-proliferation activities, which build upon the doubling of spending for these efforts, since September 11, 2001; increased funding for nuclear counterterrorism activities by 40 percent over the amount provided in 2008; increasing spending by 14 percent to secure highly-enriched uranium and other radiological materials, as part of a global threat reduction initiative; and, continue and completing activities under Bratislava Agreement with the Government of Russia.

Third, this program will secure and maintain an aging stockpile, including continuing our defense programs "Getting the Job Done" initiative, by staying focused on deliverables to the Defense Department; increasing the number of weapons dismantlements by 26 percent over the number of dismantlements in 2007; and, addressing current and anticipated challenges associated with certifying the stockpile, without requiring underground testing.

Fourth, ensuring the safety and reliability of the 103 operating naval nuclear propulsion plants, and continuing development work on nuclear propulsion technology to support required capabilities, as well as meeting future threats to U.S. security.

And finally, expanding our technical excellence, while developing the next generation of national security scientific and engineering talent. This effort is especially important to our weapons laboratories, and will require us to make important decisions to invest in certain programs and capabilities, and ensure our labs are run efficiently.

We seek to reduce the overall size of the nuclear weapons complex, and we believe it will allow for an increased focus in the areas of non-proliferation, nuclear counterterrorism, nuclear forensics, and support to the intelligence community.

Before concluding and taking your questions, I want to briefly mention a few items. As you know, nuclear weapons remain a cornerstone of our Nation's strategic defense posture, even as we continue to reduce the size of the stockpile. I'm pleased to acknowledge that, a few weeks ago, the Defense Department and Department of Energy submitted to Congress a classified white paper on the future of the nuclear weapons stockpile. While our current stockpile remains safe, secure and reliable, the supporting infrastructure has aged, with many of our facilities well over 50 years old. Maintaining the current infrastructure is not an option—it is too old, it is too expensive, it is too big, and it does not address all of our national security needs. Addressing these issues is possible, and can be accomplished with relatively flat budgets over the next 10 to 15 years.

In addition, this administration is driven by the Defense Department and the combatant commanders belief that the effort to study replacement concepts is important to the long-term assurance of the stockpile. We believe this is a key ingredient towards reducing the size of the stockpile beyond already the 50 percent reduction we have accomplished since 2001, and the further 15 percent reduction ordered by the President, President Bush, in December of last year.

Finally, our ability to effectively dispose of plutonium metals and materials coming out of our increased dismantling programs, and our work to consolidate materials, is critical to the effort to reduce the worldwide nuclear danger. This is viewed by the administration as a critical national security non-proliferation program. Just as the global threat reduction program seeks to repatriate secure, highly-enriched uranium from around the world and convert that material into beneficial energy use, so does the plutonium disposition program seek to eliminate excess plutonium with the added benefit of energy production.

We're working to comply with the direction given in the Fiscal Year 2008 Consolidated Appropriations Act, while preserving our vital national security mission focus.

PREPARED STATEMENT

Thank you, Mr. Chairman, I look forward to working with you and members of the committee on these programs, and answering your questions.

[The statement follows:]

PREPARED STATEMENT OF HON. THOMAS P. D'AGOSTINO

Thank you for the opportunity to discuss the President's fiscal year 2009 Budget Request for the National Nuclear Security Administration (NNSA). I want to thank all of the members for their strong support for our vital national security missions.

In the 8th year of this administration, with the support of Congress, NNSA has achieved a level of stability that is required for accomplishing our long-term missions. Our fundamental national security responsibilities for the United States include:

—assuring the safety, security and reliability of the U.S. nuclear weapons stockpile while at the same time considering options for transforming the stockpile and the complex infrastructure that supports it;
—reducing the threat posed by proliferation of nuclear weapons, material and expertise; and
—providing reliable and safe nuclear reactor propulsion systems for the U.S. Navy.

NNSA is examining how to proceed into the future to address evolving national security needs in a manner that anticipates significant changes in how we manage our national security programs, our assets and our people. To that end, the fiscal year 2009 budget request for $9.1 billion, a decrease of $35 million from the fiscal year 2008 Consolidated Appropriations Act, supports NNSA's crucial national security mission.

The fiscal year 2009 request will go a long way toward making significant progress in many areas of focus, including those that we have embarked upon in fiscal year 2008. NNSA anticipates that this request will enable the accomplishment of the following results:

—moving from a nuclear weapons complex to an integrated national security enterprise, including:
  —making decisions regarding transformation of the nuclear weapons complex based on the analyses in the Complex Transformation Supplemental Programmatic Environmental Impact Statement this year;
  —shrinking the size of the nuclear weapons complex and consolidating special nuclear material at fewer sites;
  —increasing funding for critical facilities, including an increase in funding for the preliminary design of the Uranium Processing Facility and Chemistry and Metallurgy Research Replacement facility over the amount provided in fiscal year 2007;
  —increasing funding for cyber security by 22 percent over the amount provided in fiscal year 2007; and
  —improving cost-savings associated with supply chain management, building upon nearly $5 million in savings in fiscal year 2007.
—advancing nuclear nonproliferation and countering nuclear and radiological terrorism, including:
  —increasing the amount of funds provided directly to NNSA nonproliferation activities by 7 percent over the funding amount provided in fiscal year 2007 (not including the Mixed Oxide (MOX) Fuel Fabrication Facility);
  —increasing funding provided to nuclear counter terrorism activities by 40 percent over the amount provided in fiscal year 2007;
  —increasing the rate at which Highly Enriched Uranium and other radiological and source materials are secured as part of the Global Threat Reduction Initiative (GTRI) program by 14 percent; and
  —and continuing and completing activities under the Bratislava agreement with the Government of Russia.
—securing and maintaining an aging stockpile, including:
  —continuing our Defense Program's "Getting the Job Done" initiative by staying focused on delivering products to Department of Defense in a timely and cost-efficient manner;
  —increasing the number of weapon dismantlements by 26 percent over the number of weapons dismantled in fiscal year 2007; and
  —addressing current and anticipated challenges associated with certifying the stockpile without requiring underground testing.
——expanding our technical excellence while developing the next generation of national security scientific, engineering and program management talent, including:
  —developing an expanded vision of the future role of our national laboratories in supporting NNSA's national security mission; and

——expanding NNSA's efforts in nuclear nonproliferation, counterterrorism, forensics, and support to the intelligence community.

Our testimony today will focus on the Weapons Activities, Naval Reactors, and Office of the Administrator accounts.

WEAPONS ACTIVITIES OVERVIEW

Nuclear weapons remain a cornerstone of our Nation's strategic defense posture and will likely remain so throughout this century, even as we continue to reduce the size of our stockpile. Our nuclear deterrent stockpile remains safe, secure and reliable. The supporting infrastructure, however, is aged—many of our critical facilities are over 50 years old. Stockpile Stewardship is working and has been successful to date at finding and remedying the technical challenges facing our aging stockpile. Additionally, we continue to reduce the size of the stockpile to meet the President's mandate to have the smallest nuclear stockpile consistent with our national security objectives. As a result, today the stockpile is half of what it was in 2001, and by 2012, the United States will have the smallest stockpile since the 1950s. Additional reductions in the stockpile are possible, but these reductions will require changes to the weapons complex and the composition of the stockpile.

Our national security enterprise is a national asset and our weapons laboratories remain unrivaled as the pinnacle of American scientific, engineering and technical expertise. Development and maintenance of our nuclear deterrent force has made possible American leadership in nuclear nonproliferation, nuclear counterterrorism, advanced computing, and high-energy density physics. None of these programs would be possible at its current level without technical advances made by the weapons program. As we continue transforming the infrastructure and maintaining our nuclear deterrent force into the 21st century, our goal is to do so without jeopardizing the advancements in other vital NNSA national security programs made possible by our investment in weapon activities.

Let there be no doubt: today's nuclear weapons stockpile is safe, secure and reliable and has not required post-deployment nuclear testing to date, nor is nuclear testing anticipated or planned. However, while today's stockpile remains safe, secure and reliable, the weapons laboratories, the Department of Defense and the NNSA are concerned about our future ability to maintain the stockpile in the future. The Stockpile Stewardship Program has worked well, so far, to discover and resolve problems that in the past would have required nuclear testing. However, the collective judgment of the Directors of our national weapons laboratories is that maintaining certification of the finely-tuned designs of the aging cold war stockpile through Life Extension Programs (LEPs) only, absent nuclear testing, necessarily entails increasing risk overtime. Although recent studies have placed the life of our plutonium pits at 85 to 100 years, other exotic materials used in our warheads degrade at different rates and many of their aging properties are still not well understood. The metallurgical and chemical issues we face with our aging warheads continue to be a technical challenge for our best scientists and the risk of catastrophic technical failure occurring as our warheads age cannot be ruled out absolutely. The one certainty we do know is that warhead certification in the absence of testing will become more difficult, especially as life extensions and component aging move the warhead further away from originally-tested designs.

After 9/11 we realized that the security threat to our nuclear warheads had fundamentally changed. The security features in today's stockpile are commensurate with technologies that were available during the cold war and designed for with the threats anticipated at that time. Major enhancements in security are not easily available via retrofits in the life extension programs.

To understand the challenges facing our stockpile, an analogy is in order. Today's Mustang remains a high-performance automobile, has about the same dimensions and weighs only a few hundred pounds more than the first Mustangs, and has all the modern safety and security features we expect today—air bags, anti-lock brakes, GPS navigation, satellite radio, theft deterrent and alarm systems. The 1965 version had none of these features, not even seat belts! We deploy warheads today that have 1970–1980's safety, security and anti-terrorism features. It does not mean that these warheads are not safe and secure, but we can do better and we should do better. Based on our initial assessments, I believe that the reliable replacement warhead concepts provide opportunities to incorporate the latest technological advances for precluding unauthorized use in a post-9/11 threat environment.

To address these challenges, the administration has proposed two efforts to maintain the viability of the deterrent well into the 21st century. The first of these is Complex Transformation. Our goal is to transform the large, costly and inefficient cold war nuclear weapons complex that cannot meet the full production require-

ments of our customer into an integrated, modern and cost effective nuclear security enterprise. Complex Transformation involves more than just transforming an aging physical infrastructure; it seeks to transform our contracting and procurement processes and overall management of the enterprise to embrace the best in business and human capital practices. Complex Transformation also must be accomplished in a way that continues to leverage our core competencies in nuclear weapons design and maintenance to advance the Nation's leadership in counterterrorism, nonproliferation, physical and cyber security, and to support the intelligence community. Our Complex Transformation strategy relies on four pillars:

—Transform the nuclear stockpile through the Stockpile Stewardship Program in partnership with the Department of Defense;
—Transform to a modernized, cost-effective nuclear weapons complex to support needed capabilities in our physical infrastructure;
—Create an integrated, interdependent enterprise that employs best business practices to maximize efficiency and minimize costs; and
—Advance the science and technology base that is the cornerstone of our nuclear deterrent forces and remains essential for long-term national security.

Infrastructure transformation is a major part of Complex Transformation. Some major facilities date back to the Manhattan Project and cannot cost effectively meet today's safety and security requirements. In other cases, new facilities are needed to restore capabilities that have been put in standby since the end of the cold war but may be needed to support future life extension programs. With the support of Congress, we produced tritium in 2007 for the first time in 18 years and the Tritium Extraction Facility (TEF) at Savannah River is now on-line. Similarly, construction of the Highly Enriched Uranium Materials Facility (HEUMF) at the Y–12 National Security Complex in Oak Ridge will allow us to consolidate uranium storage and improve security with a significantly-reduced security footprint. And at Los Alamos National Laboratory, the Chemistry and Metallurgy Research Replacement (CMRR) project will allow us to continue the plutonium pit surveillance and actinide research vital to maintaining the stockpile and the Nation's nuclear deterrent. These three projects are representative of a Complex Transformation that has already commenced.

Our plan for Complex Transformation, detailed in the draft Supplemental Programmatic Environmental Impact Statement (SPEIS), seeks to consolidate special nuclear material at fewer sites and locations within the nuclear weapons complex, close or transfer hundreds of buildings that are no longer required for the NNSA mission, and reduce NNSA's overall footprint by as much as a third over the next 10 years. By eliminating multi-site redundancies and consolidating both missions and capabilities at our sites, we expect to dramatically improve our efficiency and cost effectiveness.

The second effort we believe is necessary to maintain the viability of the nuclear deterrent well into the 21st century involves continued study of reliable replacement concepts. We believe continued work on these concepts is necessary in order to allow the next administration and Congress to make informed decisions regarding the future composition of the stockpile. Continued study of reliable replacement concepts has been identified by U.S. Strategic Command, the Navy and the Air Force as essential to long-term maintenance of an effective nuclear deterrent force. These concepts, coupled with a responsive nuclear infrastructure, offers promise for further reductions in reserve warheads maintained as a hedge against technical failure. These concepts are specifically envisioned to address long term reliability issues that can affect our existing stockpile resulting from component aging, and refurbishment of aging components, that move us further from the original designs validated by underground nuclear testing. In short, we believe these concepts could provide a means to mitigate the technical risks inherent in a life extension-only approach. Moreover, reliable replacement concepts would not add new military capabilities to the stockpile, and would introduce safety, surety and antiterrorism features that cannot easily be retrofitted into the current stockpile.

In our efforts to advance Complex Transformation and examine the potential promise of reliable replacement concepts, we have not lost focus on meeting our day-to-day commitments to the Department of Defense (DOD). Last year, we reconstituted a limited plutonium pit manufacturing capability and produced new pits for the W88 warhead, and maintained on-time delivery of the LEP B61 weapons to the Air Force. In fiscal year 2008, the Department will continue to manufacture W88 pits, maintain a limited pit manufacturing capability of six pits per year.

Meeting the needs of DOD, maintaining the safety, security and reliability of the stockpile, and commencing Complex Transformation would not be possible without the support of our dedicated Federal and contractor workforce of 37,000 employees. Retaining our current workforce and attracting the next generation of national secu-

rity scientific and engineering talent is challenging because the number of qualified university graduates continues to decrease each year.

The scientific capabilities and infrastructure developed for the nuclear weapons mission are utilized by DOD, the Department of Homeland Security, and the intelligence community, are recognized as essential to fulfilling their responsibilities. NNSA laboratories have been participating jointly with other Government agencies in addressing a wide range of national security challenges—all of which leverage the core mission of nuclear weapons development and sustainability. Recent examples include:

—Supporting war fighter needs in Iraq with improvised explosive device (IED) modeling and analysis;
—Supporting DOD and the Federal Bureau of Investigation in nuclear weapons emergency render-safe and post-event technical forensics;
—Providing solutions to the intelligence community in their nuclear counterterrorism and nonproliferation efforts by drawing upon our nuclear weapons expertise;
—Developing and deploying integrated systems for countering aerosolized bioterrorist releases and bio-decontamination technologies; and
—Developing and deploying portal detector technology to prevent smuggling of special nuclear material.

Basic research at our national security laboratories has provided technology for airborne detection of toxic chemicals, critical infrastructure modeling for disaster response, and modeling of response strategies for potential influenza pandemics.

It is important to recognize that certain major capabilities are needed at each of our national security laboratories if they are to continue to effectively contribute to national security. By leveraging the science that gave us the atomic bomb that helped win World War II and the technical innovations that helped win the cold war, today's national security labs are tackling tomorrow's national security challenges. Maintaining a core scientific and technical base at our labs will continue to attract outstanding talent to meet our future national security challenges.

Weapons Activities also provides tangible support to nuclear nonproliferation objectives. A major priority within Defense Programs has been weapons dismantlement. The United States remains committed to its obligations under the Nuclear Nonproliferation Treaty (NPT). In 2004, the President directed a 50 percent reduction in the size of the stockpile, and, in December 2007, he ordered an additional 15 percent cut. The result will be a nuclear stockpile one quarter the size it was at the end of the cold war and the smallest since the Eisenhower administration. During fiscal year 2007, DOE achieved a 146 percent increase in the rate of nuclear weapon dismantlement over the fiscal year 2006 rate, almost tripling our goal of a 49 percent rate increase.

NAVAL REACTORS OVERVIEW

Also contributing to the Department's national security mission is the Naval Reactors Program, whose mission is to provide the U.S. Navy with safe, militarily effective nuclear propulsion plants and ensure their continued safe, reliable and long-lived operation. Nuclear propulsion enhances our warship capabilities by providing the ability to sprint where needed and arrive on station, ready to conduct sustained combat operations when America's interests are threatened. Nuclear propulsion plays a vital role in ensuring the Navy's forward presence and its ability to project power anywhere in the world.

The Naval Reactors Program has a broad mandate, maintaining responsibility for nuclear propulsion from cradle to grave. Over 40 percent of the Navy's major combatants are nuclear-powered, including aircraft carriers, attack submarines, guided missile submarines, and strategic submarines, which provide the Nation's most survivable deterrent force.

FISCAL YEAR 2009 BUDGET REQUEST PROGRAMMATIC DETAIL

The President's fiscal year 2009 budget request for NNSA totals $9.1 billion, a decrease of $35.0 million or 0.4 percent less than the fiscal year 2008 consolidated appropriations level. We are managing our program activities within a disciplined 5-year budget and planning envelope, and are successfully balancing the administration's high priority initiatives to reduce global nuclear danger as well as future planning for the Nation's nuclear weapons complex within an overall modest growth rate.

The NNSA budget justification contains information for 5 years as required by section 3253 of Public Law 106–065, the National Defense Authorization Act for Fiscal Year 2000. This section, entitled Future-Years Nuclear Security Program, re-

quires the Administrator to submit to Congress each year the estimated expenditures necessary to support the programs, projects and activities of the NNSA for a 5-year fiscal period, in a level of detail comparable to that contained in the budget.

The fiscal year 2009–2013 Future Years Nuclear Security Program—FYNSP—projects $47.7 billion for NNSA programs though 2013. This is a decrease of about $2.3 billion over last year's projections. The fiscal year 2009 request is slightly smaller than last year's projection; however, the out-years increase starting in fiscal year 2010.

Weapons Activities

Defense Programs

The fiscal year 2009 budget request for the programs funded within the Weapons Activities Appropriation is $6.62 billion, an approximately 5.1 percent increase over the fiscal year 2008 Consolidated Appropriations level. It is allocated to adequately provide for the safety, security, and reliability of the nuclear weapons stockpile and supporting facilities and capabilities.

Directed Stockpile Work (DSW) activities ensure the operational readiness of the nuclear weapons in the Nation's stockpile through maintenance, evaluation, refurbishment, reliability assessment, weapon dismantlement and disposal, research, development, and certification activities. The fiscal year 2009 request is organized by Life Extension Programs, Stockpile Systems, Reliable Replacement Warhead, Weapons Dismantlement and Disposition, and Stockpile Services. The request places a high priority on accomplishing the near-term workload and supporting technologies for the stockpile along with longterm science and technology investments to ensure the capability and capacity to support ongoing missions.

The fiscal year 2008 Consolidated Appropriations Act did not contain funding for the Reliable Replacement Warhead (RRW). The administration believes that the characteristic features of the RRW are the right ones for ensuring the future of our Nation's nuclear deterrent force. The fiscal year 2009 request includes $10 million to continue the design definition and cost study. The request also continues efforts called out in the Explanatory Statement referenced in section 4 of Public Law 110–161 to address issues raised in the recent JASON's summer study of the feasibility of certifying RRW designs without nuclear testing.

Campaigns are focused on scientific and technical efforts essential for the certification, maintenance and life extension of the stockpile. The Stockpile Stewardship Program has allowed NNSA to maintain the moratorium on underground testing and move to "science-based" certification and assessments for stewardship by relying on experiments, modeling, simulation, surveillance and historical underground nuclear testing experience. The Science and Engineering Campaigns are focused to provide the basic scientific understanding and the technologies required for the directed stockpile workload and the completion of new scientific and experimental facilities. In the Inertial Confinement Fusion Ignition and High Yield Campaign, the National Ignition Facility (NIF) will focus on completing the first experiment on NIF with a credible chance of demonstrating laboratory-scale ignition in 2010. The Advanced Simulation and Computing Campaign will continue to improve capabilities through development of faster computational platforms in partnership with private industry, and with state of the art techniques for calculations, modeling and simulation, and analysis of highly complex weapons physics information. The Readiness Campaign consists of technology-based efforts to reestablish and enhance manufacturing and other capabilities needed to meet planned weapon component production.

The fiscal year 2009 request makes several changes in the location of programs within Weapons Activities. The Pit Manufacturing and Certification Campaign recently concluded with the successful manufacturing and certification of the W88 pit. Pit manufacturing related activities are moved to the Direct Stockpile Work Stockpile Services program and pit certification activities are transferred to the Science Campaign. In addition, in the Science Campaign, the Advanced Certification program will continue efforts begun in fiscal year 2008 at the direction of the Congress to review, evaluate and implement key recommendations from the JASON's RRW study regarding approaches to establishing an accredited warhead certification plan without nuclear testing. Work being performed to understand potential improvised nuclear device designs and responses is being transferred to the nuclear weapons incident response account.

Secure Transportation Asset

The Secure Transportation Asset's fiscal year 2009 budget request is an increase of $9.5 million to $221.1 million. This funding request supports the increase to transportation capacity necessary for the dismantlement of nuclear weapons, departmental initiatives to consolidate and disposition nuclear material, and the im-

plementation of the current operational doctrine to protect nuclear weapons and material in transport.

Readiness in Technical Base and Facilities (RTBF) and Facilities and Infrastructure Recapitalization Program (FIRP)

In fiscal year 2009, we are requesting $1.89 billion for the maintenance and operation of existing facilities, remediation and disposition of excess facilities, and construction of new facilities. Of this amount, $1.72 billion is requested for RTBF, an increase of $83.1 million from fiscal year 2008 operating levels, with $1.41 billion reserved for Operations and Maintenance. The Operations and Maintenance portion also includes the Institutional Site Support program which supports facility transition and capability consolidation. The request includes $308.0 million for RTBF Construction.

This request also includes $169.5 million for the Facilities and Infrastructure Recapitalization Program (FIRP), a separate and distinct program that is complementary to the ongoing RTBF efforts. The FIRP mission, which we expect to be completed in fiscal year 2013, is to restore, rebuild and revitalize the physical infrastructure of the nuclear weapons complex, in partnership with RTBF. This program assures that facilities and infrastructure are restored to an appropriate condition to support the mission, and to institutionalize responsible and accountable facility management practices. The Integrated Prioritized Project List (IPPL) is the vehicle that FIRP will rely on to prioritize and fund out-year projects to reduce legacy deferred maintenance. These projects significantly reduce the deferred maintenance backlog to acceptable levels and support the Stockpile Stewardship mission and transformation of the complex.

This request also includes $77.4 million for the newly established Transformation Disposition (TD) Program. TD is NNSA's facility and infrastructure (F&I) retirement program for old, cold war-era structures. The NNSA owns over 35 million gross square feet of footprint and over 25 percent of the footprint may become excess as a result of complex transformation. TD is established with the goal of reducing non-process and contaminated excess F&I. This includes facilities that are excess to current and future NNSA mission requirements, including those contaminated structures which are not currently the responsibility of the Office of Environmental Management. This program supports the performance measure of reducing the total square feet, improves management of the NNSA facilities and infrastructure portfolio, and reduces long-term costs and risks. The TD Program will set the groundwork for a smaller complex.

All of these activities are critical for the development of a more responsive infrastructure and will be guided by decisions based on the Complex Transformation Supplemental Programmatic Environmental Impact Statement (SPEIS) and other factors such as funding and national security requirements. Since a significant fraction of our production capability resides in World War II era facilities, infrastructure modernization, consolidation, and sizing consistent with future needs is essential for an economically sustainable Complex. Facilities designed according to modern manufacturing, safety, and security principles will be more cost-effective and responsive to future requirements. For example, a facility could be designed to support a low baseline capacity and preserve the option, with a limited amount of contingency space to augment capacity, if authorized and needed, to respond to future needs.

Having a reliable plutonium capability is a major objective of NNSA planning and is a key requirement if the Nation is to maintain an effective deterrent, regardless of the composition of the stockpile. Options for plutonium research, surveillance, and pit production are being evaluated as part of the Complex Transformation NEPA process, with a decision anticipated in 2008. The preferred alternative in the draft Complex Transformation SPEIS proposes that Los Alamos National Laboratory facilities at Technical Area 55 (TA–55) provide plutonium research, surveillance and pit production capabilities. This alternative includes the proposed Chemistry and Metallurgy Research Replacement—Nuclear Facility (CMRR–NF) to achieve the objectives of (1) closing the aging existing Chemistry and Metallurgy Research (CMR) facility, (2) replacing essential plutonium surveillance and research capabilities currently at Lawrence Livermore National Laboratory and those being conducted in Plutonium Facility 4 (PF–4) in TA–55, and (3) achieving a net manufacturing capacity of 50–80 pits per year by allowing surveillance activities now occurring in PF–4 to be conducted in CMRR.

Completion of the Highly Enriched Uranium Materials Facility (HEUMF) would allow a reduction of the overall size of the high security area at the Y–12 National Security Complex. If NNSA ultimately decides to build a Uranium Processing Facility (UPF) at Y–12, then Y–12's high security area would be reduced from 150 acres to 15 acres. This reduction combined with the engineered security features of the

HEUMF and UPF, would allow NNSA to meet the Design Basis Threat (DBT) at significantly reduced costs, to lower non-security costs, and to provide a responsive highly enriched uranium manufacturing capability.

Environmental Projects and Operations

The Environmental Projects and Operations/Long-Term Stewardship Program is requested at $40.6 million in fiscal year 2009. This program serves to reduce the risks to human health and the environment at NNSA sites and adjacent areas by: operating and maintaining environmental clean-up systems; performing long-term environmental monitoring activities; and integrating a responsible environmental stewardship program with the NNSA mission activities. The increase in this program is necessary to continue compliance with statutory requirements and to provide Long-Term Stewardship activities for two additional NNSA sites.

Nuclear Weapons Incident Response

The Nuclear Weapons Incident Response (NWIR) Program serves as the United States' primary capability for responding to and mitigating nuclear and radiological incidents worldwide. The fiscal year 2009 request for these activities is $221.9 million, of which $31.7 million is dedicated to the continued implementation of two national security initiatives that will strengthen the Nation's emergency response capabilities—the National Technical Nuclear Forensics (NTNF) and the Stabilization Implementation programs.

The NTNF program will continue the development of capabilities to support pre- and post-detonation activities and enhance technical nuclear forensics capabilities. The continued development of this capability will facilitate the thorough analysis and characterization of pre- and post-detonation radiological and nuclear materials and devices, including devices used in nuclear detonations as well as interdicted devices. Developing forensic capabilities of this nature is crucial to the overall objective of identifying the origin and pathways of interdicted nuclear materials, warheads and improvised nuclear devices.

Stabilization is a capability aimed at using advanced technologies to enhance the U.S. Government's ability to interdict, delay and/or prevent operation of a terrorist's radiological or nuclear device until national assets arrive on the scene to conduct traditional "render safe" procedures. NNSA has actively sponsored new research in this area and, additionally, continues to leverage emerging technologies that have been demonstrated successfully by the DOD in support of the global war on terrorism. In the implementation phase, NNSA will transfer these matured projects into operational testing to selected teams across the country, potentially followed by their transition into the collection of tools available to Federal response teams.

Physical and Cyber Security

The fiscal year 2009 budget request for Defense Nuclear Security is $737.3 million, a 7.7 percent decrease from the fiscal year 2008 appropriation. The fiscal year 2009 request supports the base program and the program's focus on sustaining the NNSA sites 2003 Design Basis Threat baseline operations and implementing the 2005 DBT Policy upgrades with the Nevada Test Site reaching compliance in fiscal year 2009. Starting in fiscal year 2009, there is no longer an offset in this account or in the departmental administration account for the security charges associated with reimbursable work. These activities will be fully funded by the programs with direct appropriations.

During fiscal year 2009, the program will focus on eliminating or mitigating identified vulnerabilities across the weapons complex. Measures will include additional protective force training, acquiring updated weapons and support equipment, improving physical barrier systems and standoff distances, and reducing the number of locations with "targets of interest." Physical security systems will be upgraded and deployed to enhance detection and assessment, add delay and denial capabilities, and to improve perimeter defenses at several key sites. There are no new construction starts.

The fiscal year 2009 budget request for Cyber Security is $122.5 million, an 11 percent increase from the fiscal year 2008 appropriation. The fiscal year 2009 budget request is focused on sustaining the NNSA infrastructure and upgrading elements designed to counter cyber threats and vulnerabilities from external and internal attacks. This funding level will support cyber security revitalization, enhancements in assets and configuration management, and identify emerging issues, including research needs related to computer security, privacy, and cryptography.

Additionally, the Cyber Security funding will provide for enhancement, certification, and accreditation of unclassified and classified computer systems to ensure the proper documentation of risks and justification of associated operations for systems at all sites. The funding within this request will also be applied to foster great-

er cyber security awareness among Federal and contractor personnel. NNSA will sponsor a wide range of educational initiatives to ensure that our workforce possesses the ever-expanding cyber security skills critical to safeguarding our national security information. Funding provided to NNSA sites will be conditioned upon their implementation of a risk-based approach to cyber security management and policy.

Naval Reactors

The Naval Reactors fiscal year 2009 budget request of $828 million is an increase of $20 million from the fiscal year 2008 request. Naval Reactor's development work ensures that nuclear propulsion technology provides options for maintaining and upgrading current capabilities, as well as for meeting future threats to U.S. security.

The majority of funding supports Naval Reactor's number-one priority of ensuring the safety and reliability of the 102 operating naval nuclear propulsion plants. This work involves continual testing, analysis, and monitoring of plant and core performance, which becomes more critical as the reactor plants age. The nature of this business demands a careful, measured approach to developing and verifying nuclear technology, designing needed components, systems, and processes, and implementing them in existing and future plant designs. Most of this work is accomplished at Naval Reactors' DOE laboratories. These laboratories have made significant advancements in extending core lifetime, developing robust materials and components, and creating an array of predictive capabilities.

Long-term program goals have been to increase core energy, to achieve life-of-the-ship cores, and to eliminate the need to refuel nuclear-powered ships. Efforts associated with this objective have resulted in planned core lives that are sufficient for the 30-plus year submarine (based on past usage rates) and an extended core life planned for CVN 21 (the next generation aircraft carrier). The need for nuclear propulsion will only increase over time as the uncertainty of fossil fuel cost and availability grows.

Naval Reactors' Operations and Maintenance budget request is categorized into six areas: Reactor Technology and Analysis; Plant Technology; Materials Development and Verification; Evaluation and Servicing; Advanced Test Reactor (ATR) Operations and Test Support; and Facility Operations.

The $204 million requested for Reactor Technology and Analysis will support work that ensures the operational safety and reliability of reactor plants in U.S. warships and extends the operational life of Navy nuclear propulsion plants. This work includes continued development of the Reactor System Protection Analysis for the next generation aircraft carrier, CVN 21. These efforts also support continued work on core design concepts for submarines.

The increasing average age of our Navy's existing reactor plants, along with future extended service lives, a higher pace of operation and reduced maintenance periods, place a greater emphasis on our work in thermal-hydraulics, structural mechanics, fluid mechanics, and vibration analysis. These factors, along with longer-life cores, mean that for years to come, these reactors will be operating beyond our previously-proven experience base.

The $104 million requested for Plant Technology provides funding to develop, test, and analyze components and systems that transfer, convert, control, and measure reactor power in a ship's power plant. Naval Reactors is developing components to address known limitations and to improve reliability of instrumentation and power distribution equipment to replace aging, technologically obsolete equipment. Development and application of new analytical methods, predictive tests, and design tools are required to identify potential concerns before they become actual problems. This enables preemptive actions to ensure the continued safe operation of reactor plants and the minimization of maintenance costs over the life of the ship. Additional technology development in the areas of chemistry, energy conversion, instrumentation and control, plant arrangement, and component design will continue to support the Navy's operational requirements.

The $106 million requested for Materials Development and Verification supports material analyses and testing to provide the high-performance materials necessary to ensure that naval nuclear propulsion plants meet Navy goals for extended warship operation and greater power capability. These funds support the test assemblies for use in ATR, post irradiation examination of the materials tested at ATR, and destructive and non-destructive examinations of spent navy nuclear fuel and reactor component materials.

The $264 million requested for Evaluation and Servicing sustains the operation, maintenance, and servicing of Naval Reactors' operating prototype reactor plants. Reactor core and reactor plant materials, components, and systems in these plants provide important research and development data and experience under actual operating conditions. These data aid in predicting and subsequently preventing problems

that could develop in fleet reactors. With proper maintenance, upgrades, and servicing, the two prototype plants will continue to meet testing needs for at least the next decade.

Evaluation and Servicing funds also support the implementation of the dry spent fuel storage production lines that will put naval spent fuel currently stored in water pools at the Idaho Nuclear Technology and Engineering Center (INTEC) on the Idaho National Laboratory (INL) and at the Expended Core Facility (ECF) on the Naval Reactors facility in Idaho into dry storage. Additionally, these funds support ongoing decontamination and decommissioning of inactive nuclear facilities at all Naval Reactors sites to address their "cradle to grave" stewardship responsibility for these legacies and minimize the potential for any environmental releases.

The $60 million requested for Advanced Test Reactor Operations and Test Support sustains the ongoing activities of the INL ATR facility, owned and operated by the Office of Nuclear Energy (NE), Science and Technology.

In addition to the budget request for the important technical work discussed above, facilities funding is required for continued support of Naval Reactor's operations and infrastructure. The $32 million requested for facilities operations will maintain and modernize the program's facilities, including the Bettis and Knolls laboratories as well as ECF and Kesselring Site Operations (KSO), through capital equipment purchases and general plant projects.

The $22 million requested for construction funds will be used to support the project engineering and design of KAPL infrastructure upgrades and ECF M290 receiving and discharge station, to support the design and construction of production support complex at NRF, and to support the construction of a materials research technology complex.

Office of the Administrator

This account provides for all Federal NNSA staff in Headquarters and field locations except those supporting Naval Reactors and the Office of Secure Transportation couriers. The fiscal year 2009 budget request is $404.1 million, essentially level with the fiscal year 2008 appropriation reflecting a leveling of staffing growth.

This budget request is consistent with the funding needed for personnel support in an account that is comprised of over 70 percent salaries and benefits. Staffing is projected to increase by 95 to a total of 1,942 FTE in fiscal year 2009, in support of new hires brought on-board at the end of fiscal year 2008 and beginning of fiscal year 2009 to meet increased requirements in Defense Nuclear Nonproliferation and Emergency Operations program goals as well as address NNSA workforce planning skill mix issues. Information Technology (IT) for the Federal staff is also included in this account, and the fiscal year 2009 request is level with 2008.

The out-year budget for this account projects a 3.7 percent increase in fiscal year 2010, followed by about 4 percent annually in the ensuing years. There remain significant challenges in managing this account due to the essentially uncontrollable impacts of escalation on payroll and benefits for NNSA staff that consume such a high percentage of this account.

Historically Black Colleges and Universities (HBCU) Support

A research and education partnership program with the HBCUs and the Massie Chairs of Excellence was initiated by the Congress through Congressionally directed projects in the Office of the Administrator appropriation in fiscal year 2005. The NNSA has established an effective program to target national security research opportunities for these institutions to increase their participation in national security-related research and to train and recruit HBCU graduates for employment within the NNSA. The NNSA goal is a stable $10 million annual effort. However, the fiscal year 2008 Consolidated Appropriations Act (Public Law 110–161), included $22.1 million in congressionally directed projects in support of the HBCU programs within the Office of the Administrator account, for both new and existing projects. In fiscal year 2009, the Office of the Administrator appropriation will provide funding of $3.6 million in continuing support for HBCU activities for institutions not yet ready to engage in direct NNSA mission support. The Weapons Activities appropriation will provide up to $6 million; the Defense Nuclear Nonproliferation appropriation will provide up to $3 million; and the Naval Reactors program will fund up to $1 million of HBCU efforts in fiscal year 2009 in multiple research partnerships directly supporting mission program activities.

APPROPRIATION AND PROGRAM SUMMARY TABLES AND OUT-YEAR APPROPRIATION SUMMARY TABLES—FISCAL YEAR 2009 BUDGET

NATIONAL NUCLEAR SECURITY ADMINISTRATION—OVERVIEW

[In thousands of dollars]

	Fiscal Year 2007 Current Appropriations	Fiscal Year 2008 Original Appropriation	Fiscal Year 2008 Adjustments	Fiscal Year 2008 Current Appropriation	Fiscal Year 2009 Request
National Nuclear Security Administration:					
Office of the Administrator	358,291	405,987	−3,850	402,137	404,081
Weapons Activities	6,258,583	6,355,633	−58,167	6,297,466	6,618,079
Defense Nuclear Nonproliferation	1,824,202	1,673,275	−15,279	1,657,996	1,247,048
Naval Reactors	781,800	781,800	−7,114	774,686	828,054
Total, NNSA	9,222,876	9,216,695	−84,410	9,132,285	9,097,262
Rescission of Prior Year Balances	.....	−322,000	.....	−322,000	.....
Total, NNSA (OMB Scoring)	9,222,876	8,894,695	–84,410	8,810,285	9,097,262

OUT-YEAR APPROPRIATION SUMMARY—NNSA FUTURE-YEARS NUCLEAR SECURITY PROGRAM (FYNSP)

[In thousands of dollars]

	Fiscal Year 2009	Fiscal Year 2010	Fiscal Year 2011	Fiscal Year 2012	Fiscal Year 2013
NNSA:					
Office of the Administrator	404,081	419,848	436,266	451,771	469,173
Weapons Activities	6,618,079	6,985,695	7,197,844	7,286,912	7,460,318
Defense Nuclear Nonproliferation	1,247,048	1,082,680	1,076,578	1,111,337	1,133,982
Naval Reactors	828,054	848,641	869,755	880,418	899,838
Total, NNSA	9,097,262	9,336,864	9,580,443	9,730,438	9,963,311

OFFICE OF THE ADMINISTRATOR—OVERVIEW APPROPRIATION SUMMARY BY PROGRAM

[In thousands of dollars]

	Fiscal Year 2007 Current Appropriation	Fiscal Year 2008 Original Appropriation	Fiscal Year 2008 Adjustments	Fiscal Year 2008 Current Appropriation	Fiscal Year 2009 Request	Change
Office of the Administrator	[1] 358,291	383,487	−3,490	379,997	404,081	+24,084
Congressional Directed Projects	.....	22,500	−360	22,140	.....	−22,140
Total, Office of the Administrator	358,291	405,987	[2] −3,850	402,137	404,081	+1,944

[1] Reflects the Congressionally approved appropriation transfer of $17,000,000 (07–D–04) from a source within the Weapons Activities appropriation and $1,000,000 from the fiscal year 2007 supplemental in support of the Defense Nuclear Nonproliferation program.

[2] Reflects a rescission of $3,850,000 as cited in the Fiscal Year 2008 Consolidated Appropriations Act (Public Law 110–161).

Public Law Authorization: Fiscal Year 2008 Consolidated Appropriations Act (Public Law 110–161) and National Nuclear Security Administration Act, (Public Law 106–65), as amended.

OUT-YEAR APPROPRIATION SUMMARY

[In thousands of dollars]

	Fiscal Year 2010	Fiscal Year 2011	Fiscal Year 2012	Fiscal Year 2013
Office of the Administrator	419,848	436,266	451,771	469,173

WEAPONS ACTIVITIES—FUNDING PROFILE BY SUBPROGRAM

[In thousands of dollars]

	Fiscal Year 2007 Current Appropriation	Fiscal Year 2008 Original Appropriation	Fiscal Year 2008 Adjustments	Fiscal Year 2008 Current Appropriation	Fiscal Year 2009 Request
Directed Stockpile Work	1,430,192	1,413,879	−12,627	1,401,252	1,675,715
Science Campaign	267,758	290,216	−2,592	287,624	323,070
Engineering Campaign	161,736	171,075	−1,527	169,548	142,742
Inertial Confinement Fusion Ignition and High Yield Campaign	489,706	474,442	−4,236	470,206	421,242
Advanced Simulation and Computing Campaign	611,253	579,714	−5,177	574,537	561,742
Pit Manufacturing and Certification Campaign	242,392	215,758	−1,927	213,831	.....
Readiness Campaign	201,713	159,512	−1,424	158,088	183,037
Readiness in Technical Base and Facilities	1,613,241	1,652,132	−14,751	1,637,381	1,720,523
Secure Transportation Asset	209,537	213,428	−1,905	211,523	221,072
Nuclear Weapons Incident Response	133,514	160,084	−1,429	158,655	221,936
Facilities and Infrastructure Recapitalization Program	169,383	181,613	−1,622	179,991	169,549
Environmental Projects and Operations	.....	8,669	−77	8,592	40,587
Transformation Disposition	.....	.....	.....	.....	77,391
Defense Nuclear Security	656,653	806,434	−7,201	799,233	737,328
Cyber Security	104,505	101,191	−904	100,287	122,511
Congressionally Directed Projects	.....	48,000	−768	47,232	.....
Subtotal, Weapons Activities	6,291,583	6,476,147	−58,167	6,417,980	6,618,445
Security Charge for Reimbursable Work	−33,000	−34,000	.....	−34,000	.....
Use of Prior Year Balances	.....	−86,514	.....	−86,514	−366
Total, Weapons Activities	6,258,583	6,355,633	−58,167	6,297,466	6,618,079

Public Law Authorization: Fiscal Year 2008 Consolidated Appropriations Act (Public Law 110–161) and National Nuclear Security Administration Act, (Public Law 106–65), as amended.

OUT-YEAR FUNDING PROFILE BY SUBPROGRAM

[In thousands of dollars]

	Fiscal Year 2010	Fiscal Year 2011	Fiscal Year 2012	Fiscal Year 2013
Weapons Activities:				
Directed Stockpile Work	1,762,079	1,789,979	1,760,218	1,776,388
Science Campaign	309,091	295,192	296,662	299,902
Engineering Campaign	148,863	146,565	150,475	153,907
Inertial Confinement Fusion Ignition and High Yield Campaign	434,007	381,173	373,005	377,762
Advanced Simulation and Computing Campaign	526,373	510,808	514,405	520,645
Pit Manufacturing and Certification Campaign	.....	.....	.....	.....
Readiness Campaign	170,003	161,139	161,130	164,295
Readiness in Technical Base and Facilities	1,904,398	2,153,557	2,275,909	2,372,916
Secure Transportation Asset	249,555	261,543	268,134	269,325
Nuclear Weapons Incident Response	229,661	235,211	242,425	250,947
Facilities and Infrastructure Recapitalization Program	192,945	196,379	195,096	194,779
Environmental Projects and Operations	37,288	39,026	37,468	36,040
Transformation Disposition	89,457	88,589	88,008	87,863
Defense Nuclear Security	818,285	817,809	793,856	814,928
Cyber Security	113,690	120,874	130,121	140,621
Total, Weapons Activities	6,985,695	7,197,844	7,286,912	7,460,318

NAVAL REACTORS—FUNDING PROFILE BY SUBPROGRAM

[In thousands of dollars]

	Fiscal Year 2007 Current Appropriation	Fiscal Year 2008 Original Appropriation	Fiscal Year 2008 Adjustments	Fiscal Year 2008 Current Appropriation	Fiscal Year 2009 Request
Naval Reactors Development:					
Operations and Maintenance (O&M)	747,648	739,100	−6,726	732,374	771,600
Program Direction	31,380	32,700	−297	32,403	34,454
Construction	2,772	10,000	−91	9,909	22,000
Total, Naval Reactors Development	781,800	781,800	−7,114	774,686	828,054

Public Law Authorizations: Public Law 83–703, ''Atomic Energy Act of 1954'';''Executive Order 12344 (42 U.S.C. 7158), ''Naval Nuclear Propulsion Program''; Public Law 107–107, ''National Defense Authorizations Act of 2002'', title 32, ''National Nuclear Security Administration''; John Warner National Defense Authorization Act for Fiscal Year 2007, (Public Law 109–364); Fiscal Year 2008 Consolidated Appropriations Act (Public Law 110–161); National Nuclear Security Administration Act, (Public Law 106–65), as amended.

OUT-YEAR FUNDING PROFILE BY SUBPROGRAM

[In thousands of dollars]

	Fiscal Year 2010	Fiscal Year 2011	Fiscal Year 2012	Fiscal Year 2013
Naval Reactors Development:				
Operations and Maintenance	782,087	811,651	827,164	831,084
Program Direction	35,754	37,054	38,354	39,754
Construction	30,800	21,050	14,900	29,000
Total, Naval Reactors Development	848,641	869,755	880,418	899,838

Senator DORGAN. Administrator D'Agostino, thank you very much. There are about 8 minutes remaining on this vote, I think what we will do is recess the subcommittee for about 10 minutes, and we will reconvene.

We'll call the subcommittee back to order.

COMPLEX TRANSFORMATION PREFERRED ALTERNATIVE

Mr. D'Agostino, again, thank you for your testimony. I will ask a couple of questions and then call on my colleague, Senator Domenici who will be here momentarily.

Your Complex Transformation Preferred Alternative, Mr. D'Agostino, calls for keeping all 8 nuclear weapons complex facilities. Some, including myself, are surprised that there's not a recommended closure of at least one site, or even one site.

As I understand it, OMB had the Cost Analysis Improvement Group do an assessment of the NNSA's Complex Modernization Programs, and one of the findings said that there were potential economic benefits from the relocation of the uranium operations from Y–12 to another site. The assessment highlighted the vulnerability of Y–12 and the fact that other than the HEUMF plant, virtually all other Y–12 buildings will require replacement.

I understand the final decision has not been made, but I believe you do specify Y–12 as the uranium center for the weapons complex.

Mr. D'AGOSTINO. Right.

Senator DORGAN. So, can you tell us—how did you come to this decision to retain the NNSA mission at Y–12?

Mr. D'AGOSTINO. Absolutely.

Senator DORGAN. As opposed to moving it?

Mr. D'AGOSTINO. Yes, sir, Mr. Chairman, I'd like to do that.

We did commission the Cost Analysis Improvement Group as well as an additional independent group—we had two independent teams—look at our preferred alternative, particularly from a cost standpoint.

The one thing I will start off with is, most of these studies typically do not take into account the value of the workforce that's needed to operate and deal with special materials, and uranium and the other materials, the work that happens at the Tennessee area, clearly there's a set of material there that requires a special workforce.

And, we actually have very good evidence, when we moved material out of Rocky Flats, on how difficult it is to re-establish a capability dealing with special materials. It took us much longer than expected, and cost a lot more money than we ever expected it to cost. I'm talking, in particular, in this case, about the plutonium issue.

But, in the case of Y–12, the evidence was clear that the CAIG said there was no clear winner on the decision whether to move those capabilities out, or not. In fact, it was neck-in-neck, dead even. And one of the things that came out of that was our desire to do what we're calling a "Phase II Cost Study", which is part of the Preferred Alternative process.

We put out a draft Preferred Alternative, and during the time when we're gathering public comment and input, we were also doing a Phase II Cost Study, to further evaluate these other factors, such as moving people, moving equipment, moving the material.

And, from my standpoint, it was very clear to me that because things were even from the CAIG report, the Cost Analysis Improve-

ment Group, that to err on the side of the people on the draft alternative, and then go evaluate, and do this additional study, before we get to a final position on a preferred alternative.

So, we are doing those Phase II cost studies for these materials.

Senator DORGAN. Are you going to keep us informed of those results?

Mr. D'AGOSTINO. Absolutely, sir.

Senator DORGAN. Let me ask you, as well, about the Kansas City plant. You have already decided to build a newer and more efficient facility there, and you're deciding to keep the new facility in Kansas City, as opposed perhaps to, considering moving it to other existing NNSA sites. Some have said Pantex at Sandia might be mentioned as alternatives.

My understanding is that the Kansas City site has done good work, has good people there, and I don't, with my question, mean to take anything away from them, but——

Mr. D'AGOSTINO. Right.

Senator DORGAN [continuing]. Let me ask, how have you come to a decision to retain the mission in Kansas City, when you could build the new plant at another site, when you weigh all of the alternatives, can you explain that to us?

Mr. D'AGOSTINO. Absolutely.

Senator DORGAN. And I understand, let me also say, you're seeking to have the General Services Administration (GSA) construct the new Kansas City plant, and then the NNSA will lease the facility. That means this subcommittee will never approve construction funds, because we won't be required to. Why did you pursue the GSA route for the new facility—do you use GSA in this manner for other large facilities as well, and do you have a cost analysis that would tell us whether it is cheaper to lease than for the NNSA to own?

Mr. D'AGOSTINO. Certainly. Regarding the Kansas City plant, one thing was clear, that we were in 3 million square feet in Kansas City, and we were spending $100 million more a year than we really needed to. So, the important thing is to deliver products to the Defense Department—and you're right, sir, the Honeywell organization out there has a tremendous reputation, they have a 99.99 percent quality and delivery record over many years.

But what was clear is that we needed to get out of that World War II facility. It was just costing too much. It's consistent with the theme of too old, too big, too expensive, and we needed to rightsize that facility.

So, we're going to shrink that footprint by over 60 percent, and save about $100 million a year.

Senator DORGAN. I'm not questioning whether you should do it, I was questioning the location, and also the decision to go through——

Mr. D'AGOSTINO. Right. Through the GSA.

Senator DORGAN [continuing]. GSA, which really bypasses our committee, in terms of construction funding.

Mr. D'AGOSTINO. So, from the standpoint of the location, since it's clear that I needed to get out of that current facility, I had the option of looking around, and you know, whether to put it at

Pantex, at Kansas City, or at—I'm sorry, at Sandia—or any other site across the complex.

And given Honeywell's—and that plant, in general's, high level of performance, given the quality of the workforce, I did not feel it was worth trying to move people—based on our experience of closing down Rocky Flats and closing down the Mound Plant—to satisfy that same mission.

And we decided, sir, to look at ways to acquire the project, if you will, and the GSA does do this for the Federal Government, and we felt that the lease approach made the most sense, it delivered the product, it had the lowest life cycle costs for the Government, plus it allowed—in the long term—as we expect missions to change over the number of years, it gives us an opportunity to be a bit more flexible—us, the Federal Government—to be a bit more flexible on how we satisfy the requirements.

Senator DORGAN. I'm just trying to understand where the approval is for doing this, if it doesn't go through an Appropriations subcommittee. Is there carte blanche authority for you to go to GSA——

Mr. D'AGOSTINO. No, sir.

Senator DORGAN [continuing]. And say, "I want to build a building?"

Mr. D'AGOSTINO. Absolutely not. We go through OMB first to get the facility appropriately scored, then it comes into the Environment and Public Works Committee, here in Congress, as part of a GSA package to get approval by Congress.

Senator DORGAN. The authorizing committee has signed off on this? Is that correct?

Mr. D'AGOSTINO. I don't know if it's considered an authorizing committee——

Senator DORGAN. It would be.

All right, thank you for that answer. I have other questions I want to submit to you in writing.

Mr. D'AGOSTINO. Sure.

NAVAL REACTORS PROGRAM

Senator DORGAN. Admiral Donald, there's been some discussion about new nuclear-powered Navy ships beyond aircraft carriers and submarines, most of it has been on a new class of cruisers. Could you comment on that, and what resources the Naval reactors program would need if the decision was made to build new nuclear-powered ships?

Admiral DONALD. Yes, sir. Thank you for the question. The Navy right now is in the process of what's called an Analysis of Alternatives for the new ship, which is the cruiser that would replace the Aegis-class cruisers currently in service. We've completed the part of the Analysis of Alternatives that applies to the propulsion plant. The remaining part really is about defining the specific mission and capabilities that the ship needs from a combat system and a radar system perspective.

Once that's done, then a decision would be made as to whether or not that ship would be nuclear-powered, or not. And, again, that's under review right now by the Secretary of the Navy, and the Chief of Naval Operations.

Should we—should it be chosen to be a nuclear-powered ship, we would—our plan would be to use existing components of existing designs to the greatest extent possible to help in cost, and get the most capability you can for the cost. But what it would really involve for us, was, in addition to the specific components that you have to buy, the reactor plant that you'd buy, itself, you'd also have to do some amount of redesign to fit those components into the ship, whatever type of ship they chose to buy.

So, in addition to component purchases, and the specifics of the plan itself, some re-design work would have to go into it, and likely some facilitization of existing manufacturing capabilities, that would have to be considered as well, sir.

Senator DORGAN. Admiral, thank you very much.

Senator Domenici?

MATERIALS, MISSIONS, AND MANPOWER

Senator DOMENICI. I was wondering if I might—you go ahead.

Administrator D'Agostino, your testimony makes a thorough case of the consolidation of materials, missions and manpower. However, in 13 pages of written testimony, I find only—find that only the reference to science and a handful of examples, primarily focused on past scientific achievements. There's absolutely no mention of scientific path forward, or a strategy to sustain the scientific excellence of the labs.

Could you please explain to us what this budget provides in terms of long-term planning to sustain science capabilities at the laboratory?

Mr. D'AGOSTINO. Certainly. We have an item in our budget—it's not a big item, it's about $5 million—to work on upgrading the accelerator at Los Alamos. But, more importantly, we have a number of facilities——

Senator DOMENICI. What is that for, again?

Mr. D'AGOSTINO. For the, upgrading the accelerator, the LANSCE Accelerator, however, it's clearly not enough to do any significant work in fiscal year 2009. In order to really do that work, it will likely cost well over $100 million to upgrade that accelerator—that's done a tremendous job over the past decades, in getting the scientific information that we need.

Our focus——

Senator DOMENICI. So, you're saying—you're telling this committee you need LANSCE in order to round out the scientific capability of the lab, and all you could get out of this year was $5 million?

Is that——

Mr. D'AGOSTINO. Well, I think there's more than that, Senator. I was going to add to that, if I could.

Senator DOMENICI. Go ahead.

Mr. D'AGOSTINO. For one thing, we—with the support of this subcommittee—we have now finished the DARHT project. I think in about 2 days, or so, we will actually be signing, doing the formal completion of the DARHT project at Los Alamos, which as you know, is a tremendous technical achievement.

We're in the mode now, sir, of actually operating all of these tools that have been appropriated over the last number of years, the NIF

facility is in its final stages of construction. As you know, sir, the MESA Project was completed 3 years early, and is now an active part of supporting our stockpile, particularly the work on the W76, and so, the concern I have is consistent with what you've described, what is the long-term science for Los Alamos, and what's our long-term strategy across the complex?

Our near-term strategy, sir, is to utilize the tools that we've built up over the last decade during Stockpile Stewardship, and there was a lot of utilization that we do need that is so important to do.

The concern that we have, and Director Anastasio may get a chance to talk about this, is what is that particular capability for Los Alamos? We haven't answered that question yet, but we're in the process of working with the Office of Science to lay out that right path for the laboratory. I think MESA and NIF will do that Livermore and Sandia, quite well.

Senator DOMENICI. Now, Administrator, we're approaching the 2-year anniversary of the new management team's take-over of Los Alamos. It appears to me that things are on the right track, with several of the deliverabilities met in pit manufacturing, super computing and improved site security. What is your impression of the operation at LANL?

Mr. D'AGOSTINO. Senator, I would say, I'm very impressed with what has happened over the last 2 years. A lot of people will point to maybe one incident or two, I look at the overall trend, and when I look at the overall trend, I see good indication—from security, for example, the laboratory has actively reduced its amount of classified removable media from over 80,000 pieces, now it's less than 5,000 pieces.

It has consolidated its vaults—we used to have 142, or 143 vault-type rooms. We're already down to 114, and I think the Director is trying to get that number down to the 20 to 40 range of vault-type rooms. We've centralized our classified document storage, and the accident rate has decreased by 35 percent at the laboratory.

From a project management standpoint, the laboratory is delivering on over 90 percent of its project deliverables on these milestones that we track in our systems—these are tremendous accomplishments—they've improved facility management by 11 percent, and all of this within a very difficult financial situation.

So, Los Alamos has done this on the basis of hard management, and my hat's off to the Director for putting that through.

We actually have similar types of changes going on at some of our other laboratories, and in addition to the programmatic accomplishments that you just described, a lot of times what gets ignored is the hard management part of the laboratory.

Senator DOMENICI. I didn't mean to isolate this one out, and thereby indicate that you weren't making advances on all of them, I just chose Los Alamos, because it had received so much adverse criticism——

Mr. D'AGOSTINO. Right.

Senator DOMENICI [continuing]. Two and three years ago, and had some security problems. It was bantered around up here as a laboratory that couldn't get things done, and I just wanted your observations for the first—it's only been 2 years for the new management, and you've told the committee what you think.

Mr. D'AGOSTINO. Yes, sir, thank you. I do think we have a bit more to go, but we're heading in the right direction, and I'm very encouraged by it, but conscious, as well.

Senator DOMENICI. I have a lot more, but I want to yield after one last question.

The budget provides $10 million advance for feasibility work on the RRW. You've been present when we've had an exchange between the chairman and myself, regarding whether or not we should fund that, and his view that we should not, my view that we should.

Ten million—but that's not enough to complete the research. It is my understanding that an additional $55 million is needed to complete this phase of the study. Can you tell me what will be gained if Congress provides the full $65 million needed to complete the feasibility study? What would, then, be the next steps? And back up and tell me why we need the $10 million, which we're going to have an argument about—somebody out there ought to be defending it—are you one who defends the $10 million?

Mr. D'AGOSTINO. I'm in defense of the $10 million, sir. I do think—I want to emphasize, I think it's important to emphasize—that this is a study, this is not about building a warhead.

From my view, the gain and the understanding is to help inform future administrations of an approach to better manage our nuclear weapons stockpile. I'm very concerned that if we continue down the path of rebuilding our cold war stockpile exactly the way we built it in the past, that we will lock in very difficult materials that we have had to deal with in the past, that are causing us so much problems now.

So, from that standpoint, what we would gain, in my view, is an opportunity for future administrations to actually understand what an RRW concept can actually deliver, in terms of driving the size of the stockpile down, and adding safety and security—additional safety and security—into our nuclear weapons stockpile. I think this is a matter of making sure everyone's fully informed, and making sure that it's clear, this is not a decision to build a warhead.

Your last part of the question was, why the $10 million, sir? It was clear in the very early days of January of this year that we hadn't achieved a consensus, and you know, we needed an opportunity to make sure that we had to drive home what this Reliable Replacement concept was all about. The $10 million in the budget request is there to make sure that all of the work that has happened over the last 2 years on this topic—and there has been some excellent work—did not get lost just because we immediately cut off funding on day one.

We take the views of congressional appropriations seriously, when we got the bill, Deputy Administrator Smolen issued a note out to the complex saying, "Stop work on RRW." And that literally means, stop work. And, you know, there's no way to really tie a ribbon around the information that you have appropriately, but we want to be able to close off that work appropriately, and at least put together some information for future administrations.

Senator DOMENICI. Thank you very much.

Senator DORGAN. If I might—I'm going to call on Senator Craig, and use the early bird rule back and forth, Senator Craig, Senator Reed then Senator Bennett.

My understanding is last year the administration was already beginning to put some amount of money in the Air Force budget—going beyond the Navy piece, with respect to RRW. That presumes, of course, that that program was going to be a continuum. And I, I mean, I—we have a disagreement about these issues——

Mr. D'AGOSTINO. Right, right.

Senator DORGAN. But, I think it's very important that we understand, how this fits in a much broader context of nuclear weapons policy. I appreciate the comments of Senator Domenici.

Senator Craig?

STATEMENT OF SENATOR LARRY CRAIG

Senator CRAIG. Mr. Chairman, thank you.

Gentlemen, thank you.

And Administrator D'Agostino, before I come to you with a question, I want to first thank the Admiral for the work we've done together at the lab. As you know, Idaho's lab was not a nuclear—a weapons lab. However, NNSA does work at the INL, mainly through the Navy nuclear program, and its use of the Advanced Test Reactor (ATR).

In 1967, the ATR was commissioned to support the Navy Nuclear Propulsion Program, tackling nuclear fuels reliability and material testing issues. And, of course, we know that history—probably one of the more successful ones, if not the most successful in the extension of life of our Navy's—our national nuclear fleet.

Last April, DOE designated the Advanced Test Reactor, the ATR, as a National Scientific User Facility, and that's where the cooperation of the Navy came in, and this would not have happened without the support that you've given us, and I want to thank you for that.

Today, the ATR, the National User Facility, is open for businesses and universities from all over the Nation, and they're able to use the facility for research and educational purposes. The INL also works on certain NNSA waste, such as sodium debris from Sandia National, and we also have some highly-enriched uranium weapons-grade materials for non-weapons research purposes.

Now, my question of you, Administrator. I want to talk to you about Building 651, and Building 691. As you know, infrastructure at most of our labs continues to be a problem, and a top priority, it is true at the Idaho lab. Our scientists and engineers perform research and development in facilities that oftentimes back-date into the 1950s.

These are facilities at the lab that were constructed in the 1990s to recycle the Navy's spent nuclear fuel. These two building have never been used, they're basically brand new, and sitting there. And I understand that for a relatively small investment, these facilities could be upgraded and used.

Your office looked at these facilities in the past to find alternative uses, funds have been made available in 2006, and in the Omnibus bill last year for the required upgrades, however, no work has begun, or is expected to begin any time soon. It's my under-

standing, understanding is that even Congress has provided the funds, there is a disagreement over the right mission, and who will be responsible for the facilities. So, my question is a relatively simple one—can you tell me what happened to the $5 million that was appropriated in 2006?

FUNDING OVERSIGHT

Mr. D'AGOSTINO. As to the specifics, I can't tell you at this point exactly what would happen. What I can talk about are the two buildings and how we looked at it from a Departmental view——

Senator CRAIG. Yes.

Mr. D'AGOSTINO [continuing]. If I could, Senator.

Senator CRAIG. Please.

Mr. D'AGOSTINO. Okay.

Those buildings, we looked at originally, a couple of years ago, as potential areas to store plutonium while we were trying to deinventory the plutonium we have at Hanford, as a—what I would call—an interim storage location.

Senator CRAIG. Those are the right words for Idaho, thank you.

Mr. D'AGOSTINO. Yes, thank you.

Well, the idea was getting the material out of Washington State, ultimately our plan was to disposition that material through the mixed oxide facility in South Carolina.

At the time, Savannah River was not in a position to accept plutonium in South Carolina, and we had a deep desire to try to reduce our security costs in Hanford, because we don't want to declare it a permanent site. And these buildings looked attractive to be studied, and in fact, they were studied.

The end result of that study was that in order to upgrade one of the buildings—and I believe it was Building 651—it would cost in excess of $300 million just to finish the building and put the security features in place.

Senator CRAIG. For the purpose you were looking at it for?

Mr. D'AGOSTINO. For the original purpose, that's right, sir. And we felt that that was a lot of—well, it just didn't make financial sense to move plutonium twice, spend $300 million just for an interim site. It made more sense to move it once.

Since that time, of course, we've started construction on a mixed oxide facility, and now we're in the position of shipping material directly to South Carolina, which is a safer and more secure way of doing it, and ultimately not resulting in material that potentially accumulates, and the emission associated with it. The MOX construction is underway, from that standpoint.

So, when we looked, it didn't make sense to use Idaho as a waystation, if you will——

Senator CRAIG. Right.

Mr. D'AGOSTINO. For plutonium. And ultimately that's what ended up happening. I can provide to your staff, sir, the analysis that was done in that case, if that makes sense.

Senator CRAIG. It does. And I appreciate that, also, answer, and I don't mean to sound as direct, as it might—answer the question.

Mr. D'AGOSTINO. Right, the $5 million?

Senator CRAIG. What happened to the 2006 appropriation of $5 million that was re-established in the 2007 budget, and somehow

nothing has materialized? Because this was a general upgrading of the buildings for future use?

Mr. D'AGOSTINO. Right.

Senator CRAIG. Okay, if you would do that, I would appreciate it.

Mr. D'AGOSTINO. Absolutely.

Senator CRAIG. Because it's the anomaly that it's in—it was put in over in the House, it's in your budget in buildings that aren't in your responsibility, as I understand it.

Mr. D'AGOSTINO. That's right. And——

Senator CRAIG. Thank you. So, I'm—we're just searching for some money.

Mr. D'AGOSTINO. That's right. And I think ultimately, because we had—there's, of course as you're probably aware, $14 million that was appropriated for this activity in the 2008 Omnibus, as well. And what we want to do—you mentioned earlier in your question about sodium debris bed material from Los Alamos——

Senator CRAIG. Right.

Mr. D'AGOSTINO. So, some of that money we would use for that purpose. But it would not require all of that money.

Senator CRAIG. Okay.

Mr. D'AGOSTINO. So, we'll be coming back, ultimately, with a reprogramming request.

Senator DORGAN. Administrator——

Senator CRAIG. Thank you.

Senator DORGAN [continuing]. He wants to know where the $5 million is, if you'd let us know, we'd appreciate that.

Mr. D'AGOSTINO. Absolutely.

Senator DORGAN. Thank you.

Senator CRAIG. Thank you.

Senator DORGAN. Senator Reed.

Senator CRAIG. Thank you, Mr. Chairman.

Senator DORGAN. Thank you, Senator Craig.

RELIABLE REPLACEMENT WARHEAD

Senator REED. Thank you very much, Mr. Chairman.

Mr. D'Agostino, can you tell us what the scope of work is in the NNSA budget for 2009 for the RRW concept? I ask that, because last year there was a specific RRW design line, attributed specifically to RRW, but then there was engineering and science work throughout the budget that was also attributed to the concept of RRW. Can you focus on what the scope of work is in this budget?

Mr. D'AGOSTINO. This budget has $10 million specifically in the RRW line, and the purpose of that money is to close on the cost and schedule and put—essentially tie the ribbon around, and gather in one spot, all the work that has gone into RRW.

What you're, I believe, referring to, from previous years, is the fact that there is very similar elements of our program, for example, in the Surety Campaign, for example, that Campaign's responsibility is to develop Surety technologies that could be applied to any future system or existing nuclear weapons system that we have. It's not focused on RRW.

The RRW line was focused on a particular design put forth by Lawrence Livermore National Laboratory, the ultimate lab design that was chosen.

Senator REED. But this work such as a Surety function, is that being coordinated with RRW, in the sense of, they're explicitly considering the possibility of moving forward with RRW development?

Mr. D'AGOSTINO. No, it's not—the Surety line is to develop a generic suite of Surety tools to be used, whether in RRW or not. But ultimately, what would have to happen, is once it's been decided that a Surety technology that was developed in this campaign was going to be used in RRW, we would have to stop work in that campaign, move it over to that Surety line. I think it's important for our laboratories to have the flexibility to continue to develop Surety technologies, because this effort is part of activities that bolster the skills that are so important to maintain.

Not just to maintain the stockpile—and particularly to modify it as it changes and ages—but also to hone the exact skills that we use to understand and defeat nuclear terrorism. If we happen to come across an Improvised Nuclear Device, these are the exact same people that will be deciding which wire to cut—the green wire or the red wire. And they only do that based on developing these generic skills.

Senator REED. Let me continue in another aspect of this, for many, many years, but certainly the last 15 or so—there's been an investment in facilities, to improve existing facilities and capabilities for the Stockpile Stewardship Program to maintain nuclear weapons without testing. And, in fact, about 15 years ago, the daunting technical problems associated with RRW would never have been considered.

But nevertheless, because we've been investing in the complex, we are now considering an RRW, and yet we're told now that there has to be more new investment in the complex for RRW. Can you talk about—comment upon that?

Mr. D'AGOSTINO. Absolutely, in fact, I will be very straightforward—we would need new investment, more new investment, to maintain our existing stockpile. We do not have the infrastructure to maintain our stockpile now. But the investment we need, just to maintain a nuclear deterrent whether it's a RRW-type future or life extension future—they're two different avenues.

What we're doing right now, is making the investments that would not preclude, essentially, going down either track. So, we're making the investments that cover both options.

A quick example would be plutonium infrastructure. My view is, we don't need two plutonium infrastructures in this country, we only need one, and so we have to look at maintaining one, smaller, safer, plutonium infrastructure. I think that plutonium infrastructure could be at Los Alamos. Same thing with uranium, and the like.

So, if we said RRW is not in our future—if the Congress says that, I understand how those decisions get made—that would drive the Administrator, myself or whoever follows me, to say, "Well, we absolutely need to make investments in facilities that we have decided to hold off making investments in."

Beryllium oxide, and beryllium metal work, for example, is one area that we decided 4 years ago—beryllium is bad, bad stuff, we don't want to work with it, we're not going to spend $300 million in Tennessee to reconstitute a capability we'd prefer never to have again in our stockpile.

That is still an open question—if we stayed with the existing legacy stockpile, at some point—and it won't be this year—but some future Administrator will be here, in front of this committee saying, "I need to build a beryllium oxide capability, and a beryllium metal capability." And it's just a fact of life, because our current stockpile relies upon beryllium.

Senator REED. Just a quick follow-up, but if you go the other pathway will a future Administrator be here saying they have to build some specific facilities unique to RRW?

Mr. D'AGOSTINO. No, because I believe, for example, one of the elements of RRW will simplify work on plutonium. Right now, we think we can simplify it and do it in a much smaller space. If we have to reconstitute a capability to work with plutonium, for the cold war stockpile, we would need much more space than we currently are planning for right now.

So, RRW takes a lot of materials off of the table that we'll never have to use again. And that's my main focus, is to get rid of as much of the hazardous material as I can. Physics doesn't allow us to get rid of uranium and plutonium at this point, but about everything else, we can do.

Senator REED. Thank you.

Mr. D'AGOSTINO. Yes, sir.

Senator DORGAN. Senator Bennett.

SUBTERRANEAN NUCLEAR TESTS

Senator BENNETT. Thank you very much, Mr. Chairman.

Mr. D'Agostino, I want to thank you for the wonderful trip that you arranged for me to visit Sandia, Los Alamos and Livermore, I learned a great deal, and I'm grateful to you and all of those who acted as host for that. I look forward to learning more. All I really learned was that, I don't know very much and sometimes that's the beginning of wisdom.

I'm impressed by all of the work you've done, and by your computer capability, and I want to just ask, for the record, do you foresee the need to resume underground nuclear testing at a time in the future—at a time in the foreseeable future?

Mr. D'AGOSTINO. Of course, if I could predict that far ahead, I probably wouldn't be in this business, but we think we have a handle in the near term on knowing what issues we have in our current stockpile. And, as you probably were aware, there are concerns that we have—the stockpile remain safe and reliable right now, but these are very complicated devices, they're not static, I think General Chilton called it a "chemistry project in motion." You've got very hazardous materials, and radiation and exotic materials together for long periods of time. So, they're very complicated.

I can't give you a definitive answer on that, but what I can say is we are very confident now that the tools that we have, and that the country's invested in over the last decade, can deal with most issues.

I know I'm not giving you a direct yes or no answer, sir——

Senator BENNETT. Yes, yes.

Mr. D'AGOSTINO. Because I can't give you one.

Senator BENNETT. Well, I left you an out, and let me repeat it again, with the same out—and I understand, by the way, that no Administrator, no one sitting in your position representing any administration would ever say "never."

Mr. D'AGOSTINO. Right.

Senator BENNETT. But, with the understanding—do you have any idea in the foreseeable future, that you might have to renew underground testing?

Mr. D'AGOSTINO. No.

Senator BENNETT. Okay.

It's important that we have that on the record——

Mr. D'AGOSTINO. Yes.

Senator BENNETT [continuing]. I got it from your predecessor, I need it for the people in Utah, to understand that we keep asking that question.

Mr. D'AGOSTINO. Right.

Senator BENNETT. Now, I was pleased that you requested an increase of 22 percent over fiscal year 2008, with respect to cyber-security.

Mr. D'AGOSTINO. Right.

CYBER-SECURITY

Senator BENNETT. As I mentioned to you, this is an issue I've been interested in now for a number of years. It may be difficult in this setting—which is not classified—but could you discuss the threat that NNSA and the other labs face from cyber attacks?

Mr. D'AGOSTINO. Absolutely. I'll discuss it in broad terms, if I could, and that is the laboratories and the Federal infrastructure that we have are literally bombarded with tens of thousands of attacks on a regular basis. Now, that doesn't mean all of them get through, because the people we have at our laboratories are very good at this. But, we are noticing a very significant increase in the amount of cyber-attacks.

Quite frankly, we put forth a 22 percent increase in the cyber-security investment area in this budget request. In all likelihood, we're going to have to continue that kind of ramp-up into the future, in order to develop the tools necessary to counter this threat.

A lot of the times, the security focus always is on physical—guns, guards, gates—because most of us can see that and understand that. In this case, there is the sense that the information that's possessed is extremely valuable, and we have to ramp-up on the cyber side.

So, we've got a long road ahead of us, and we have a lot more to do in this area. From a detail standpoint, I don't know if I want to get into too much detail.

Senator BENNETT. No, I have further questions, but I don't think this setting is the appropriate place to ask them. I think we can ask—have there, has there been a significant increase in, say, 12 months or 18 months? Or has it been just a steady kind of attack?

Mr. D'AGOSTINO. I see an ever-increasing rate, so the acceleration rate is increasing——

Senator BENNETT. It's logarithmic rather than arithmetic?
Mr. D'AGOSTINO. Yes, sir.
Senator BENNETT. I see, okay.
Thank you very much.
Thank you, Mr. Chairman.
Senator DORGAN. Senator Bennett, thank you very much.
Senator Feinstein.

STATEMENT OF SENATOR DIANNE FEINSTEIN

Senator FEINSTEIN. Thank you very much, Mr. Chairman.

And welcome, gentlemen, particularly you, Mr. D'Agostino, and I want to thank you, you know, we've talked on the RRW and other things, and as I've said to you privately, I'll say to you publicly—you have always been a straight shooter, and I very much appreciate that. And so you have very high credibility with me.

I want you to understand that I support the chairman in his mark, if he does remove the $10 million for the RRW. And that's really based on the fact that we need to have this congressionally appointed bipartisan commission examine United States strategic posture and nuclear weapons policy. And it's due to report its findings and recommendations to Congress and the President by December 1, of this year. And the Defense Authorization bill also required the next President to conduct a nuclear posture review, and report by December 1, 2009.

I really think the Congress—before it goes ahead with what, in my view, is a new nuclear warhead, should have these two things under its belt—should understand what's going to happen, how the strategic triad will or will not be changed, what our nuclear posture will be. And then, I think, it's easier to make this decision.

LAWRENCE LIVERMORE FINACIAL ISSUES

You also called me about Lawrence Livermore, and I'd like to ask you a couple of questions about it. You indicated to me that there were going to be 250 voluntary retirements, and about 500 involuntary retirements made. And the lab, because of the fact that it was an LLC, a limited liability corporation, the costs were higher.

And as I began to think about that—you know, the corporate management was supposed to make the lab more economically competitive, in addition to bringing good management. I understand the lab has lost its tax-exempt non-profit status? Is that correct? It is. And that the new management has underestimated retirement and health benefit costs? Is that correct?

Mr. D'AGOSTINO. I don't know if that's—mis-estimated might be a reflection of the times, on these costs, are increasingly going up.

Senator FEINSTEIN. And, has the yearly management fee increased from $8 million to $46 million?

Mr. D'AGOSTINO. Yes, ma'am, consistent with the terms of the contract.

Senator FEINSTEIN. Who receives those fees?

Mr. D'AGOSTINO. The limited liability corporation, which is composed of the University of California, Beditel, and a few other contractors, Washington Group.

I think there's one other fact——

Senator FEINSTEIN. I didn't know that when I talked to you, I've learned it since then, and it does cause me some concern. And so, let me ask you, what do you think about this management team?

Mr. D'AGOSTINO. Actually, I think very highly of the management team, and I'll say why.

First of all, we've got 2 years under our belt using a limited liability approach at a similar laboratory, Los Alamos.

And we've seen significant changes and improvements in management and efficiency at Los Alamos—I don't want to repeat an answer, but there are a series of improvements—11 percent improvement in maintenance of facilities, for example, at Los Alamos, significant reduction in the amount of security material that is around the laboratory, improvement in worker safety and worker health at the laboratory. As you may know, there's a term called "days away reportable," and total reportable cases at Los Alamos, we're now heading in the right direction, and we're starting to see, right now at Livermore, the same types of trends—a shift, an improvement in the safety of the workforce.

So, I have strong faith in the management team at that laboratory, and this approach of governance, which is a big difference from what it was before.

I now have a Board of Governors at Lawrence Livermore, for example. Norm Patis is the chairman, and I can go to him and express my concerns as a shareholder—I represent all of the shareholders in the country that have invested in that laboratory. And he, as the chairman, has the ability to act to provide corporate resources to help the laboratory.

We've seen it work at Los Alamos, and I'm actually excited about the opportunity to see it at Lawrence Livermore, as well.

There were three main reasons why we're in the situation of having to do an involuntary separation.

Senator FEINSTEIN. Let me be clear on this. My concern is that the fees go up at the time you lay off people. This is a very hard time to lay off people. And, it's a very hard time to lay off these people, because I don't know what available jobs there are for physicists and very highly skilled personnel, if these are whom you are going to involuntarily lay off. And at the same time, the management part of it is collecting increased fees. I'm not sure that's the right thing.

Mr. D'AGOSTINO. I will admit, Senator, that it sends a very strange signal. My job, and ultimately the job of the lab director is to put the lab in the best competitive situation. Right now, the costs of doing work at Lawrence Livermore are too high. The customers that come to Dr. Miller tell him this is an expensive lab to work at.

The lab has a tremendous future. It's has a future that's anchored by the National Ignition Facility, but also by its assets in intelligence, and in nuclear counterterrorism work, which I think are going to be very important to the country, whether we have a small stockpile or a large one—nuclear counterterrorism work is incredibly important, and we need to get those resources and that work into the laboratory.

It's an incredibly difficult decision, it's one that I do not take lightly, I can assure you, in this whole process. But I will admit,

it looks strange when you look at fees going up at the same time workforce is having to be reduced.

Senator FEINSTEIN. Well, I really question this. In the interest of full disclosure, Mr. Chairman, my husband is chairman of the Board of Regents of the University of California. And, you know, my responsibility is a little different. And I would really question—and I would ask you to look into—why the fees would go up at a time when you have to lay off 500 people involuntarily, let alone 250 voluntarily. It doesn't seem right.

Thank you, Mr. Chairman.

Senator DORGAN. Senator Feinstein, thank you very much.

I'm going to submit some additional questions to all three witnesses.

Senator Domenici wishes to make a final comment, and then I'm going to call the second panel to the witness table.

Senator Domenici?

RELIABLE REPLACEMENT WARHEAD

Senator DOMENICI. Thank you very much, Mr. Chairman.

Let me say first, General, I'm sorry we didn't have any questions for you, but I think we'll have some, we'll submit them.

I do want to say, however, that your presence and your rank and the fact that you are involved in very serious issues that confront us with reference to stockpile of the future and RTW—you're involved heavily in that, and you have long-term experience and that kind of makes me wonder what we need a brand-new group of people appointed by some—by the Congress to do the study work on this $10 million program and the future of it, when people like you are doing that work, in a formal way, and are very, very well-prepared, and prepared to tell us the answer to most of the questions, and we won't be using you for awhile, until we get that report, I guess.

But I want you to clarify for me, Mr. Administrator, I think I'm confused now as to what the $10 million would be used for?

Mr. D'AGOSTINO. What it would be used for?

Senator DOMENICI. Yes.

Mr. D'AGOSTINO. The $10 million would be used to make sure that past work has been adequately captured. So the money that we've invested over the last couple of years on this activity doesn't get lost.

Additionally, the money would be used to help answer the questions that were asked, and put forth in the fiscal year 2008 Omnibus Appropriations Act on advanced certification. One of the topics in the advanced certification omnibus line, talked about establishing this activity in order to address the JASON Report concerns about Reliable Replacement Warhead.

In order to address those concerns, we need to further develop and mature, one or two aspects of the design on RRW, so we can do that work to answer that question posed by Congress. We could have put that money in the advanced certification line, but I think what we wanted to do is make it crystal clear that we weren't trying to play games. These are activities that are associated with maturing some of the design elements to answer the advanced certification questions.

Senator DOMENICI. All right. So, General, you're fully aware with this, are you not?

General SMOLEN. Yes, sir, I am. And answering some of the JASON questions was as part of this, but there is a distinction. The RRW piece does refine the data that remains, but it's not really incurred yet.

Senator DOMENICI. Yes. Well, I'm having—now that you talked today with me, I'm even having more difficulty understanding why we wouldn't be doing it. I don't want to argue now with the chairman, we'll argue later, but what you tell me it's for, it's much—it seems to me to be almost common sense when you're stopping this program, and you don't know how long before you start it up again that, some of the things you've described we're going to do, we ought to do.

It has nothing to do with pushing the program ahead, it has to do with just tying a ribbon around it, and making sure we don't lose what we've done. And I don't understand the Jason answers as well as that, they may very well be what is concerning some people about this.

But I'd like you to help me later on, on that—I don't want to go out on a limb in fighting with the chairman on the floor, or anywhere else, if I don't understand that second part. But if that second part is as simple as the first part, and has so little to do with the future of an RRW, the program, than I feel like, number one, is it worth taking on? If it is worth taking on, it's rather easy to explain.

And I thank you both for that, and I want to repeat for the record, for you, Mr. Administrator, I had a lot to do with forming NNSA.

Mr. D'AGOSTINO. Yes, sir.

Senator DOMENICI. I worked closely with those who tried hard for a number of years to find somebody who could run the program. And I'm very, very disturbed that those who are looking for somebody to run the program—including this Senator who is helping—had you right in the backyard while we looked all over the Army, the military, the security network, and we put people in that didn't know how to do anything. In fact, they had NNSA going backward. And we found you.

And I've got to tell you, I don't only agree with the Senator from California about your integrity, you've got that, but you're doing a terrific job with a very complex relationship, because these three labs are complex with relationship of the work you do, because they're nuclear deterrent laboratories.

But we want you to pay attention to their future, too.

Mr. D'AGOSTINO. Yes, sir.

Senator DOMENICI. Because they must be around, and we want you to particularly be concerned about science in these laboratories. That's what they're for.

Thank you.

Thank you, Mr. Chairman.

Senator DORGAN. Well, Senator Domenici, you and I share a self-described common trait—we both lack understanding on this. I'm trying to understand it, as well, and you indicate you are.

Senator DOMENICI. That's right.

Senator DORGAN. And I would only observe, with respect to the RRW program, that there are a couple of things at work here. One is, what do we do, if anything? And number two is, when do we do it? And the only point I have made is there are larger and significant international issues that relate to our question about a nuclear weapons policy.

So, we will nonetheless have a longer discussion——

Senator DOMENICI. Right.

Senator DORGAN [continuing]. Perhaps in private, perhaps in the subcommittee and maybe on the floor.

Senator DOMENICI. And we will know what we're talking about before then.

Senator DORGAN. Well, maybe not.

But we'll enjoy it nonetheless.

Senator DOMENICI. We'll try.

Senator DORGAN. But, you know, these issues are very serious—very serious—and have substantial consequences, and I appreciate what you have said, I appreciate what Senator Feinstein has said, and our subcommittee will work through this.

Let me thank the subcommittee—had we asked General Smolen a lot of questions, I know he would have answered them very well, he spent part of his career in Minot, North Dakota.

General SMOLEN. Yes, sir.

Senator DORGAN. So, he was fully prepared.

We do intend to submit questions to the three of you, and we appreciate you being here, and ask that you would respond to written questions, and thank you very much.

Mr. D'AGOSTINO. Yes, sir.

Senator DORGAN. I'm going to call the next panel forward—this is a time when we have, for the first time in a long time—asked the directors of the three laboratories involved in weapons programs to come and testify before the Senate subcommittee.

I want to say that I—we have done that for a very specific reason. I think it is important to, for us to hear directly from the directors of the laboratories involved in this important work.

Dr. Mike Anastasio of Los Alamos is with us, Dr. George Miller of Lawrence Livermore is with us, and Dr. Tom Hunter of Sandia.

We have invited them all and are appreciative that they've taken time to come to Washington, DC to present testimony. The entire testimony in your submitted testimony will be made a part of the permanent record, I would ask the three of you to summarize your testimony, if you will, and we will begin with Dr. Anastasio.

Dr. Anastasio, why don't you proceed with your testimony followed by Dr. Miller, and followed by Dr. Hunter?

You may proceed.

STATEMENT OF DR. MICHAEL R. ANASTASIO, DIRECTOR, LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO

Dr. ANASTASIO. Chairman Dorgan, Ranking Member Domenici, and other distinguished members of the subcommittee, thank you for the opportunity to testify about the Stockpile Stewardship Program. I am Michael Anastasio, the Director of the Los Alamos National Laboratory, and I'd like to personally thank the sub-

committee for its strong support over very many years for this program that's so important to the country.

As I look to the future, until there's a policy change, I must assume the Nation will continue to have a nuclear deterrent. And consequently, our role is to do everything we can to ensure that we remain confident in that deterrent for our national security.

The Stockpile Stewardship Program that the country has been following has been the right approach. To remain confident while minimizing the need to ever do nuclear testing again.

We knew this would be a hard, because the science needed requires advances that are well beyond anything we'd ever done before. And that meant new tools—experiment and computational, and the people who can use them.

We've been making excellent overall progress over the last 12 years, with many examples of remarkable accomplishments, even though not all of these new tools are yet in place.

And to try to illustrate this, I thought I would just tell one little story as an example to illustrate. And imagine you're trying to understand what's going on inside a nuclear—or a mock—nuclear weapon. And you need to take a three-dimensional movie picture using x-rays.

But unlike a medical x-ray, the object you're exploring is exploding in front of your eyes, and the length of the movie you're trying to take is only a millionth of a second long. And to make sure you can stop the action that you're watching, the exposure time of this image can only last for a few ten-billionths of a second. That's DARHT, the new facility we're bringing online at Los Alamos, where we have just recently demonstrated that we can meet all, in fact, exceed, the technical requirements to accomplish the job I just described.

But that's not all. Once you have this image, or this movie, now you have to say, well, what implications does that have for the overall nuclear performance of this device? And for that we need to be able to use computer simulations to predict the nuclear performance instead of doing a test.

In the summer, the roadrunner computer that we've been developing with IBM, we anticipate will be the first computer in the world to ever achieve sustained performance of the petaflop, that's quadrillion calculations per second. I like a million billion better than quadrillion, maybe that speaks better. But we need a computer of that kind of horsepower.

Senator DORGAN. Doctor, is that the same as 1,000 trillion?

Dr. ANASTASIO. That is 1,000 trillion, yes sir.

Senator FEINSTEIN. Good for you.

Senator DORGAN. That's much simpler.

Dr. ANASTASIO. Okay, thank you.

But whatever it is, it's that level of computational power that we need to try to, to try to answer that predictive question, what nuclear performance will we get.

So that gives a little, I think, example of what we're trying to do. And there are many other accomplishments of outstanding science, that I describe at Los Alamos or the other three labs—or the other two labs.

I think that just as a momentary sideline, I think it's also important to understand that this very same science, the tools and the people, that's being used to meet other national challenges, from countering proliferation and terrorism to global climate modeling, and alternate energy sources, the Stockpile Stewardship Program is the program that's putting that science in place.

And if I think about the progress we've made, I think the most important thing, on progress in Stockpile Stewardship is that we now understand the status of the current stockpile, and the technical issues that control performance, better than we ever have. And that's reflected in the annual assessment letters that each of the three laboratory directors—and our predecessors—have sent in over the last 12 years.

So, with all of this, I have confidence in the stockpile today. But, I am concerned about the risks to success for the future. And let me describe two concerns—two areas of risk.

First, the risk to the long-term vitality of science at Los Alamos, to support our broad national security missions. The confluence of an aging infrastructure, demanding increasing standards for safety, security and the environment, a recent focus on near-term deliverables, and declining operation budget—operating budgets—are squeezing out science at the laboratory.

My second long-term concern is the continuing accumulation of change to the stockpile, and these changes will increase performance uncertainties, and pose increasing risk in a low margin, legacy cold war weapons stockpile. And by following a remanufacturing approach in a life extension program, we require a cold war production complex using the technologies and processes which are increasingly expensive, not fully functional, and do not provide an agile response.

To manage these growing stockpile risks, we should be doing more science, by increasing the use of our advanced tools, and further developing them. With a constrained NNSA budget, and the growing infrastructure costs, we are actually doing less science. The basic tenants of the Stockpile Stewardship Program are at risk.

The good news is that the progress we've made in understanding opens up alternative paths that we could go forward with, rather than a life-extension program. Such a path could include a transformed stockpile, with increased performance margins, hence reducing risks.

By also eliminating difficult materials, it could remit a transformed complex, further transformed than the NNSA plan is already outlining, and further reducing infrastructure costs.

PREPARED STATEMENT

So, in conclusion, it's my view that it's time for the Nation to set a path for the future, and provide a commensurate budget that will reduce and take on addressing these risks that I've outlined. Los Alamos remains committed to do all we can in our role as a national security science laboratory.

As so with that, I thank you for the opportunity to testify today, and I'd be happy to answer any questions.

[The statement follows:]

PREPARED STATEMENT OF DR. MICHAEL R. ANASTASIO

Chairman Dorgan, Ranking Member Domenici, and distinguished members of the subcommittee, thank you for the opportunity to provide a statement on the status and future of the Stockpile Stewardship Program. Today, the three directors of the national security laboratories are testifying before Congress about the Stockpile Stewardship Program for the first time since 2002 and much has happened in the interim.

The Los Alamos National Laboratory remains committed to sustaining confidence in the United States' nuclear weapons stockpile through a more fundamental science-based understanding of weapons performance, safety, and security. I am keenly aware of the daunting technical challenges demanded by this mission, requiring the best science, engineering, and technology that we can muster. I am responsible for providing this set of capabilities and skills for today and, equally important, ensuring that they are sustainable over the long term.

The three Department of Energy/National Nuclear Security Administration laboratories and their employees, working with the National Nuclear Security Administration production complex, are the basis and key driver for the successes of the Stockpile Stewardship Program. I personally appreciate the strong, vital support this subcommittee has provided over the years to enable us to execute our responsibilities.

Los Alamos National Laboratory in particular has been at the forefront of both nuclear weapons development and the Stockpile Stewardship Program. As you know, beginning with its designation as Site Y of the Manhattan Project, Los Alamos National Laboratory's core mission has been to conceive, develop, and sustain the U.S. nuclear deterrent. Currently, 61 percent of the Laboratory's fiscal year 2008 budget is allocated to carrying out our stockpile stewardship responsibilities (and associated security activities) and this mission is our highest priority. As a national security science laboratory, Los Alamos also applies this same science and engineering expertise to reducing threats from the proliferation of weapons of mass destruction and terrorism, and to provide for the Nation's energy security.

Today, I will focus my comments on our core mission and will shape my remarks around three main themes:

—A perspective on the evolution and content of the Stockpile Stewardship Program;

—An evaluation of the success of the Stockpile Stewardship Program over its 12-year evolution; and

—An assessment of the critical challenges and risks posed to retaining confidence in the Nation's nuclear stockpile as we look to the future.

DEVELOPMENT OF THE STOCKPILE STEWARDSHIP PROGRAM

My first key theme is that the Stockpile Stewardship Program has been the correct program for the United States, even though it presents extreme technical challenges.

With the end of the cold war, the Nation was at a crossroads with regard to our nuclear deterrent. Was the nuclear stockpile still required for the national defense? How long could the nuclear test moratorium, which began with a decision in 1992 by the United States to voluntarily cease underground tests of nuclear weapons, continue?

In 1995, the United States embarked on an ambitious effort to sustain the nuclear weapons stockpile without nuclear testing, an effort for which we could not guarantee success. Many felt that maintenance of adequate confidence in the stockpile required following the scientific method with the ability to continue at least partial yield nuclear tests to address the inevitable issues that would arise. As one of the participants, I can tell you it was a very dynamic period, with much expert debate within the scientific and defense communities that considered a range of possible options. The policy decision was made for a moratorium on nuclear testing coupled with implementation of a science-based Stockpile Stewardship Program. This decision was a very significant policy shift because the scientific and engineering capabilities needed to confidently execute this program did not then exist.

Congress, the White House, the relevant executive branch agencies, and the national laboratories outlined a core set of requirements that would be needed to take on this challenge. All involved understood that it would take at least a decade to bring together all the complicated elements of the new Stockpile Stewardship Program. It was also understood that success was in no way guaranteed because of the unprecedented scale of cutting edge science needed to accomplish this mission.

The approach relies upon developing, and validating through inter-laboratory peer review, a more fundamental scientific and engineering understanding of the per-

formance, safety, and security of weapon operations. This fundamental approach is based on a much more extensive range of non-nuclear above-ground testing and a vastly improved simulation capability—calculations with high resolution both in spatial description and in physical models. These calculations are necessary for addressing issues requiring extrapolation beyond tested regimes. The existing nuclear test database is used as a crucial resource for challenging the validity of these improved simulations. Ultimately, expert judgment and rigorous peer review assures that critical conclusions are drawn from the best available data, appropriate high-resolution simulation outputs, and results from the suite of evolving testing capabilities. Sound science is always at the core of our confidence.

In addition, enhancements to our weapon surveillance tools to accurately characterize the status of the weapons and the continued support of the production complex to extend the life of aging weapons were critical. The Stockpile Stewardship Program was described not as something with a fixed end-point, but as a new way of maintaining the Nation's nuclear weapons deterrent into the future.

Tools of Science-Based Stockpile Stewardship

With the loss of the ability to test the integrated operation of a weapon, more technically sophisticated and more frequent non-nuclear above-ground tests were essential. We judged at the time that these tests should include at a minimum:

—subcritical experiments to elucidate the dynamic behavior of plutonium driven by high explosives (now proceeding at the U1a facility at the Nevada Test Site);
—advanced radiographic experiments with multiple images and enhanced spatial resolution to provide multiple sequential views of high-explosive implosion dynamics with very fine detail (e.g., Dual Axis Radiographic Hydrotest Facility);
—ignition experiments to explore the fusion process crucial to the operation of modern warheads (e.g., National Ignition Facility); and
—enhanced surveillance tools for destructive and nondestructive testing and analysis to characterize the status of the stockpile.

At the same time, we judged that our computer simulations would need to be enhanced at least 1 million times in order to incorporate the known physics and scientific resolution. We judged that this computational requirement was the minimum necessary to model subsystem behavior and predict integrated weapons safety, reliability and performance without underground testing.

All of these capabilities were first-of-a-kind, requiring technical advances beyond the existing state of the art at the time. Because of technical challenges and funding limitations, all of these needed capabilities are still not yet fully in place 13 years later.

Production Complex and Life Extension Programs

Hand in hand with all the above capabilities was the need to have a production complex, working together with the laboratories, which could respond to any potential issues discovered through the weapons systems surveillance process. In addition, weapons would be returned for remanufacture to their original specifications in order to extend their life into the future so that they would regain their original characteristics. This requires the full suite of cold war production capabilities.

I am convinced that the Stockpile Stewardship Program has been the right program for the United States. What the Nation committed to over a decade ago is a very challenging set of integrated scientific capabilities that provide a means to validate the reliability of our strategic deterrent. For success, a balanced funding profile, between near-term actions and long-term capability investment was needed. A compromise of any one of the Stockpile Stewardship components will have significant consequences on the overall program. We have been able to sustain confidence in the nuclear deterrent through a program whose elements were beyond the state of the art at the program's inception—a remarkable testament to the people throughout the National Nuclear Security Administration complex.

THE STOCKPILE STEWARDSHIP PROGRAM HAS BEEN A SUCCESS

My second key theme is that the Stockpile Stewardship Program has been extremely successful since its inception.

Annual Assessment

President Clinton stated on August 11, 1995, "In this regard, I consider the maintenance of a safe and reliable nuclear stockpile to be a supreme national interest of the United States. I am assured by the Secretary of Energy and directors of our nuclear labs that we can meet the challenge of maintaining our nuclear deterrent under a CTB through a science-based stockpile stewardship program without nuclear testing."

For the 12th consecutive year in September 2007, the Laboratory Directors each signed their annual assessment letter reporting that there was no requirement for nuclear testing at this time to maintain the certification. I have had the honor to be involved each of these 12 years, personally signing a letter on five occasions. Today, these letters also include the additional assessments required by section 3141 of the Fiscal Year 2003 National Defense Authorization Act.

My 2007 assessment was based on the following comprehensive data set analysis:

—The details contained in the joint Los Alamos National Laboratory—Sandia National Laboratories 2007 annual assessment report based on the ongoing theoretical, analytical, experimental, and computational activities throughout the year.

—Assessments by applicable Los Alamos National Laboratory technical experts and managers on the adequacy of science-based tools and methods, tools and methods employed by the manufacturing infrastructure, and nuclear test readiness.

—An evaluation of the health of the stockpile by my Director's Red Team for annual assessment, an independent group of technical experts from Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories.

—The extensive and detailed technical reviews that I personally conducted of each warhead with technical experts on the Los Alamos National Laboratory warhead design and engineering teams.

Equally important, I assessed the current status of each weapon's nuclear package, the health of the overall Stockpile Stewardship Program, and the areas of significant risk.

Life Extension Programs

For most stockpile issues, the application of the Stockpile Stewardship Program tools has allowed the laboratories to resolve anomalous conditions with no impact to safety, reliability, or performance. For other issues that cannot be resolved in a timely manner through the Stockpile Stewardship Program, the following options are available:

—exceptions, limitations, or changes to the Military Characteristics or Stockpile to Target Sequence;

—component replacement or warhead refurbishment;

—introduction of more robust components that sustain the reliability of the stockpile;

—selective retirement of individual warheads or a warhead type;

—decertification; or

—nuclear testing.

In the past, all of these options have been employed. Today, we routinely use all options except decertification or nuclear testing to maintain the certification of warheads in the stockpile. In particular, we have completed the W87 Life Extension Program (LEP), achieved first production units on Alt 357 for the B61–7 and B61–11, as well as numerous smaller changes to gas transfer systems and non-nuclear components or subsystems to allow us to extend the life of these systems where possible. The first production unit for the W76–1 was not achieved on schedule as a result of a difficult materials production issue. Los Alamos National Laboratory is providing significant on-site technical assistance and coordination between the plant and Laboratory materials experts. The Laboratory also is working with the National Nuclear Security Administration to develop a recovery plan consistent with Department of Defense needs.

Reestablishing Pit Capacity

In 2007, Los Alamos National Laboratory produced the first war reserve pit manufactured in the United States since the Rocky Flats Plant was closed in 1989. By the end of fiscal year 2007, the Laboratory had manufactured 11 W88 pits (one more than required) and delivered 6 pits to the Pantex Plant for use in stockpile warheads. One of these has been assembled into a war reserve W88 warhead with the new 4T Terrazzo gas transfer system. The 4T was delivered for use and certified over 1 year ahead of schedule, a remarkable achievement that reflected excellent coordination among all sites in the nuclear weapons complex. As W88 warheads with Los Alamos National Laboratory manufactured pits enter the stockpile, warheads returned for surveillance will be available for disassembly and inspection, correcting a long-standing weakness in the W88 surveillance program.

Advanced Simulation and Computing (ACS)

Of all of the elements of the original Stockpile Stewardship Program this area has shown the most progress. Los Alamos, Lawrence Livermore, and Sandia National

Laboratories have led the way in developing the world's fastest supercomputers and then harnessing that power into tools needed to simulate our baseline weapons performance. This capability allows us to integrate our component level understanding into overall system performance. We have already enhanced our computing speed by more than a factor of one million with the ASC Purple machine at Livermore. The return on investment in this area has been high for the United States. For example, we are now able to confront the most challenging weapons physics questions that have plagued us for decades.

Los Alamos National Laboratory, in a partnership with IBM, has completed the installation of the first phase of the Roadrunner supercomputer for computations in support of national security science. Roadrunner is expected to become the world's first system to achieve a sustained performance level of a petaflop—a quadrillion calculations per second—early this summer. All three National Nuclear Security Administration laboratories will use Roadrunner for advanced physics simulations and predictive simulations of complex scientific processes.

Advanced Radiographic Experiments

Beginning in December 1999, warhead designers were able to see the clearest views ever made of the inside of an imploding, mock-weapon, test object with the successful operation of the first axis of the Dual Axis Radiographic Hydrotest Facility (DARHT). The images helped to validate new descriptions of high-explosive driven physics used in computer simulations of weapons performance.

With the advent of the Stockpile Stewardship Program, the decision was made to enhance the capability of the DARHT second axis to a 4-pulse machine. This enhancement required a completely new accelerator design that went far beyond what had ever been attempted before. Now in 2008, DARHT has met, and in many cases far exceeded, all of its technical requirements and expectations. We expect that this month it will officially become "dual" with the formal completion of the project for the second axis, adding both new capability and higher energy to this unique accelerator facility. The first use of this full capability in an implosion test of a mock weapon will take place later this year. The ability to produce multiple pulses with varied intensities in a preset time sequence allows warhead designers to specify what they want to see and DARHT will be able to deliver.

Ignition Experiments

The National Ignition Facility (NIF) is a critical piece of the Stockpile Stewardship Program and, arguably, is the most complicated and complex part. Developing a more detailed understanding of the fusion reactions that take place inside a weapon system remains one of the great challenges in the field of weapons science. Until the National Ignition Facility becomes operational, significant uncertainties will remain. I understand how difficult this project has been and am also acutely aware of the immense contributions that the full capacity of NIF will make to the overall Stockpile Stewardship Program. My conversations with Director Miller lead me to believe that this project is tantalizingly close to fruition.

Stockpile Surveillance

The weapons in the stockpile are not static. The chemical and radiation processes inside the nuclear physics package induce material changes that limit weapon lifetimes. We are seeing significant changes that are discussed in detail in my Annual Assessment letter.

The improvement in efficiency at Pantex helped us understand the present state of the stockpile and has greatly reduced our disassembly backlogs. This improvement allows us to get up-to-date technical information on the condition of weapon materials. We use the stewardship tools to evaluate the changes that continue within the stockpile. Using more detailed data from enhanced surveillance tools, we now have a better understanding of the major sources of stockpile issues:

—*Birth Defects.*—Flaws introduced into the warhead resulting from the manner in which it was produced, manufactured, or assembled;

—*Design Limitations.*—Warhead design decisions that were made that limit conditions under which a warhead can reliably operate because of incomplete scientific understanding of physics performance; and

—*Aging Effects.*—Changes in the stockpile that constantly take place and reduce the operating ranges or reliability of the warheads—effects that will continue to grow as the stockpile ages.

Los Alamos and the nuclear complex continue to make great strides in being able to both discover and correct these problems through advanced surveillance and nondestructive testing. As potential concerns are discovered, commonly referred to as SFIs or significant finding investigations, we are now able to use our new tools to rapidly assess, simulate, and model potential effects. At Los Alamos, we have dra-

matically reduced the number of open, unresolved SFIs over the last few years. Further, we are using our increased understanding to reduce the sampling rate for surveillance, while focusing on the important aspects for each warhead system.

Other National Security Applications of Stockpile Stewardship Tools

Additional important national benefits derive from these capabilities. Los Alamos applies this same science and engineering expertise to reduce threats from the proliferation of weapons of mass destruction and terrorism, and to provide for the Nation's energy security. The Laboratory works on the front lines and behind the scenes to prevent the use of nuclear or radiological materials as threats to national or international security. The Nuclear Nonproliferation Program and its predecessors originated nuclear safeguards and created most of the technology used to monitor and measure nuclear materials to assure their use in legitimate, peaceful purposes.

Recent Los Alamos Threat Reduction Accomplishments

—We delivered the fully integrated Cibola Flight Experiment space vehicle for launch with an orbiting computer capable of performing more than 1 trillion operations per second. This matches the performance of the best supercomputers from a decade ago, yet weighs only 40 pounds and requires only 80 watts of power.
—We rapidly and effectively supported the national response to the North Korean nuclear test. We provided the sole technical support from the Department of Energy at the Six-Party talks in Beijing on implementation of the North Korean denuclearization commitments.
—We recovered more than 1,750 U.S.-origin radiological sources in fiscal year 2007, including the first-ever disposal of Radium-226 sealed sources.

Recent Los Alamos Science and Energy Security Accomplishments

—We garnered over 102 major science awards from major external organizations.
—We developed the first high-resolution climate model for ocean circulation that allows us to better understand climate effects like El Niño and La Niña.
—We completed the 100th genetic sequence for the Joint Genome Institute.

These accomplishments represent a different application of the science underlying our core nuclear weapons mission. For example, many of the same people who would help us deal with potential nuclear terrorism incidents are our experts from the nuclear weapons program. Our global climate change expertise developed out of our need for knowledge on nuclear winter effects tied to the nuclear weapons program, and our supercomputer expertise was developed to simulate nuclear explosions. The dual-use aspects of our scientific capabilities allow for greater national return on investments, discovering other important applications for the stockpile stewardship tools. This broader use can often enhance their application for our core mission.

Even though all the elements of the Stockpile Stewardship Program are not yet in place and there are certain science processes that we do not understand yet, it is clear that there have been and continues to be significant accomplishments emanating from the scientists and tools of this program. This program has allowed us to sustain the necessary level of confidence in the stockpile. At the same time, we have much greater insight into the risks we face for the future.

INCREASING RISKS TO THE FUTURE SUCCESS OF THE STOCKPILE STEWARDSHIP PROGRAM

Today I have confidence in the United States nuclear deterrent and believe that within the next few years we will put in place the essential tools we envisioned at the outset of the Stockpile Stewardship Program. But I have increasing concerns as I look to the future. The stockpile continues to change because of aging and the necessity to remanufacture cold war weapons through the Life Extension Program approach. The accumulation of these changes, whose combined effects are difficult to quantify, will increase our uncertainties and pose increasing risk.

At the same time, there are ever-increasing standards imposed by environmental management, safety, and security requirements driving up the costs of the overall infrastructure. When coupled with a very constrained budget, the overall effect is exacerbated, restricting and, in some cases eliminating, our use of experimental tools across the complex. This puts at risk the fundamental premise of Stockpile Stewardship. At a time when our uncertainties are increasing, we should have a more vigorous program of non-nuclear, above-ground testing development and use, capabilities that allow us to validate and augment our developing predictive simulation tools. Regrettably, we are moving in the opposite direction.

TOUGH CHALLENGES AHEAD—LOS ALAMOS NATIONAL LABORATORY

I will first address specific challenges at Los Alamos National Laboratory. The risks at Los Alamos are similar to those that we face nationally.

Commitment to Science

Although available science-based tools and methods, both the large-scale facilities discussed above and the laboratory-scale capabilities that are the workhorse of our programs, have been adequate to address current issues in the stockpile, use of these tools is particularly at risk.

Los Alamos is one of the oldest sites in the nuclear complex whose facilities are difficult to maintain. Several of our aging facilities are nuclear facilities with extremely demanding standards for the environment, safety, and security. At the same time, the National Nuclear Security Administration's preferred alternative for complex transformation designates Los Alamos as the national center for plutonium R&D and production, further concentrating nuclear operations on our site. This increased responsibility for nuclear facilities and operations must be viewed in the context of a reduction in purchasing power of approximately half a billion dollars over the last 5 years Moreover, from our preliminary planning discussions with the National Nuclear Security Administration, we anticipate further erosion of our purchasing power by about $400 million over the next 5 years, assuming inflation and a flat level of appropriated dollars.

The growing costs of our infrastructure in this declining budget environment puts science at risk, especially our ability to execute and develop large-scale and laboratory-scale experiments. As the questions arise from a stockpile that inevitably continues to undergo change, we will be increasingly constrained in our ability to gather the data essential to assess those changes and to assure the efficacy of the recommended actions that must be made.

There are equally important consequences for the long term as well. All of the above near-term pressures constrain our ability to renew our aging infrastructure, which becomes more expensive to maintain the longer this renewal takes. Nationally, the program has become more focused on implementing near-term solutions at the expense of longer-term investments. The overall risks in the Stockpile Stewardship Program will be growing in the future. A balance of long-term investments in science and engineering with near-term actions will best serve the success of the program.

Commitment to the Scientists

Key to the ability of Los Alamos to respond to national needs over the long term is maintaining our technical skills—our people make us a premier national security science laboratory. We must be able to recruit and retain the best and brightest scientific talent. Los Alamos, like all the other national laboratories, draws and retains scientists because of the unique capabilities and opportunities we offer.

Part of what attracts people to a science laboratory such as Los Alamos, are the unique capabilities that are hard to find elsewhere. LANSCE, our neutron accelerator, has been a prime example of such a capability. Part of the future that we see for this facility is to transform it into the world's premier materials science and test capability, Matter-Radiation Interaction in Extremes (MaRIE). MaRIE will be designed to create and exploit extreme radiation fluxes and probe matter to achieve transformational materials performance through predictive multi-scale understanding. This facility would draw scientists to Los Alamos because it would represent a one-of-a-kind user facility whose scientific and practical applications could not be duplicated, and it would also be a key facet to the weapons program. When coupled with modern facilities and equipment and our role as a high-performance computing center (Roadrunner is the latest example), this facility would help ensure our access to the best scientific talent well into the future.

Because there is no advanced training program for nuclear weapons physics and engineering at our colleges and universities, the National Nuclear Security Administration laboratories need the right tools to attract scientists and engineers from the traditional disciplines and then teach them the true art of what we do. Without the continuing commitment to exceptional science, Los Alamos National Laboratory will not be able to provide the incredible diversity and depth of talent we require.

Commitment to Modern Facilities

Los Alamos is one of the oldest sites in the nuclear complex. With many old, high-consequence mission facilities, our Laboratory is very expensive to maintain. The Laboratory's main focus for infrastructure reinvestment priorities is replacing the Chemistry and Metallurgy Research building (CMR) and refurbishing our LANSCE accelerator facility. The CMR building was built in the late 1940s and early 1950s

to support scientific research of plutonium and other actinide elements. But after more than 50 years of service, it will be very difficult for the CMR to continue to meet modern safety, security, and operational requirements. Several sections have been closed to help manage risk, and the remaining laboratory space is harder and more expensive to use. As part of the National Nuclear Security Administration's preferred alternative for complex transformation, the CMR would be replaced by a new facility called the Chemistry and Metallurgy Research-Replacement (CMR–R) project.

The CMR–R project will include two buildings, one a light lab and administration building and the other a high-security R&D and storage building. Together these two structures will have a smaller footprint then the old CMR facility, and will be safer and more secure. The first phase of the CMR–R project, currently under construction, is the Radiological Laboratory Utility Office Building (RLUOB), a modern laboratory facility that will include 19,000 square feet of laboratory space, offices for 350 people, and a training facility. The second phase of the CMR–R project is the Nuclear Facility and construction will begin in the first quarter of 2010. The Nuclear Facility is being designed to provide 22,000 square feet of laboratory space, mostly dedicated to plutonium research, and will include a vault capable of storing 6 metric tons (6,000 kilograms) of plutonium. Neither the RLUOB nor the Nuclear Facility will manufacture pits. Regardless of whether the Nation elects to sustain the existing stockpile or transform it to a different configuration, congressional support of the CMR–R will be essential to conduct the fundamental research that supports the use of actinides in weapons and in other critical applications.

As I mentioned earlier in my statement, the Laboratory has developed a plan to sustain our long-term scientific capability in materials science through the experimental facility MaRIE. This plan could realistically take about a decade to reach full completion. A critical first step in evolving LANSCE, a fully functional but aging facility, into the MaRIE capability would be to start refurbishing the base accelerator within the next year with the help of Congress. LANSCE–R, as we refer to the refurbishment project, is an immediate critical step if Los Alamos is to continue using this facility for our classified weapons research activities. LANSCE is the only facility of its type in the country that can support both classified weapons research and unclassified scientific experiments. The weapons program relies heavily on capabilities derived from LANSCE, such as proton radiography, to interrogate fundamental physics cross-sections, the properties of various classified subsystems, and materials under extreme conditions.

Controlling Costs while Maintaining Mission Capability

I believe it is incumbent on my management team to focus on aligning overall costs with the mission requirements while at the same time finding efficiencies for more effective use of overall programmatic funding. At Los Alamos, we are actively working to reduce our physical footprint by roughly 2 million square feet (over one-quarter of the reduction has been completed in the last year and a half). We have internally absorbed the higher operating costs associated with the new contract structure. At the same time, we are providing significant leadership in the National Nuclear Security Administration's effort to achieve complex integration. Los Alamos is also working with the National Nuclear Security Administration and the Department of Energy in developing a third-party financing proposal to build a new science complex to help further consolidate our overall facilities footprint. This proposed new facility would eliminate over 450,000 square feet of existing substandard scientific space and house over a 1,500 scientific staff in the main Technical Area of the Laboratory.

The Laboratory has also had to make tough decisions and significant reductions in overall staffing levels. Since the beginning of fiscal year 2006, the Laboratory's total headcount has been reduced by over 2,100 individuals, about 46 percent of whom were part of the technical workforce. Matching the Laboratory's workforce to the size of our budget is my responsibility, but I am deeply concerned that with the loss of mission experienced scientists and engineers and the current budget outlook Los Alamos' ability to execute our mission is at risk for the future.

In summary, it is my view that it is in the national interest that we continue to develop and nurture the Laboratory's scientific talent and to invest in and rebuild our infrastructure in order to preserve Los Alamos National Laboratory as a premiere scientific institution. To achieve these critical outcomes, we need the help of Congress to ensure a stable, forward-looking, balanced budget profile to plan for the future.

CRITICAL CROSSROADS FOR THE NATIONAL STOCKPILE STEWARDSHIP PROGRAM

Since the moratorium on nuclear testing began in 1992, the Stockpile Stewardship Program has successfully maintained the nuclear weapons stockpile; however, it has become increasingly difficult and costly to sustain our legacy stockpile, manufactured in the 1960s, 1970s, and 1980s through refurbishment projects. The full cold war infrastructure required to support the older technologies and processes embodied in weapons developed during the cold war is expensive, not fully functional, and does not provide an agile response to evolving needs. The overall cost of the weapons complex is dominated by growing infrastructure costs, relatively independent of the number of weapons in the stockpile.

The continuing accumulation of small changes from stockpile fixes, life extension activities, and aging—with combined effects that are difficult to quantify—will result in larger performance uncertainties and pose increasing risk to the certification of low-margin legacy warheads.

With growing costs of the full cold war infrastructure and the prospects for a declining budget, it is becoming more difficult to maintain, use, or enhance the Stockpile Stewardship tools we have put in place. At the same time, there is a continued decline in the number of people in the complex who have direct experience with the design, manufacture, and testing of an actual weapon. Yet with the increasing risk to certification noted above, we should be moving in the opposite direction. To assess the impact of larger performance uncertainties with low-margin warheads we need a more detailed technical understanding of key, fundamental, technical issues to manage these uncertainties. This requires the more frequent use and further development of advanced laboratory-scale and large-scale capabilities and the simulation tools that can predict these results. The combinations of these factors cause me to conclude that the basic tenets of the Stockpile Stewardship Program are at risk.

With increasing risks to certification, I urge us to implement a more comprehensive inter-laboratory peer review process as part of Annual Assessment. Only one design laboratory would have certification responsibility for each nuclear package, but all the information for each would be readily available to both design laboratories. This would include, for example, the original nuclear test data, and all current data from surveillance and non-nuclear testing. Each would then execute a comprehensive assessment of the current nuclear package status and share that with the certification responsible design laboratory that would inform their final assessment. This approach is a near-term step that could mitigate the increasing certification risks and also provide more opportunities to build workforce expertise at both laboratories. In the past 2 years, Lawrence Livermore and Los Alamos have taken a step in this direction where the two directors are jointly briefed on the status of all the nuclear packages.

The Stockpile Stewardship Program has provided a much better understanding of both the stockpile status and the key technical issues that control performance and reliability. This insight has opened up the possibility of alternate paths forward beyond the current Life Extension Program approach. Such a path could include a transformed stockpile with increased performance margins, reducing risk. By also eliminating difficult materials it could permit a transformed complex, reducing infrastructure costs. It is clear to me that it is time to start making decisions about how to best accomplish this transformation.

Los Alamos fully supports the National Nuclear Security Administration in the development of a more cost-effective, lower-risk, and more responsive nuclear weapons complex infrastructure. A replacement warhead strategy, such as the Reliable Replacement Warhead concept, would have greater margin against performance uncertainties and would use design options with materials and components that would be less complex, safer, more secure, and easier to manufacture and maintain. Additionally, if the Department of Defense can have greater confidence in the National Nuclear Security Administration complex and its products, then that could lead to even further reductions in the stockpile.

CONCLUDING REMARKS

Los Alamos National Laboratory is committed to providing our technical expertise as part of the national effort to sustain confidence in a viable nuclear deterrent, while minimizing the risk for a return to nuclear testing, with the smallest number of weapons consistent with national policy goals.

The Stockpile Stewardship Program has been the right approach for the United States. We knew at the outset that it would be a very challenging program as the required scientific capabilities necessitated advances beyond the existing state of the art. There was no guarantee of ultimate success.

Over the last decade, there has been excellent overall progress with many examples of remarkable accomplishment. Among them is a much better understanding of the status of the current stockpile.

I am concerned about the risks to success for the future. First, the long-term vitality of science at Los Alamos to support our national security missions is at risk. Second, the continuing accumulation of changes to the stockpile will increase performance uncertainties and pose increasing risk in low-margin legacy cold war designs.

It is time for the Nation to set a path for the future that will address these risks.

Thank you for this opportunity to testify. I would be pleased to answer any questions you may have.

Senator DORGAN. Director Anastasio, thank you very much.

Next, Director Miller?

STATEMENT OF DR. GEORGE H. MILLER, DIRECTOR, LAWRENCE LIVERMORE NATIONAL LABORATORY, LIVERMORE, CALIFORNIA

Dr. MILLER. Thank you very much, Chairman Dorgan, for inviting me here and giving me the opportunity to give you my perspective of the health of the Nation's nuclear weapons program. I'd especially like to thank Senator Domenici, and personally thank him for his many years of leadership and service to this Nation, and importantly, for his extensive and exceptional stewardship of this country's science and technology and nuclear affairs, broadly.

I'm also very pleased that Senator Feinstein is here, and I thank her very much for her continuing support of the laboratories broad mission.

I'd like to summarize just a couple of points from my written testimony. Through Stockpile Stewardship, this Nation has been able to maintain an increasingly small nuclear deterrent, without nuclear testing. But the job's not done.

I'm concerned that the investments that have brought us to this point are at risk. As you and several members of the panel have pointed out, the country needs to make a series of decisions about the overall structure of the nuclear weapons program, and the policies associated with it. It is my view that—independent of the policy that we move forward—the science and technology embedded in the Science-based Stockpile Stewardship is necessary to succeed, because it is the intellectual underpinning for any decision.

I'm extremely proud of the contributions that Livermore has made to bringing the Stockpile Stewardship Program to this point. The W87 life extension program was the first life extension program certified without nuclear testing.

Through the Livermore, IBM, NNSA partnership, we have successively produced the world's largest computers, currently BlueGene/L at Livermore is 500 teraflops, half a petaflop.

Weapons simulations using these computers have shown us that there's much about the inner workings of a nuclear weapon that we do not yet understand, and they've pointed the way to the scientific capability that's necessary to continue to be able to certify the stockpile.

The national ignition facility is already the world's largest and most powerful laser, and it will be completed within a year. It will shortly bring fusion experiments, and the science of the cosmos to the laboratory. It's critical to enabling us to answer some of the most fundamental questions that we have about nuclear weapons performance.

Since the project was re-baselined about a decade ago, the NIF has been on-budget, on-schedule, and met all of its milestones. I thank the committee for its role in allowing NIF to move forward. I think you can take great pride in its accomplishments.

But the job of Stockpile Stewardship is not complete. The weapons are continuing to age, and the experienced weapons scientists are continuing to age. Some of the tools are just now coming online, they have yet to be applied to the full spectrum of problems that need to be resolved. As Mike said, DARHT has just recently been completed, it needs to be applied to the stockpile.

The simulations done on the BlueGene/L have pointed out that we need tens of petaflops sustained to be able to accurately understand what's going on in a nuclear weapon. NIF is not yet complete.

To ensure better confidence as we move forward, I believe it's important that we implement a more comprehensive peer review, whereby Livermore and Los Alamos more fully evaluate the entire stockpile each year, and it's essential that we complete this job.

I think we understand what the laboratories——

Senator DOMENICI. Would you repeat that again, please?

Dr. MILLER. Yes, sir.

I believe that we should implement a more comprehensive peer review, whereby Livermore and Los Alamos each year would more fully evaluate all of the stockpile, rather than just the systems for which they own have responsibility.

I think our job as laboratory directors is to provide technical options that can inform policy goals of the United States. To provide a weapons complex that's sustainable into the future, that has the smallest number of weapons consistent with policy goals, has the least costly weapons complex, and minimizes any need to return to testing.

As I look into the future, I'm concerned that the investments that have brought us to this point are not sustained. If they are not sustained, I believe a crisis in confidence will result.

Without a fully developed science and technology program, we will lose confidence in the stockpile, whether we have a life extension program, or some other. I believe we are seeing the signs of this concern borne out already, the critical investments in the accelerated super-computing initiative have already begun to decline. We are not able to fully utilize the experimental facilities that we have built.

The effects are already being felt at Livermore, with the reductions associated with last year's Federal budget, and the costs associated with the contract. By the end of this fiscal year, Livermore will have reduced its population by more than 2,000 people from the beginning of fiscal year 2007.

I believe that the Stockpile Stewardship Program is at a cusp of being able to ensure confidence in the stockpile without nuclear testing. I believe we can be successful if we push forward, I believe we can fail if we stop.

The weapons labs are centers of big science in this country. The resident expertise is being applied to the pressing problems of this country, of securing the Nation's defense and energy, and environmental and economic security.

Nuclear weapons expertise is critical to intelligence and understanding the problems of proliferation and terrorism. Nuclear weapons expertise is critical to the issue of understanding nuclear forensics. As a result of the scientific investments made by the Department of Energy and this subcommittee, these labs provide value to the country, well beyond nuclear weapons, in areas that I believe are the defining issues of this century.

PREPARED STATEMENT

We're doing a lot, but we can do more. All that we do is dependent upon the vital core of the nuclear weapons program. As you forward through the difficult decisions ahead of you, I ask that you think in terms of sustainment—sustaining and protecting what is most critical, and applying these critical resources to our country's, and the globe's, most defining and important problems.

[The statement follows:]

PREPARED STATEMENT OF DR. GEORGE H. MILLER

Mr. Chairman and members of the subcommittee, thank you for the opportunity to provide my perspectives on the fiscal year 2009 budget request as well as the health of the country's nuclear weapons stockpile and nonproliferation programs. I am the Director of the Lawrence Livermore National Laboratory (LLNL), a multidisciplinary national security laboratory with major responsibilities in nuclear weapons. My responsibility—and today's critical challenge—is to help enable a nuclear weapons program that is sustainable into the future with the smallest number of weapons and the least costly weapons complex consistent with policy goals and that minimizes the risk of needing to return to nuclear testing.

Because this is a time of significant change for the National Nuclear Security Administration's (NNSA's) nuclear weapons complex and our Laboratory, I open my statement with my perspective of the broad challenges we face. I then briefly highlight Livermore's accomplishments in NNSA programs and specific issues related to our activities. I conclude with summary remarks about my future vision for the Laboratory.

But first, I want to thank the Congress and especially this subcommittee for your continuing strong support of the Stockpile Stewardship Program and our important and technically demanding programs to reduce the dangers of proliferation of nuclear weapons. The Stockpile Stewardship Program continues to make excellent technical progress, but it is not yet complete and faces challenges in the years ahead. Critical decisions have to be made about the future of the U.S. nuclear stockpile and the weapons complex. Independent of specific choices made, it is clear that a strongly supported and sustained Stockpile Stewardship Program is necessary to ensure that this Nation can maintain the safety, security, and reliability of its nuclear deterrent over the long term. I support NNSA's goal of transforming the nuclear weapons complex to make it smaller, safer, more secure, and more cost effective. I recognize the realities that constrain the overall budget as we attempt to create a nuclear enterprise appropriate to the post-cold war era.

CHALLENGES FACING THE NNSA WEAPONS COMPLEX AND LLNL

Lawrence Livermore National Laboratory serves NNSA and the Nation by applying multidisciplinary science, engineering, and technology to meet urgent challenges to national security and global stability. Since the Laboratory's inception in 1952, a special national security responsibility has been ensuring that the Nation has a safe, secure, and reliable nuclear weapons stockpile. In addition, Livermore provides advanced technologies, integrated analyses, and operational capabilities to prevent the spread and use of weapons of mass destruction and strengthen homeland security.

Our special multidisciplinary capabilities are also applied to strengthen global security through research and development for advanced defense systems, abundant energy and environmental quality, biotechnology to improve human health, U.S. industrial competitiveness, and basic science. These activities—many directed toward finding innovative solutions to the great challenges of the 21st century—both derive from and depend on the core nuclear weapons science and technology and also con-

tribute to supporting the science and technology required for our nuclear weapons mission.

Livermore is an integral part of NNSA's Stockpile Stewardship Program and committed to helping the Nation transform the U.S. nuclear weapons complex and stockpile to meet 21st century deterrence needs. We need an affordable nuclear weapons complex; the smallest nuclear deterrent force consistent with policy goals; and a sustainable nuclear weapons program that provides confidence in the safety, security, and reliability of stockpile and minimizes the risk of the need for nuclear testing.

The Stockpile Stewardship Program was a very ambitious undertaking when launched a little over a decade ago. To date it has been highly successful in its two major goals. First, we had to develop and use vastly improved tools to much better understand nuclear weapons performance. I am proud of our tremendous accomplishments in this area. Great progress has been made and even more will come with quadrillion-operations-per-second (petascale) computers and high-fidelity simulations and the capability, beginning in 2009, to conduct thermonuclear weapons physics experiments at the National Ignition Facility (NIF). These tools are critically important to maintain confidence in our deterrent without nuclear testing. Second, we have to sustain the expertise—people—to ensure that the U.S. nuclear stockpile remains healthy by applying our improved understanding of weapons performance to deal with issues that arise in aging weapon systems without resorting to nuclear tests. So far, we have been able to do that. The first weapon system to successfully complete a life-extension program under the Stockpile Stewardship Program without nuclear testing was Lawrence Livermore's and Sandia's W87 ICBM warhead. Although the job is not over, I remain confident that science-based stockpile stewardship will continue to be a technical success provided that the Nation continues its investments in the science-based programmatic activities.

Budgets for NNSA nuclear weapons activities are tight and likely to remain so. As I look to the future, I am very concerned that the investments that have brought success to science-based stockpile stewardship might not be sustained. Over the longer term, failure to sustain investments in stockpile stewardship will result in loss of the expertise, capabilities, and activities that underpin the Annual Stockpile Assessment and certification of weapon modifications. That would lead to a loss in confidence in the stockpile. In some respects, the future is now at Livermore. The National Ignition Campaign, work needed to carry out the initial ignition experiments in 2010 and continuing research the following years, did not receive the full funding requested by NNSA in fiscal year 2007, fiscal year 2008, or fiscal year 2009, putting timely achievement of program goals at higher risk than would be the case otherwise. Reduced levels of funding for the Accelerated Simulation and Computing (ASC) program are eroding our capabilities to improve physics models in weapon simulation codes. Most tellingly, in fiscal year 2008 the Laboratory's spending power was reduced $280 million (compared to a $1.6 billion budget in fiscal year 2007)—about $200 million more than anticipated. While our focus is on reducing support costs and preserving programmatic capabilities, it is noteworthy that the staff will decline from about 8,900 in October of 2006 to under 7,000 FTEs by the end of fiscal year 2008. More than 500 of these are highly-trained scientists and engineers.

In a constrained budget environment, it is important to preserve critically needed capabilities and to stay focused on the long-term objectives: an affordable nuclear weapons complex supporting a smaller nuclear deterrent force sustained by a nuclear weapons program that provides confidence in the stockpile. Many details about the end state will have to be worked out—and depend on future nuclear weapon policy choices and world events—but it is clear that expertise, skills, and capabilities currently embodied in the NNSA national laboratories will be needed in the long term and can serve as useful technical resources to help define the path forward. In broad terms, a prudent path forward that would sustain science-based stockpile stewardship capabilities would be to:

—Consolidate selected capabilities and facilities such as those for special nuclear materials to reduce costs, while preserving intellectual independence of key capabilities that are necessary for technical peer review. Fully capable, independent peer review is critical when nuclear testing is not available.

—Sustain investments in capabilities at the NNSA laboratories that are both critical to the long-term success of stockpile stewardship and because of their technical leadership, provide a basis for expanding work for other Federal agencies and addressing important national priorities (e.g., at Livermore, NIF and ASC).

—Apply the capabilities at the NNSA laboratories to: continuing to improve their understanding of weapons physics issues to reduce uncertainties in weapon performance; managing issues that arise in stockpiled weapons; and working with the NNSA production plants and Department of Defense to devise an optimal

path forward for a certifiably safe, secure, and reliable stockpile at affordable costs.

—Work to reduce overhead costs at the NNSA laboratories and expand work for other Federal agencies in a way that supports and augments NNSA's investments in the laboratories.

This approach, which is fully consistent with NNSA's long-term objectives for complex transformation, provides an additional valuable service to the Nation. It secures a long-term role for the weapons laboratories as crown jewels of large-scale science supporting our Nation's defense, energy, environmental, and economic security. These laboratories are the largest multidisciplinary concentration of PhDs in the country—there are no other institutions like them. As a result of this investment in the scientific and technical infrastructure by DOE and this committee, the laboratories provide value to the country well beyond nuclear weapons work—in areas that are the defining problems of this century. And we can do even more.

NEW STOCKPILE STEWARDSHIP TOOLS AND THEIR APPLICATION

One of the greatest accomplishments of the Stockpile Stewardship Program to date is our tremendous progress in acquiring new tools and using them to better understand weapons performance. When nuclear testing was halted, there were significant gaps in our knowledge. Some nuclear test results remained unexplained and for some processes in the detonation of a nuclear device, our simulation codes were simply not adequate. Either the computers were not large and fast enough or we did not understand the physics—or both. For those processes, we depended on nuclear test data to adjust the codes.

A key focus of stockpile stewardship has been to fill the gaps in our knowledge to reduce our uncertainties about nuclear weapons safety, security, and performance as the stockpile ages. There are four major areas of investment in improved capabilities: more powerful computers, enhanced hydrodynamic testing capabilities to experimentally study the performance of (mock) primaries prior to nuclear explosion, an experimental facility to study the high-energy-density and thermonuclear processes in weapons (the National Ignition Facility), and tools to better understand the properties of plutonium. With these tools, we are striving to develop a better understanding of the physics, improve our simulation models, and use non-nuclear experiments and past nuclear test data to validate those model improvements. To date, some of the unknowns about nuclear weapons performance have been resolved, others we are close to resolving, and still others will require more time and effort. Greater knowledge increases the likelihood that we can resolve with confidence a problem that arises in stockpiled weapons without having to resort to a nuclear test.

Advanced Simulation and Computing (ASC)

The ASC program continues to be a remarkable success. The goal set when the Stockpile Stewardship Program began was a million-fold increase in computing power in a decade. It was estimated at the time that a computer capable of 100 trillion floating point operations per second (100 teraflops) would provide a minimum level capability to model the full performance of a nuclear weapon in three dimensions with sufficient resolution to illuminate the physics issues where we need to make significant improvement. The goal was attained with the delivery to Livermore from IBM of the 100-teraflop ASC Purple supercomputer, with over 12,000 processors and 2 million gigabytes of storage.

In April 2006, the NNSA laboratories began using ASC Purple for classified production runs. Soon after the machine began operating, a joint team of scientists from Livermore and Los Alamos performed a series of weapon simulations at unprecedented resolution using the most advanced ASC simulation software. The results gave dramatic new insights into weapons physics by pointing to phenomena not seen at lower resolution.

ASC Purple is now running a series of 6 month campaigns as a national user facility—managed in a manner similar to a unique, large experimental facility. Each of the NNSA laboratories propose computing work packages to be run as campaigns. These packages, which need ASC Purple's size and capability, aim at achieving major stockpile-stewardship milestones. The proposals are reviewed and prioritized for relevance, importance, and technical rationale; and machine time is allocated accordingly. ASC Purple is the first ASC system to be managed in this way.

A remarkable feature of the ASC program is its strong partnerships with the U.S. computer industry and major research universities to accelerate the development of supercomputer platforms, storage and operating systems, and software capable of running efficiently on machines with tens to hundreds of thousands of processors. An example of this is Livermore's partnership with IBM to develop and bring into operation BlueGene/L, the world's fastest computer. With its system-on-a-chip tech-

nology, BlueGene/L is a world apart from its predecessors. Compared with the previous record holder, it was 8 times faster and one-fourth the cost, and it required one-tenth the floor space and one-sixth the power consumption. In 2007, the machine was expanded from 131,000 to 208,000 processors and now benchmarks at 478 teraflops (with a peak speed of 596 teraflops).

BlueGene/L was acquired through the ASC program as a computational research machine for evaluating advanced architectures to help define an affordable path to petaflop computing (quadrillion operations per second). It has been remarkably successful, efficiently running simulation codes capable of addressing a broader range of weapons issues than originally envisioned. For 3 years running, simulations performed by researchers using BlueGene/L won the prestigious Gordon Bell Prize, which is awarded to innovators who advance high-performance computing.

It is vital that the laboratories build on the ASC program's outstanding successes and sustain the momentum toward petaflop computing and beyond by staying on schedule for the next planned ASC investments, the Roadrunner machine for Los Alamos and the Sequoia machine for Livermore, and continuing to maintain and develop the extraordinary simulations code systems. These next two machines take different approaches to the integrated problem of the computer architecture and simulations that must run on them. Sequoia is an extension of the successful BlueGene/L approach while Roadrunner takes a different approach. Both entail risks. The continuing advances in simulation required to resolve the remaining weapons performance issues are too important to pursue only one approach. One needs to succeed and hopefully both will. The generation of machines beyond them can combine the two different approaches.

Through the highly successful ASC program, we are turning simulation into a tool of predictive science—a full partner with theory and experiments. In particular, we are making key discoveries about physical processes in the functioning of a nuclear weapon that help us to improve models in codes and reduce sources of uncertainty in weapon performance. The more powerful Roadrunner and Sequoia computers are essential for implementing better physics models and as discussed below, the methodology we have been developing to quantify uncertainties in weapon assessments and certification. It is critically important to sustain the investments that have led to such remarkable successes in the ASC program.

Hydrodynamic Testing

Hydrodynamics testing is the most valuable experimental tool we have for diagnosing device performance issues for primaries in weapons before they enter the nuclear phase of operation. Hydrodynamics experiments are conducted at Livermore's Contained Firing Facility (CFF) at Site 300, our remote testing location, and the newly commissioned Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT) at Los Alamos. Experiments are executed in accordance with a National Hydrotest Program, which NNSA coordinates with the laboratories. The plans include both Integrated Weapons Experiments—large-scale tests of mock weapon primaries—and smaller-scale focused experiments, performed to study specific physics or engineering issues. Over the last 3 years, Livermore researchers performed nearly 20 Integrated Weapons Experiments at CFF for both Livermore and Los Alamos. The Laboratory has also conducted a long series of Focused Experiments to study radiation case dynamics after high-explosive detonation. Important information was learned from these experiments that led to major improvements to weapons code physics and new insights into nuclear weapons performance.

In the NNSA's preferred alternative for complex transformation, long-term plans call for closure of CFF when its use for hydrodynamic testing is no longer programmatically necessary and reduced NNSA support for Site 300. As these changes occur, Livermore scientists and engineers will carry out aspects of their important hydrodynamic experiments at other sites. It is critically important that sufficient funding be made available to fully utilize the new capabilities available at DARHT.

The National Ignition Facility (NIF)

NIF is critical to the success of the Stockpile Stewardship Program. It is the only facility capable of creating in a laboratory the conditions necessary to experimentally access all of the nuclear phase operations important to modern nuclear weapons. A wide range of precisely diagnosed experiments can be fielded at NIF. These experiments offer the promise of uncovering important physics details about the functioning of a nuclear weapon that were inaccessible or not examined in underground nuclear tests. NNSA scientists will gather necessary data to improve and validate physics models in simulation codes. Ignition experiments at NIF are critical to understanding fusion burn, a key phenomena in the performance of weapons in the stockpile. The design and execution of complex NIF experiments will also test

the expertise of NNSA scientists and sustain their critical skills and knowledge about nuclear design.

Major progress continues to be made on NIF and preparations for fusion ignition experiments with the 192-beam laser. As has been the case since being rebaselined in 2000, the NIF project is meeting all of its technical performance, cost, and schedule milestones. Current plans are to complete the construction project and laser commissioning in March 2009, and begin the first ignition experiments in fiscal year 2010. In July 2007, Laboratory scientists, engineers, and technicians commissioned the first of two 96-beam laser bays, assuring that each beam met NIF's operational and performance qualification requirements. In early 2008, all 192 main laser beams were precisely aligned. As of the end of March 2008, testing has been completed on 144 of the 192 beams, and installation has begun of the final optical modules that convert the laser light from infrared to ultraviolet. More than 3.1 megajoules of infrared-light energy have been fired, making NIF by far the world's most energetic laser. The extraordinary laser energy (more than 1.8 megajoules of energy in ultraviolet light), the remarkable beam quality, and the ability to shape the pulse to meet the specific needs of experiments provide NIF unique and unprecedented experimental capabilities.

The National Ignition Campaign (NIC), which is being managed for NNSA by our Laboratory, involves multiple laboratories and encompasses all work needed to carry out the initial ignition experiments in 2010 and continuing research the following years. Currently, the main thrust of NIC is to prepare for experiments in 2009 to validate the ignition target's design. Using 96 beams, these experiments will help select the optimum radiation temperature conditions for the ignition experiments. Computer simulations, which have been validated by their close match with data gathered from the 4-beam NIF Early Light experiments conducted in 2003–2004, indicate that NIF's laser beams will propagate effectively through the hot plasma generated in fusion experiments to achieve ignition.

NIC is following a well-defined technical path toward ignition on NIF and the transition of NIF to routine operations in 2012 as a highly flexible high-energy-density user facility for research for stockpile stewardship as well as energy security and the basic science of matter at extreme conditions. However, NIC did not receive the funding requested by NNSA in fiscal year 2007 and fiscal year 2008, putting timely achievement of program goals at higher risk than would be the case otherwise. We remain confident that ignition will be achieved soon after the experimental program begins in 2010. We have larger concerns about a shortfall in the future funding needed to sustain the experimental effort and achieve the full benefits of NIF's unique capabilities. NIF is the only source of the data about the "nuclear phase" of operation that are necessary for the long-term success of stockpile stewardship.

A number of key uncertainties about nuclear weapons physics relate to weapons performance near the time the device "goes nuclear" and thereafter. The process of boosting the fission yield of primaries, in particular, is key to weapons performance and is not well understood. NNSA has launched a science campaign to investigate the physics of boost and improve the modeling of it in simulations with the goal of reducing uncertainties in weapon performance. Data and insights from NIF experiments are required to develop and validate the models. Ignition and thermonuclear burn is another area where NIF experiments will enable scientists to better understand the underlying physics and reduce weapon performance uncertainties.

In addition, NIF experiments will provide critically needed equation-of-state, opacity, and material dynamics data to improve and validate weapon simulation models. NIF is unique in its capabilities for these types of experiments because of its ability to produce very high temperatures in a sufficiently large volume for a sufficiently long period of time and because of its excellent diagnostics. These same attributes make possible scaled experiments of hydrodynamic and radiation transport phenomena, with results that can be directly compared to simulation model predictions of nuclear-phase weapon performance. As it nears completion, it is extremely important that the NIF project be fully funded so that it can be completed on time and that NIF be fully utilized to demonstrate ignition and resolve the weapons physics issues critical to continuing to certify the stockpile without nuclear testing. At this point in the project, there is little flexibility to accommodate funding shortfalls without impact on completion.

Plutonium Research Capabilities and Facilities

Plutonium is an extremely complex material and understanding its detailed properties is a major scientific challenge. Completed in 2006, a concerted long-term study by Livermore and Los Alamos researchers concluded that the performance of plutonium pits in U.S. nuclear weapons will not sharply decline due to aging effects

over decades. Because plutonium is highly radioactive, over time it damages materials in weapons including the pits themselves. However, the study concluded that the plutonium pits for most, but not all, nuclear weapons have minimum lifetimes of at least 85 years. These results have important implications in planning for the weapons production complex of the future.

Still, there is much we do not know about the material and its properties at extreme conditions, which is important for weapon performance. In 2007, Livermore researchers met an important stockpile stewardship milestone by completing the development of a new description of plutonium under a variety of physical conditions—an "equation of state." This equation of state is based on advanced theory and simulation, including simulations only now possible with the ASC Purple and BlueGene/L supercomputers, together with very accurate data from diamond-anvil-cell measurements at high static pressures and dynamic experiments using the Joint Actinide Shock Physics Experimental Research (JASPER) gas gun at the Nevada Test Site. Work with this equation of state tells us that the technical research into this complex material must continue if we are to meet all the needs of the stewardship program.

Large-scale work with plutonium at Livermore's plutonium facility (Superblock), which has provided vital support to the Stockpile Stewardship Program, will be phased out. NNSA's plans for complex transformation include the consolidation of weapons-useable special nuclear materials to fewer sites. All Category I/II quantities of special nuclear materials are to be removed from Livermore by the end of 2012—2 years earlier than planned when the first shipment of plutonium left the Laboratory for Los Alamos in late 2006. Since then, two more shipments of material have been made to the Savannah River Site in South Carolina, where surplus nuclear materials are being consolidated.

Livermore researchers will continue research and development activities to better understand plutonium, improve plutonium part manufacturing processes, and provide surveillance of stockpiled weapons. Our plutonium research breakthroughs have proved important over the years, and the two-laboratory approach is a vital part of effective peer review processes. Category III amounts of nuclear materials will remain on the Livermore site for small-scale experiments. For other activities, Laboratory scientists and engineers will begin using facilities elsewhere to conduct their work. To this end, modern plutonium-capable facilities are necessary for stockpile stewardship and sustaining the Nation's nuclear stockpile. It is essential that the Nation proceed with the Chemistry and Metallurgy Research (CMR) Building Replacement Project at Los Alamos.

MANAGING THE HEALTH OF THE STOCKPILE

Lawrence Livermore is responsible for the nuclear explosive packages in five nuclear weapons systems—four that were designed by Livermore: the W62 ICBM warhead, the W84 cruise missile warhead (inactive), the B83 strategic bomb, and the W87 ICBM warhead; and one designed by Los Alamos: the W80 cruise missile warhead. The Laboratory monitors the health of the weapons for which it is responsible, conducts stockpile stewardship activities to better understand aging effects on weapons materials and components, develops advanced technologies for weapon surveillance, evaluates issues as they arise in stockpiled weapons, and pursues programs to extend the stockpile life of weapons. In addition, Livermore scientists and engineers develop advanced technologies for weapons surveillance and manufacture of weapons parts, and the Laboratory participated in the Reliable Replacement Warhead Feasibility Study.

Livermore also assists others in the nuclear weapons complex on production issues. Laboratory engineers are working closely with the Pantex and Y–12 Throughput Improvement Project teams to improve plant efficiencies, expedite completion of joint projects, and introduce new capabilities. In addition, Livermore helped with the resumption of weapon pit manufacturing at Los Alamos, where a team succeeded in fabricating and certifying new pits for the W88 submarine-launched ballistic missile warheads. The Laboratory supplied radiographic inspection capabilities, produced small-scale plutonium samples for testing, and provided engineering evaluations and peer reviews based on a wide range of independently conducted experiments and simulations.

Comprehensive Peer Review and Advanced Certification

Livermore is a key participant in formal review processes and assessments of weapon safety, security, and reliability. As part of the Annual Stockpile Assessment Process, Lawrence Livermore and Sandia prepare Annual Assessment Reports for each of the nuclear weapons systems for which the two laboratories are jointly responsible. As input to the reports, Laboratory scientists and engineers collect, re-

view, and integrate all available information about each weapon system, including physics, engineering, chemistry, and materials science data. These Annual Assessments use the advanced tools developed by the stockpile stewardship program—such as ASC, DARHT, and soon NIF—as an integral part of the assessments. This work is subjected to rigorous, in-depth intralaboratory review and to expert external review, including formal use of red teams.

With the aging of U.S. nuclear weapons, risks are growing that reliability issues will arise, and modifications to extend the stockpile lifetime of weapons are likely to become more complex and challenging to certify. In recognition of these issues, the JASON Defense Advisory Group recommended to NNSA that the weapon certification process be improved through expanded peer review mechanisms and refinement of the computational tools and methods for certification. To address these recommendations, NNSA was directed by Congress to implement a new Science Campaign called Advanced Certification to significantly increase the scientific rigor of certifying the Nation's nuclear deterrent. The campaign is focused on expanding and applying the Stockpile Stewardship Program methodology called the quantification of margins and uncertainties (QMU). By enhancing the scientific rigor and transparency of QMU, the Advanced Certification Science Campaign will improve the quality of the assessments and enable better peer review by external panels of experts. These efforts will expand the applicability and validity of the process, initially developed for the existing stockpile, to complex Life Extension Programs and reuse of previously produced components such as pits, and they will answer questions raised by the JASONs in their consideration of the Reliable Replacement Warhead.

In conjunction with the Annual Assessment process, the laboratories have recommended that a more Comprehensive Peer Review process be implemented. In this process, responsibility for assessing a nuclear package in a weapon system will remain with the current responsible design laboratory. However, surveillance and underground test data for all stockpile systems will be accessible to both design laboratories, and each laboratory will annually carry out comprehensive independent analyses of all stockpile systems, thereby enabling in-depth, intensive laboratory technical peer review. This effort will provide the responsible laboratory and NNSA with more comprehensive evaluations of the stockpile and more efficiently apply complex-wide resources to address time urgent stockpile issues, such as significant finding investigation (SFI) resolution. I believe that adding the Comprehensive Peer Review process is the single most important action to take to improve confidence in the nuclear deterrent in the absence of nuclear testing.

Life-Extension Programs (LEPs)

The LEP that refurbished the W87 ICBM warhead was a successful example of stockpile stewardship. Congress authorized the W87 LEP in 1994, the first rebuilt W87 was delivered back to the Department of Defense (DOD) on schedule in 1999, and Lawrence Livermore and Sandia completed formal certification in 2001. NNSA and DOD established an extensive technical review process to certify the design changes and production procedures. The process entailed thorough internal reviews at Livermore, technical reviews by NNSA (including peer review by Los Alamos), and reviews by DOD. Throughout the program, the Laboratory collaborated with the production plants, working to ensure the quality of the W87 refurbishment work.

Subsequent LEPs are proving to be challenging, and future ones can be expected to be even more difficult because there are going to be more things that need to be fixed—that happens with age. Nuclear weapons include a variety of reactive and organic materials sealed in close proximity in a hostile radiation environment. In some weapon systems, we are beginning to see aging signs that concern us. Cold-War-era weapons were designed to meet stringent military characteristics (MCs). The limits of what was possible were often pushed in the design of currently-deployed weapons. Ease of manufacture or long shelf-life were lower design priorities. Exotic and/or environmentally unfriendly materials are used in a number of instances to improve performance, and manufacture of the weapons entailed numerous steps that are difficult to exactly reproduce. Furthermore, while there is a basis for high confidence in the performance of the stockpiled weapons as they were produced, some designs do not have large performance margins, which makes their performance less resilient to change. These factors increase the difficulty of certification of any modifications in refurbishments and the expense of rebuilding the weapons.

Reliable Replacement Warhead Feasibility

After authorization by Congress, the Nuclear Weapons Council launched the Reliable Replacement Warhead (RRW) Feasibility Study in 2005. The goal of the RRW is to replace existing aging warhead systems with designs that more closely meet the requirements of the post-cold war era. The RRW would include advanced safety

and security technologies, and it would be designed to have much larger performance margins than the system being replaced. Large performance margins make it easier to certify reliable performance without underground nuclear testing. These designs would be based on devices that were well tested previously, further obviating the need for nuclear testing. They would be manufactured from materials that are more readily available and more environmentally benign that those used in current designs. The objective is for these modified warheads to be much less costly to manufacture by a smaller, modernized production complex. The RRW is to maintain the current military capability—not to improve it.

In early 2007, NNSA announced its decision that Livermore and Sandia national laboratories would provide design leadership for the RRW for the U.S. Navy. After the decision, NNSA and the Navy began work to further define and develop detailed cost estimates for the RRW program. This work was intended to support a future decision to seek congressional authorization and funding in order to proceed into system development and potentially subsequent production. The effort has since been halted. Seeking clarification on a number of related policy and technical issues, Congress stopped funding for RRW work in fiscal year 2008. The Nation would benefit from a clearer view of the costs of RRWs versus programs to extend the life of existing warheads or a blending of the RRW and LEP approaches—together with the technical challenges and risks of the various options. Considerable technical work is needed to support an informed decision about the preferred options for the Nation's enduring nuclear deterrent and nuclear weapons complex. It is important that we expeditiously start to develop the needed information.

SUPPORT OF DEFENSE NUCLEAR NONPROLIFERATION PROGRAMS

Livermore engages in a wide range of activities for NNSA's Defense Nuclear Nonproliferation Program, whose important mission is to address the threat that hostile nations or terrorist groups may acquire weapons-useable material, equipment or technology, or weapons of mass destruction (WMD) capabilities. We contribute to almost all program areas because the Laboratory takes an integrated, end-to-end approach to its WMD nonproliferation work—from preventing proliferation at its sources, to detecting proliferant activities and identifying ways to counter those efforts, to responding to the threatened or actual use of WMD.

Another feature of the Laboratory's work is that we work closely with end-users of our technologies and systems so that our research and development efforts are informed by real-world operational needs. Livermore, in fact, supports several sponsors with unique operational capabilities. For Defense Nuclear Nonproliferation these include the National Atmospheric Release Advisory Center (NARAC), the Nuclear Incident Response Program, and the Forensic Science Center, which supports multiple sponsors. NARAC is the source of technical capabilities that also support the Department of Homeland Security's (DHS's) Interagency Modeling and Atmospheric Assessment Center. As a result of our special capabilities, the Laboratory is also responsible for DHS's Biodefense Knowledge Center and DOD's Counterproliferation Analysis and Planning System and the Homeland Defense Operational Planning System. The uniqueness of Livermore's capabilities is borne out by the fact that we are one of only 12 world-wide laboratories, and currently the only one in the United States, certified to analyze samples pertaining to the Chemical Weapons Convention and the only certified forensics laboratory able to receive all types of forensics evidence—nuclear, biological, explosive, and hazardous chemicals.

Selected examples of the Laboratory's activities in support of Defense Nuclear Nonproliferation include:

—In support of the Global Threat Reduction Initiative, Livermore is leading the effort to secure more than 1,000 radioisotopic thermonuclear generators deployed across Russia. Installed in the 1970s as remote power sources, these devices are highly radioactive and largely unsecured, thus posing proliferation and terrorism risks.

—In support of the Material Protection Control and Accounting (MPC&A) program, Livermore completed MPC&A upgrades for the last two Russian navy sites in the Kamchatka region in 2007. The Laboratory also leads the Federal Information System effort to establish a comprehensive national nuclear material accounting system for Russia.

—In a significant breakthrough to strengthen international nuclear safeguards, a team of researchers from Lawrence Livermore and Sandia recently demonstrated that the operational status and thermal power of reactors can be precisely monitored over hour- to month-timescales using a cubic-meter-size antineutrino detector. The detectors could be used to ensure that nuclear fuel in civilian power reactors is not diverted for weapons purposes.

—In support of efforts to monitor for underground nuclear explosions, Livermore develops tools and methodologies for detecting seismic events in regions of proliferation concern. In 2007, Laboratory scientists produced regional seismic calibrations for the Persian Gulf and surrounding regions, and they developed improved methods for distinguishing the waveform for earthquakes and nuclear explosions in North Korea.

—The Laboratory works on a variety of advanced detection capabilities. One example is major success in 2007 in developing a passive technique to detect shielded highly-enriched uranium, an important breakthrough for homeland protection.

All of these capabilities are built upon the science and technology infrastructure required to meet our nuclear weapons responsibilities.

SUMMARY REMARKS

On October 1, 2007, a newly formed public-private partnership, Lawrence Livermore National Security, LLC (LLNS), began its contract with the Department of Energy to manage and operate the Laboratory. LLNS is honored to take on the responsibility. We see a future with great opportunities to apply our exceptional science and technology to important national problems. To this end, we have identified four top-level goals.

First, we will work with NNSA to provide leadership in transforming the Nation's nuclear weapons complex and stockpile to meet 21st-century national security needs. As in NNSA's preferred alternative for complex transformation, we envision Livermore as a center of excellence for nuclear design with centers of excellence for supercomputing with petascale machines, high-energy-density physics with the National Ignition Facility (NIF), and energetic materials research and development with the High Explosives Applications Facility (HEAF). We are vigorously supporting the goal of consolidation and working toward eliminating Category I/II quantities of special nuclear material from the site by 2012.

Second, we will carry forward Livermore's tradition of exceptional science and technology that anticipates, innovates, and delivers. This is the science and technology that brought into operation currently the world's most powerful computer and used it the last 3 years in a row to win the Gordon Bell Prize with amazing scientific simulations; that is finishing commissioning of NIF and preparing for experiments to achieve the power of the sun in a laboratory setting for national security, long-term energy security, and scientific exploration; that is developing advanced radiation detection systems as well as analysis-on-a-chip technologies and DNA signatures for rapid detection of pathogens for health and security applications; and that has provided critical technical support since 1990 to the Intergovernmental Panel on Climate Change, which was a co-winner of the Nobel Peace Prize in 2007 for its work.

Third, we will aggressively make available the core scientific and technical capabilities of the Laboratory to meet pressing national needs in areas that build on and contribute to the core missions and strengths of the Laboratory. As I highlighted in this testimony, the Nation and the world face many complex challenges in the 21st century that require the exceptional science and technology and sustained multidisciplinary efforts that the Laboratory can offer.

Four, we will enhance business and operational performance, paying particular attention to safe and secure operations and improving our operational efficiency and cost effectiveness. Public trust in our Laboratory depends on meeting mission goals through safe, secure, disciplined, and cost-efficient operations.

LLNS' start as managing contractor at the beginning of fiscal year 2008 coincided with the reduction of $280 million in spending power at the Laboratory. We have been working to dramatically reduce support costs and the staff will decline from about 8,900 in October 2006 to under 7,000 FTEs by the end of fiscal year 2008. More than 500 of these are highly-trained scientists and engineers. The change is painful, but it is my responsibility to "right size" the Laboratory to budget realities.

It is the Nation's responsibility to "right size" the NNSA laboratories to their important, continuing missions and their broader responsibility to "think ahead" and pursue multidisciplinary science and technology in anticipation of emerging national needs. I urge your continuing support for a strong Stockpile Stewardship Program and for sustaining the NNSA laboratories' work on the science-based stockpile stewardship and NNSA nonproliferation programs as well as other activities to meet vital national needs.

Senator DORGAN. Dr. Miller, thank you very much.

Finally, Director Hunter, from Sandia.

STATEMENT OF DR. THOMAS O. HUNTER, PRESIDENT AND DIRECTOR, SANDIA NATIONAL LABORATORY, ALBUQUERQUE, NEW MEXICO

Dr. HUNTER. Thank you, Chairman Dorgan, and Senator Domenici, and Senator Feinstein. It's a pleasure to be before you today.

I'm Tom Hunter, President of Sandia National Laboratories. And our principal mission, as you know, is to provide and support the non-nuclear subsystems for all of the nuclear weapons in the stockpile. We also support a wide range of research and development, in other areas of national security.

I've presented written testimony, as you've noted, I'd like to summarize a few points, perhaps some of the same points the other directors mentioned, but I'll focus on them in a little different way, and then be glad to answer questions.

Let me first talk about Stockpile Stewardship. In my view, Science-based Stockpile Stewardship has made exceptional progress since its inception, over a decade ago. The Nation asked us to stop testing, to stop development of new weapons systems, and to invest in key scientific and engineering capabilities that would allow the continued certification of the stockpile. We've done that.

Along the way, we've been leaders in the development of many key areas of science, in particular, advanced modern super-computing, high-energy density physics, advanced microsystems, and many areas of material science.

One of the areas I'm most proud of, to have been associated with, at our laboratory is the Mesa facility, which was mentioned earlier by Director D'Agostino, when he said that we have completed on-schedule, and ahead of budget. In that facility, we build the small, little devices that can be put in nuclear weapons and I usually like to say, there we build little things you can't see, that do things you can't imagine.

Today I, Dr. Anastasio, and Dr. Miller—Mike and George—continue to support the annual assessment of the safety and reliability of the stockpile. We independently provide a personal statement of the condition of each of the systems in our stockpile. I don't think I can describe in words how significantly we take that responsibility—it means a lot to us professionally and personally, we do it each year, and are in the process of doing it this year, as well.

This annual assessment is a matter of both legislative requirement, and personal accountability. Behind it stands the investment of the Government, the work of many dedicated scientists and engineers, and our personal credibility and reputation, and that of our institutions. The stockpile needs, and will continue to need, attention. The stockpile will age. Issues will have to be resolved. As time progresses, we must maintain confidence that our deterrent is effective. As we move forward, it is essential to recognize the need for a vital, scientific foundation to support this confidence, and to make wise choices about the composition of the stockpile and the nuclear weapons complex that it supports.

I believe it is important to continue the investigation of a replacement strategy for legacy, cold war era warheads. A right-size stockpile that is safer, more secure, has more inherent performance margins, and can be maintained more effectively, should be our mutual goal.

The nuclear weapons complex must be transformed to be more effective. It must work better, operate more safely, be better integrated, and cost less. The NNSA's program for complex transformation is very important. We've already begun at our lab, we've already completed removal of all discrete category two and category three nuclear materials from our site. We've already achieved a reduction of 18 percent of our workforce since 2004, that supports nuclear weapons.

We're working to change our work mix at our California site. We're re-looking at our approach to super-computing. All of these transitions must be managed effectively so that our ability to effectively support the stockpile is maintained. We must use the insight from our Stockpile Stewardship Program to chose which infrastructure investments are made, and decide when they will be made.

The capabilities we have developed to support our nuclear tern have allowed us to make many, many contributions in other areas of national security—from combustion science for energy efficiency, to nuclear waste disposal, specialized radars for defense applications and many more. These applications provide great synergy and great vitality for our ability to support the stockpile. The nuclear weapons path forward is actually just one piece, though, of a much broader nuclear future for the country, and for the world.

It is important to enhance our efforts in non-proliferation, and help realize the full potential of nuclear power as a safe, and environmentally friendly source of energy. The budget legislation you see before you will allow that to be addressed.

Finally, I think I'd be remiss if I did not note that few threats to this country's future loom as large as our chronic lack of investment in science and engineering, and the education systems that support it. History will not judge our generation very favorably if we do not speak out, if we do not act, to significantly change our lack of attention and lack of investment in one of the clear elements that made this country great.

PREPARED STATEMENT

You have the full commitment of my—my personal commitment, and that of my organization—to support you in addressing these important problems in the future, and I'll be glad to address any questions.

[The statement follows:]

PREPARED STATEMENT OF DR. THOMAS O. HUNTER

Mr. Chairman and distinguished members of the subcommittee, thank you for the opportunity to testify. I am Tom Hunter, president and director of Sandia National Laboratories. Sandia is a multiprogram national security laboratory owned by the United States Government and operated by Sandia Corporation [1] for the National Nuclear Security Administration (NNSA).

Sandia's core role in the Nation's nuclear weapon program is the design, development, qualification, and certification of non-nuclear subsystems of nuclear warheads. As a multiprogram national security laboratory, Sandia also conducts research and development in nuclear nonproliferation, energy security, intelligence, defense, and homeland security.

My statement today addresses the appropriation request for the Department of Energy (DOE) programs that fund activities at DOE national laboratories and spe-

[1] Sandia Corporation is a subsidiary of the Lockheed Martin Corporation under Department of Energy prime contract no. DE–AC04–94AL85000.

cifically at Sandia National Laboratories. I will discuss the stockpile stewardship program and the laboratory capabilities at Sandia that are essential to sustain it. I will suggest how the NNSA laboratories can help respond to the challenges of the emerging global nuclear future, including nonproliferation issues. I will comment on programs in energy security and for the Office of Science. Finally, I will also bring to your attention my concern that a larger role for these laboratories in a broader national security context will be important, so that the best solutions for critical national needs may be achieved. My written statement includes an addendum of specific issues of concern that I offer for the attention of the subcommittee.

THE U.S. NUCLEAR DETERRENT

The U.S. nuclear deterrent remains an essential element of the Nation's security. Sandia serves NNSA's long-standing mission to maintain and enhance the safety, security, and reliability of the U.S. nuclear deterrent.

Development of Stockpile Stewardship in the Post-Cold War Era

The end of the cold war was a pivotal moment in the history of the U.S. nuclear weapon program. By 1992, all in-progress and planned nuclear weapon programs for new systems were either canceled or suspended, and arms reduction initiatives signaled a smaller nuclear weapon program in years to come. Also in that year, the United States committed itself to a moratorium on nuclear testing, which had been fundamental to the nuclear weapon development program since its inception.

It was clear that a different framework for maintaining the stockpile would be required. The Department of Energy implemented a new approach called "science-based stockpile stewardship" and invested in a comprehensive suite of capabilities and programs, which included experimental facilities and high-performance computers. By 2002, the NNSA Administrator and laboratory directors were able to report to Congress that science-based stockpile stewardship was meeting expectations.[2]

Today, "science-based" stockpile stewardship could be considered a redundant phrase. Stockpile stewardship assumes and requires the scientific competencies and resources that have been developed over the last decade.

Since 1996 the stockpile stewardship program has performed 12 successful annual assessments of the safety and reliability of each weapon type in the stockpile. The assessments include peer reviews and red team challenges, and they provide the basis for each of the laboratory directors' annual reports to the Secretaries of Energy and Defense as well as the Secretaries' subsequent annual report to the President on the condition of the stockpile. As I have reported in my recent assessments, numerous aging issues in nuclear weapon components have been discovered; to date, we have been able to provide sufficient confidence in the safety and reliability of our stockpile to support national policy requirements.

The advanced facilities and capabilities developed in the stockpile stewardship program enable our successful execution of the life extension program for the W76 warhead. In May 2007 Sandia completed the design—and NNSA's Kansas City Plant initiated production of—the new integrated arming, fuzing, and firing subsystem for this warhead. The radar fuze development costs were approximately 30 percent of the cost of the fuze we designed and produced for the W88 warhead in the late 1980s, while meeting similar requirements for survivability in the severe radiation environments of a nuclear detonation.

Sandia's Microsystems and Engineering Sciences Applications (MESA) facility was essential for the design, qualification, and fabrication of the radiation-hardened integrated circuits used in the W76 arming, fuzing, and firing subsystem. Advanced computational and physical simulation tools were used extensively in the design and qualification of key components, which will enable us to confidently place this life-extended warhead in the stockpile without underground nuclear testing.

In today's stockpile stewardship program, radiation tests using aboveground simulators provide adequate radiation effects testing for most spectra of concern to Sandia. We take the parameters derived from such tests and incorporate them into computational models that calculate system performance over a broader and more intense range of conditions. This achievement is possible using the capabilities and tools developed in the stockpile stewardship program.

In my view, the stockpile stewardship program today has advanced to the point where the preferred approach would be to rely on numerical simulation and test facilities for certification of non-nuclear subsystems in the stockpile. This approach

[2] House Armed Services Committee, Subcommittee on Military Procurement, Hearing on the Safety, Security, Reliability and Performance of the Nuclear Stockpile, 107th Cong., 2nd sess., June 12, 2002.

will, however, include some risk. We must maintain facilities, qualified people, and modeling and simulation capabilities that allow us to assess with confidence. We will continue to be concerned with certain issues in the stockpile for the indefinite future. However, I am confident that we will be able to perform our assessment and design responsibilities successfully if the national investment in a robust stockpile stewardship program is sustained in years ahead.

The Stockpile Today and Future

The Nation's nuclear weapon policy has changed significantly since the end of the cold war. The stockpile is smaller in total numbers and comprises fewer weapon types. It is natural that nuclear weapon policy in the post-cold war era should undergo revision to address the threats of the 21st century. I understand and support the need for stockpile transition.

But the fact is, the legacy stockpile is composed of weapons tailored for the threats and strategies of the cold war. Whether the designs of the legacy stockpile are appropriate for the 21st century, and can be maintained indefinitely, is problematic. It is important that Congress and the Executive agree on how the nuclear deterrent should be sized and shaped for the future and what role it should play in the larger context of national security. We need to establish the path forward for the deterrent, recognizing the reality of a changed global situation and fiscal constraints. We need a commitment to a robust stockpile stewardship program and an infrastructure appropriately configured to support it.

In looking at future options for the stockpile, I believe it is important to continue to investigate a replacement strategy for legacy cold war era warheads. Aging issues in the stockpile will require a measure of stockpile refurbishment as long as those systems remain in stockpile. In the long term, a revived Reliable Replacement Warhead (RRW) program would offer advantages for ease of manufacture, maintenance, and assessment, and especially enhanced safety and security. I support the NNSA's request to fund the RRW Program so that the laboratories can complete their feasibility studies, including cost estimates.

Simply put, the current stockpile will require continued maintenance and a laboratory/production complex configured around the past, with all its cost, complexity, and inherent risk. We must balance modernizing the stockpile with providing assurance to the world that we stand for an enhanced nonproliferation regime. The desired result would be a right-sized stockpile that maintains a balanced deterrent but is smaller, safer, more secure, and can be maintained more effectively.

Complex Transformation

In January NNSA released its draft Supplemental Programmatic Environmental Impact Statement (SPEIS) for transforming the nuclear weapon complex. Complex Transformation is a vision for a smaller, safer, more secure, and less expensive nuclear weapon complex. The SPEIS outlines a Preferred Alternative utilizing distributed centers of excellence, and it would consolidate missions and facilities within the existing NNSA sites.

Under the Preferred Alternative, Sandia would continue to be the center of excellence for science and engineering for warhead non-nuclear systems and components and for major non-nuclear environmental testing. Sandia would also cease operations at the Tonopah Test Range and would have a different role in NNSA's high-performance computing program. Sandia's California laboratory would continue to support the Lawrence Livermore National Laboratory with non-nuclear systems engineering, but would transition to a multi-agency resource. We are developing a plan to guide that transition.

We have long supported and see great benefit in the Preferred Alternative's proposal to consolidate Category I and II special nuclear materials (SNM). We are so committed to that concept, and to the improvements in security posture and the complex-wide cost savings associated with it, that we recently completed the removal of all discrete Category I and II SNM from Sandia sites. As of the end of February 2008, Sandia no longer possesses SNM in quantities that require a Category I or II security posture. This has made it possible for us to implement cost savings in our security protective force, which we have achieved through normal attrition and a thoughtful program of job transitioning and retraining.

A problem of worker displacement may arise in many job classifications as the Preferred Alternative is implemented. NNSA has set a goal of reducing the nuclear weapon complex workforce by 20 to 30 percent over 10 years. At Sandia we have sought to do our part by responsibly managing our workforce size. We have reduced our direct nuclear weapon workforce by 18 percent since 2004, largely through retirements and by redirecting engineers, scientists, and technicians to other national security programs. It is important to recognize and account for the fact that those

organizations that have already made progress toward achieving their goals should not be subject to even further reductions.

We at Sandia recognize the need for changes in the nuclear weapon complex. We support NNSA in its effort to transform the complex into an efficient enterprise for stewardship of the nuclear deterrent. Implementation of the Preferred Alternative must be carefully managed so that essential capabilities remain robust and workforce impacts are mitigated.

THE GLOBAL NUCLEAR FUTURE

As the demand for energy increases in the United States and worldwide, nuclear energy must be part of the solution. New nuclear power plants are now being proposed in the United States and worldwide. New reactor designs are likely to be part of the expansion of nuclear power. There will be technical issues, safety issues, and waste disposal issues associated with the expansion of nuclear energy, and the Department of Energy national laboratories can play a useful role in assisting with their solution.

The global nuclear landscape is changing significantly. The expansion of nuclear power generation internationally raises the potential for growing stockpiles of separated plutonium and spent nuclear fuel; and the spread of nuclear technology and material augments concern over smuggling and the threat of nuclear terrorism. Policy development and technology development have not kept pace with the accelerating changes in the global nuclear security landscape. The nonproliferation regime established by the Treaty on the Non-Proliferation of Nuclear Weapons has been challenged. Sandia and other laboratories have been very active in programs for nonproliferation, verification, and cooperative threat reduction for many years.

Reclaiming U.S. Leadership

It is in the security interests of the United States to assert leadership in the development of a safe and secure global nuclear future. We need an integrated policy framework that will provide for safe, secure expansion of nuclear energy while minimizing proliferation risks.

The United States must reclaim the technical leadership to support the development of proliferation-resistant nuclear energy expansion, control of nuclear materials, and verification regimes for future international agreements. The NNSA laboratories are unique in that they possess competence in both military and civilian uses of nuclear energy. I believe an opportunity exists to engage these laboratories in the development and implementation of solutions that deal with the larger nuclear context. To address gaps that have emerged as a result of both changing threat conditions and lagging investment, it will be important to strengthen the NNSA laboratories' capabilities to address the security challenges related to malicious or clandestine use of nuclear material or facilities.

Global Nuclear Energy Partnership (GNEP)

Part of the approach of the United States to support safe and proliferation-resistant nuclear power throughout the world is the Global Nuclear Energy Partnership (GNEP), which is contained in the budget for the Department of Energy's Office of Nuclear Energy. This program focuses on research and development to reduce the volume and toxicity of high-level waste, reduce the proliferation threat posed by civilian inventories of plutonium in spent fuel, and provide proliferation-resistant technologies to recover the energy content in spent nuclear fuel. Sandia leads the safety, security, and regulatory elements of the GNEP program. We are focusing our efforts on defining the regulatory framework and the data requirements to support licensing of fast reactors and recycling facilities. We at Sandia stand ready to support the Department of Energy and the Congress in deployment of this important program.

Nuclear Waste

An acceptable solution for radioactive waste management is critical to the expansion of safe nuclear power in the United States. Yucca Mountain was intended to be the Nation's long-term repository for spent nuclear fuel and high-level radioactive waste. These materials are currently stored at numerous sites around the country.

Sandia completed its portion of the Yucca Mountain license application early and provided it to the Department of Energy's Office of Civilian Radioactive Waste Management (OCRWM). As the lead laboratory for repository systems, Sandia managed the technical effort to develop much of the license application safety analysis. This work was accomplished despite a severely reduced budget in fiscal year 2008 and the consequent loss of some staff. We brought together the best talent available from among the Department of Energy national laboratories, research universities,

and technical contractors. We endeavored to produce a license application that will be credible among technical peers, defensible before the Nuclear Regulatory Commission, and respected for the integrity of its science.

We have already begun to prepare for the license application's defense, which will enable the Department of Energy to respond to technical questions from the Nuclear Regulatory Commission and requests for additional information throughout 2009. Public hearings and evidentiary hearings before the Atomic Safety Licensing Board are expected to last 2 to 3 more years.

Looking ahead, the Nation should establish a path forward that enables an environment where nuclear energy can realize its full potential as a safe, environmentally friendly source of energy. Confidence in a nuclear waste management solution remains a critical element of the nuclear fuel cycle and is critical to the expansion of nuclear power in the near term. Yucca Mountain could be made consistent with an approach that includes recycling and interim storage in a phased approach to nuclear waste disposal. In my view, we should seek ways to get the most from the investment in Yucca Mountain.

There are many options for managing the waste from current and future nuclear reactors, but all options ultimately rely on geologic disposal. The high-level waste from defense reprocessing will also need such a disposal method. The policy and resulting program for waste disposal need to be addressed now. My organization and I stand ready to support the administration and the Congress in the development of a revitalized approach to this important national issue.

LABORATORY CAPABILITIES

Sandia National Laboratories maintains an array of multidisciplinary capabilities at world-class levels to support its mission work for the Department of Energy and synergistic programs for other agencies. The research and development disciplines we require cover most of the physical sciences and engineering specialties recognized today, as well as the computational and supporting technologies needed for modern scientific investigation.

Essential Capabilities for the Stockpile

Sandia's essential capabilities for stockpile stewardship support our program's core products, which include engineered and integrated warhead systems; arming, fuzing, and firing systems; neutron generators; gas transfer systems; and surety systems.

The capabilities that we recognize as essential for this program include systems integration, major environmental testing, radiation effects science, computational simulation, microsystem technologies, materials science, and the engineering sciences. Many of these capabilities are synergistic with those in industry and at research universities but do not exist in those sectors in the specialized or unique forms required for stockpile stewardship, and rarely as an integrated enterprise. Our essential capabilities are integrated with the core products that we design and support for the nuclear weapon stockpile.

Microsystems and Engineering Sciences Applications (MESA) Complex

The MESA complex at Sandia's New Mexico site is the cornerstone of NNSA's initiative to address the need for microelectronics and integrated microsystems to support a certifiable stockpile for the future. Further, it is a unique, world-class capability for the integration of modeling and simulation into design and product realization of specialized components for national security applications. It is a major investment on the part of the agency to retain the mission capability for designing and fabricating radiation-hardened microsystems. MESA will meet that requirement for future decades.

We have established in MESA the ability to develop, design, and produce if necessary, unique integrated microsystems for weapon safety and security. This capability includes a national "trusted foundry" for radiation-hardened microelectronics. We have applied approximately 40,000 such products to the stockpile and nonproliferation missions of NNSA and for other national security customers. MESA is developing many new nano-enabled microsystem technologies for broad national security applications

The MESA facility is a landmark achievement for our laboratory. It is especially noteworthy as an example of project management excellence. MESA construction is effectively complete, 3 years ahead of schedule and $40 million below the original baseline. A dedication ceremony was held in August to celebrate the opening of MESA's Weapons Integration Facility, the final building of the MESA complex.

High-Performance Computing

Sandia's high-performance computing capabilities are vital tools for NNSA mission responsibilities in stockpile surveillance, certification, and qualification, and they have proved to be indispensable in our work for other agencies, especially elements of the Department of Defense. NNSA's decades-long investment in high-performance computing at Sandia revolutionized modern supercomputing and its application to science and engineering.

Since 1992, Sandia has been a pioneer in massively parallel processing (MPP), which employs special software to control thousands of low-cost processors configured as a single machine. Sandia was the first to shatter the world computational speed record by exceeding one trillion floating-point operations per second (one teraflop) with MPP. We achieved this milestone on the "Red" supercomputer that we developed with Intel under the Department of Energy's Accelerated Strategic Computing Initiative in 1996.

Sandia's current supercomputer, "Red Storm," also has been highly successful in terms of performance, effective cost for computing capability, and improvements achieved after initial operation. Sandia led the development of the architecture and associated applications of this machine. Our partner, Cray, Inc., developed its XT family of supercomputers based on the Red Storm design and now has 36 installations at 20 sites worldwide. Based on this significant heritage, Sandia claims the most cost-effective approach to supercomputing.

Application of these computing capabilities has allowed Sandia to address technical problems—previously thought to be impossible—in support of nuclear weapon qualification activities. Further, in several cases other Federal agencies have asked us to address computational problems that could not be addressed by any other institution. The impact of these calculations is hard to overstate; they have allowed resolution of formidable science and engineering challenges in support of national security.

Under the Preferred Alternative for complex transformation, NNSA plans to consolidate its high-performance computing platforms at the Lawrence Livermore and Los Alamos sites, principally due to the NNSA investments in computing facilities at those institutions. In order to remain a key participant in NNSA's high-performance computing program, Sandia has negotiated a memorandum of understanding with Los Alamos that will bring together the two laboratories' computer science and operational capabilities for high-performance computing. Under this agreement, Sandia will lead in providing the architecture and engineering expertise for capability platforms, and Los Alamos will lead in deployment and operations. Teams will be formed from both laboratories to provide an unparalleled computational resource for future NNSA capability platforms.

This partnership is not without risk to both institutions. It is essential for NNSA to execute a platform strategy that supports the Sandia/Los Alamos partnership with a platform procurement in fiscal year 2010 and meets the established requirements for maintaining and refurbishing the nuclear weapon stockpile. These requirements clearly identify the need for replacing the existing NNSA Purple and Red Storm platforms by fiscal year 2010.

Support for the Weapons Activities Engineering Campaign

I am concerned about erosion in the Weapons Activities Engineering Campaign. This campaign contains much of the science and technology foundations supporting Sandia's ability to assess and sustain the stockpile. This science-based campaign advances the engineering competencies that are the basis for assessing components and subsystems and improving weapon safety and reliability. This program suffered a 40 percent reduction between fiscal year 2004 and 2007; the fiscal year 2008 appropriation was still 35 percent below the 2004 mark, and the 2009 request is about the same. Chronic under-funding of this campaign may diminish the advanced engineering capabilities at the laboratories over the long term. These capabilities are essential for maintaining confidence in the assurance stewardship activities for the stockpile.

Attracting and Retaining Technical Talent

We are very deliberate about preserving critical skills in our workforce. Through strategic hiring and mentoring of top graduates, especially from key universities throughout the country, and through a formal knowledge preservation program, we believe we can ensure that the smaller workforce of tomorrow will have access to the technical knowledge and lessons learned that will be needed for the future.

We have been able to attract new talent largely because of the diversity of missions and professional challenges at the laboratories. System engineering programs, technology development, and advanced scientific and engineering research are es-

sential for sustaining career interest and commitment. The opportunity to support national security needs beyond the nuclear weapon program is motivating to prospective staff.

NNSA Capabilities Going Forward

My biggest concern with the long-term future of NNSA is that science and engineering capabilities may be relegated to a subordinate role as we strive to right-size the nuclear weapon complex and necessarily confront the fiscal realities of today. In my view, an essential characteristic of the cold war's resolution and a fundamental element of deterrence going forward is the strength and resiliency of the NNSA laboratories. Their scientific capabilities have deterred our adversaries, contributed mightily to the Nation's technological leadership, and seen many unparalleled applications in support of national security.

ENERGY SECURITY

By 2030, world energy demand and carbon emissions are expected to increase by 60 percent. The Nation needs a credible plan for transitioning from today's carbon-based energy and transportation infrastructure to a system that is less dependent on fossil fuels. Nuclear energy will be a major part of that solution, but other approaches to low-carbon energy generation and conversion will also be important.

The Department of Energy and its national laboratories are exploring bold new ways of translating research into deployable solutions to have more impact, sooner, particularly to achieve goals related to reducing oil and gas imports and lowering emissions. We are working on a plan to leverage several key Sandia capabilities with academia, a few other laboratories, and industry, to dramatically increase the effectiveness of transformative energy research in transportation systems.

Consistent with the Preferred Alternative for complex transformation, we are exploring a research thrust in energy security to be centered at Sandia's California site. The initiative would focus on low-net-carbon alternative fuels, accelerated electrification of transportation infrastructures, and combustion efficiency, which is a long-standing competency of the successful Combustion Research Facility in California. I believe a unique opportunity exists to apply existing facilities at Sandia's California laboratory to basic and applied research in support of our energy needs. This will serve to bring together the fundamental research efforts of the Department of Energy Office of Science with the applied energy programs of DOE. This will include university and industrial participation and draw on the entrepreneurial capabilities that are so strong in the San Francisco Bay area.

More intensive use of modeling and simulation through high-performance computing can accelerate the contributions of renewable energy technologies. Sandia is currently working toward an agreement with the National Renewable Energy Laboratory (NREL) to establish a partnership in which Sandia would provide capacity computing for NREL programs. NREL and Sandia bring extensive capabilities to the renewables mission and are focused on meeting this challenge—from understanding renewable resources for energy, to the conversion of these resources to electricity and fuels.

PROGRAMS FOR THE OFFICE OF SCIENCE

I am increasingly concerned that the Nation's investment in science and engineering is not receiving the attention the Nation requires. This is one of the most significant challenges that will define the Nation's future. While legislation like the America COMPETES Act[3] provides a statement of good intent, in my view it is essential for the Federal Government to make real investments in people, education, and programs across a broad spectrum of science and engineering.

The Office of Science is the steward for a significant fraction of the fundamental physical science research in the United States, both at the Department of Energy laboratories and in universities around the country. Its portfolio and those of a number of other agencies are central to American competitiveness, as argued in the "Gathering Storm" report of the National Academies.[4] In addition, many of the Office of Science research directions promise revolutionary advances in scientific areas vital to our national security. Despite the importance of a strong physical science foundation for future U.S. competitiveness, the history of investment in the Office

[3] American COMPETES Act, Public Law 110–69, U.S. Statutes at Large 121 (2007): 572.

[4] Committee on Prospering in the Global Economy of the 21st Century, Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future (National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 2007, http://www.nap.edu/catalog.php?record__id=11463.

of Science is not consistent with the Department of Energy's prominent role and potential for the future.

Sandia has a presence in four of the Office of Science's programs: Basic Energy Sciences (BES), Fusion Energy Sciences, Advanced Scientific Computing Research, and Biological and Environmental Research. BES represents the lion's share of our work and includes research in materials, chemical sciences, combustion, geosciences, and nanotechnology.

The Office of Science's Center for Integrated Nanotechnologies (CINT) core facility was completed in 2006 and is jointly operated by Sandia and Los Alamos National Laboratories as a Department of Energy user facility available to university and industrial researchers. CINT is devoted to establishing the principles that govern the design, performance, and integration of nanoscale materials. Leadership in the science and engineering of nanotechnology will be important for U.S. competitiveness in the decades ahead.

Sandia is a major partner in the Joint BioEnergy Institute (JBEI), a research center funded by the Biological and Environmental Research Program. The research focus will be on understanding how to reengineer biological processes to develop efficient methods for converting plant materials into ethanol or other biofuels. This 5-year effort may help make biofuels production truly cost-effective on a national scale.

The synergy between programs in the Office of Science and other parts of the Department of Energy is very important. The investment across all of these programs must be balanced in order to assure a steady stream of scientific advances that can be translated into technologies of benefit to the American people. NNSA programs and all aspects of energy research and development gain from the fundamental science available in Office of Science programs. It would be beneficial for the Congress to support the funding levels contained in the fiscal year 2009 budget submission. This support would stimulate the kind of productive collaborations across programs that are so helpful. In addition, I am aware of efforts to strengthen the fiscal year 2008 budget by considering a supplemental appropriation for the Office of Science. I would encourage your consideration of that matter.

FUTURE OF THE NNSA LABORATORIES IN NATIONAL SECURITY

During the cold war, the nuclear weapon laboratories benefited from a designated core mission that for 50 years had furnished the rationale for their exceptional technical foundations. The unambiguous importance of that mission assured sufficient funding to sustain an effective technology base.

Today, the national security challenges are more complex than they were during the cold war. The NNSA laboratories are uniquely positioned to contribute to the solutions of these complex national security challenges. However, the NNSA Administrator and the laboratory directors face a formidable problem of how to maintain technical competencies—especially in nuclear weapons—in an era of limited resources, a smaller program, fierce competition for talent, and widespread public and political uncertainty toward the program. In this new and difficult operating environment, synergistic work supporting other national security missions is crucial. We depend on other national security activities to support and stabilize our critical capabilities and science base. It makes sense, therefore, to encourage more extensive use of the NNSA laboratories by multiple agencies and sponsors, thereby exercising and enhancing the competencies we require for stockpile stewardship.

We are working with DOE and NNSA to establish a strategy and approach that provides enhanced access to the unique facilities at these laboratories that will significantly benefit the Nation's responsiveness to broader national security problems.

An Example of Multiprogram Synergy: Radar

Sandia's capabilities for the nuclear weapon program benefit from synergy with other national security programs. An excellent example of this synergy is our work in radars.

Competency in specialized radar applications is a required capability for the nuclear weapon program. As a result of initial investments in radar fuze capability for nuclear weapons, we began working on miniature radars based on synthetic aperture concepts in 1983 for other national security applications. In 1985 we became involved in a special-access program for the Department of Defense to develop a 1-foot-resolution, real-time synthetic aperture radar (SAR) suitable for use in unmanned aircraft. Sandia flew the first real-time, 1-foot-resolution, SAR prototype in 1990. Follow-on work sponsored by the Department of Defense reduced the size and cost of SAR systems, improved resolution, and significantly expanded the applications and military benefits of radar. Partnerships with industry have transitioned each generation of the technology into field-deployable systems. Sandia-designed air-

borne SAR systems have now been used for real-time surveillance by every U.S. military command.

In this example, the original radar competency of the nuclear weapon program was improved by this work for the Department of Defense. The resulting advanced radar competency made it possible to apply new technology to the updated fuzing system for the W76–1 in the nuclear weapon program. This updated fuzing system would not have been possible without the competency that was maintained by work for the Department of Defense.

Broad National Security Engagement

Today, nuclear weapon activities constitute about 42 percent of Sandia's funding. Department of Energy programs in nonproliferation, energy security, and science provide another 20 percent, while agencies other than the Department of Energy furnish 38 percent of our total operating funds.

The work-for-others (WFO) process that has been in place for many years for accepting non-DOE work into the NNSA laboratories should be streamlined for the future. Many agencies could benefit from a reimbursable system that would give them direct access to the Department of Energy laboratories, and DOE would benefit from the additional programmatic activity and institutional support. In order to enhance our ability to serve the Nation, it may also be useful to explore innovative governance options to promote shared agency investment.

There are questions that naturally arise as the laboratories take on important national security assignments from agencies other than the Department of Energy. It is important to recognize that other agencies do contribute more than the direct program costs of their activities. In fact, they pay the overhead rates that all programs pay, and those payments help provide support for operational and infrastructure costs and for the Laboratory-Directed Research and Development Program. A portion of our overhead rates is utilized for capital improvements, and in some cases other agencies have paid directly for the construction of buildings and the purchase of capital equipment. It is important to recognize that while operational costs and some capital improvements are currently being addressed, there is still a need for more substantive investment in the science and engineering fabric of the laboratory.

The laboratories and NNSA should be encouraged to develop a realistic approach for maintaining the excellence of our scientific and engineering foundations well into the future. I believe we can succeed only as national security laboratories in a broad sense, serving the needs of multiple agencies for mutual benefit and shared excellence in national service.

Thank you, Mr. Chairman.

ADDENDUM—ISSUES OF CONCERN

The following specific issues of concern to Sandia National Laboratories—some of which were addressed in my statement—are summarized for the attention of the Committee.

Implementation of Complex Transformation

We support NNSA in its effort to transform the complex into an efficient enterprise for stewardship of the nuclear deterrent. Implementation of the Preferred Alternative must be carefully managed so that essential capabilities remain robust and workforce impacts are mitigated.

High-performance computing will remain an essential competency for Sandia. There is significant risk that the skills acquired by Sandia's system computing team will be lost over time without a high-performance computing platform on site. Sandia is committed to cooperating with the implementation of complex transformation and will monitor the implementation process to assure that capabilities are fairly integrated.

A problem of worker displacement may arise in many job classifications as the Preferred Alternative is implemented. NNSA has set a goal of reducing the nuclear weapon complex workforce by 20 to 30 percent over 10 years. At Sandia we have sought to do our part by responsibly managing our workforce size. We have reduced our direct nuclear weapon workforce by 18 percent since 2004, largely through retirements and by redirecting engineers, scientists, and technicians to other national security programs. It is important to recognize and account for the fact that those organizations that have already made progress toward achieving their goals should not be subject to even further reductions. Normal attrition should allow for appropriate workforce restructuring, but we may need a thoughtful program for job transitioning and retraining for those instances in which workforce dislocations are acute.

Support for the Weapons Activities Engineering Campaign

The Weapons Activities Engineering Campaign advances the competencies that are the basis for assessing engineered components and subsystems and improving weapon safety and reliability. This program suffered a 40 percent reduction between fiscal year 2004 and 2007; the fiscal year 2008 appropriation was still 35 percent below the 2004 mark, and the 2009 request is about the same. Chronic under-funding of this campaign may erode the advanced engineering capabilities at the laboratories over the long term. These capabilities are essential for maintaining confidence in the assurance stewardship activities for the stockpile.

Cyber Security

The United States relies extensively on information technology in the form of computers, chips embedded in all forms of products, communication systems, and military capabilities. There are growing indications that the security of our society is increasingly vulnerable to attacks on these systems. A national initiative in cyber security deserves increased attention, and that is beginning to happen. The Department of Energy and the NNSA laboratories have much to offer in assisting with solutions in this area.

During the past several years, the NNSA laboratories have experienced an increase in the level, intensity, and sophistication of network attacks directed against computer resources. Offensive capabilities for cyber warfare and cyber espionage have advanced by leaps and bounds worldwide. Other nations have been working assiduously to neutralize the cyber advantages that the United States has enjoyed for 2 decades and to exploit weaknesses in our cyber architecture as an asymmetric vulnerability for U.S. national security. These developments cause us to worry that the sophistication of the threats is growing at a faster rate than we are able to respond in hardening our systems against intrusions.

NNSA's request for cyber security in fiscal year 2009 is $122.5 million, an increase of 22 percent over 2008. This increase is essential to help us continue to harden our infrastructures against cyber attacks. But it should be recognized that this is a first step toward the kind of comprehensive effort needed to deal with this growing threat. Additionally, there is a need to bring in other parts of the Department of Energy in a more significant way, particularly the Office of Science.

Safeguards and Security Funding Offset for Reimbursable Programs

The fiscal year 2001 appropriation for Weapons Activities created a direct-funded budget for safeguards and security at NNSA sites. The conference report directed the Department of Energy to obtain funds from non-DOE customers in 2002 and beyond to offset a portion of the security appropriation. The laboratories have been collecting that offset via an overhead charge applied to work-for-others (WFO) projects. This practice has been called into question. Accordingly, the fiscal year 2009 budget execution guidance provides for direct funding only. Thus the funds formerly collected via the WFO offset will be lost, which at Sandia will cause a shortfall of several million dollars in funds available for safeguards and security.

Program Enhancements That Would Be Possible With Additional Funding

Full Utilization of the Refurbished Z Pulsed Power Accelerator

The Z pulsed-power facility provides data for nuclear weapon primaries, secondaries, and non-nuclear components essential for stockpile stewardship. Experiments on Z also explore advanced concepts and study alternative approaches to fusion energy. Full single-shift utilization is the most efficient way to maximize the return on the value of the recent refurbishment of Z. Operations are currently funded jointly by NNSA's Science and Inertial Confinement Fusion (ICF) Campaigns.

A new approach to creating high-current pulsed-power devices, known as a Linear Transformer Driver (LTD), has recently been demonstrated at Sandia. LTD is more than twice as efficient as traditional pulsed-power devices. This advance is likely to be the future of large-scale sub-microsecond pulsed-power devices. It is also the simplest technological approach to fusion energy. Additional funding would enable Sandia to accelerate the maturation of this game-changing technology.

B61 Life Extension

The B61 bomb has several versions and is one of the oldest weapon systems in the legacy stockpile. Many of the technologies used in the B61 are old, several components are reaching end-of-life, and the system would require upgrades to be compatible with new digital-interfaces for future delivery systems. Modern technologies and redesigned architectures would permit upgrades to this weapon without providing a new military capability. B61 refurbishment should be implemented as soon as possible to sustain the Nation's gravity-delivered nuclear weapon capability.

Discovery Science and Engineering Innovation Institutes

The America COMPETES Act passed last year authorized the establishment of Discovery Science and Engineering Innovation Institutes at Department of Energy national laboratories. Discovery Institutes would be catalysts for transformation by helping to develop the next generation of science and engineering leaders to address national challenges and meet industrial needs to compete globally. An appropriation for the Discovery Science and Engineering Innovation Institutes at national laboratories would enable this initiative to proceed.

Nuclear Waste

An acceptable solution for radioactive waste management is critical to the expansion of safe nuclear power in the United States. Sandia National Laboratories has developed significant waste-repository expertise through its work with both the Waste Isolation Pilot Plant and the Yucca Mountain Project. There are many options for managing the waste from current and future nuclear reactors, but all options ultimately rely on geologic disposal. The high-level waste from defense reprocessing will also need such a disposal method. The policy and resulting program for waste disposal need to be addressed now. My organization and I stand ready to support the administration and Congress in the development of a revitalized approach to this vital national issue.

Senator DORGAN. Dr. Hunter, thank you very much.

This is—as you might expect for those of us who don't work in this area—this is enormously complicated, complex, and difficult to understand.

Dr. Hunter, when I visited Sandia, you told me something about a teraflop, so let me ask you to share that again. I think what you said is a teraflop is one trillion computer functions in a second.

Dr. HUNTER. That's correct.

Senator DORGAN. Is that correct?

Dr. HUNTER. Yes.

Senator DORGAN. You told me that we achieved the first teraflop in 1997.

Dr. HUNTER. That's correct, in the mid-1990s, yes.

Senator DORGAN. And you told me the amount of space it required for the computers to achieve that teraflop—how large was that?

Dr. HUNTER. It basically required a full room, a complete room full of computers, and it required many thousands kilowatts of electricity to support it.

Senator DORGAN. And you said 10 years later we achieve a teraflop with what size application?

Dr. HUNTER. Actually, today there are chips being produced that were one single chip—about the size of a dime—does a teraflop on a chip.

Senator DORGAN. And it requires the energy of a 60-watt light bulb?

Dr. HUNTER. Sixty-five.

Senator DORGAN. Sixty-five. All right. So, that's a teraflop—1 trillion computer functions in a second.

Dr. HUNTER. That's correct, yes.

Senator DORGAN. You are saying that you have achieved, or are about to achieve next year a petaflop.

Dr. ANASTASIO. We're about to achieve this summer, a petaflop.

Senator DORGAN. Which is not a trillion functions per second, but a thousand trillion functions per second?

Dr. ANASTASIO. That's correct, sir.

Senator DORGAN. And Mr. Miller, you said that's not enough?

Dr. MILLER. Yes, sir.

Senator DORGAN. Yes, well, okay, so——

Senator DORGAN. I'm not sure I understand anything about this. I mean, I don't understand a trillion, I understand now what a teraflop and a petaflop is, I understand the dramatic advancements, I understand that weapons physics, perhaps, allow you to use these unbelievable, muscular, computer capabilities to understand things you didn't previously understand, but I think I speak for this subcommittee that, we don't understand how a scientist might use this capability. I think you tell us it's important, I believe that. I think that that is important.

Let me ask a couple of questions, and Dr. Hunter, thank you for allowing us all to understand what these are.

Director Miller, you said that you've lost 2,000 people—is that correct?

FUNDING AND PERSONNEL

Dr. MILLER. Yes, sir, it is.

Senator DORGAN. Let me try to understand how that happens, because the nuclear weapons program has not decreased—we increased it, not very much—we increased it by about $50 million last year, so it was relatively stable, just up, just a little bit.

Science, we increased last year, so we increase—in this subcommittee—the funding for nuclear weapons and science, and yet you end up losing 2,000 people. Tell us how that happened, does it have something, perhaps, at least in small part, to do with the contract that Senator Feinstein talked about?

Dr. MILLER. Yes, sir. There are three fundamental elements that are associated with that loss of 2,000 people. The first is that the Federal funding for the Laboratory mostly coming from NNSA, went down $100 million, so the money that you appropriated went elsewhere.

Senator DORGAN. That's an NNSA decision, not the decision of this subcommittee, is that correct?

Dr. MILLER. It is associated with the budget that was approved and where money was in the budget, so again, as an example, the money that goes into super-computing has steadily gone down. At its peak in 2004, it was $750 million a year, it is currently $545 million.

Senator DORGAN. Where did it go? If we're increasing the appropriation, does it go to facilities? The only point I'm making is——

Dr. MILLER. Right.

Senator DORGAN [continuing]. That doesn't—that responsibility doesn't necessarily rest at this table, if we're actually approving more money—slightly more money—for science and nuclear weapons. That's a decision made somewhere else in the bowels of NNSA. So, I'm just trying to understand it.

Dr. MILLER. So, yes, I mean, again, in a very, very simplistic fashion, you know, there are three elements to NNSA's budget. There is the science and technology, there is the physical infrastructure, and there is taking care of the stockpile that we currently have.

Senator DORGAN. That's correct.

Dr. MILLER. And so the increases in the budgets, in fact, more than the increase in the budgets, are going to maintain the cold

war stockpile that we have, and take care of the infrastructure that is aging and needs replacing. And where does that money come from? It comes out of science.

Senator DORGAN. All right, and——

Dr. MILLER. And the rest of your question—so we lost $180 million, I'm sorry—we lost $100 million in Federal funding. The cost of the contract, as a result of principally, the public to private sector changes, increased the costs at the laboratory $130 million. Of that $130 million, $40 million was the increase that Senator Feinstein asked about, in terms of the fees that go to the companies that are the management.

The reason for those fees was the NNSA and congressional decision to attract industrial partners, if you want to attract industrial partners, it will cost. That's what it cost in the case of Livermore, about $40 million extra.

Senator DORGAN. That's a pretty substantial cost. It cost you some, apparently, very attractive workers.

Dr. MILLER. Right. And then the other, then the third part is just inflation. The sum of all of that is about $280 million, that's what drove the decrease in people.

Senator DORGAN. Dr. Hunter, and Anastasio, tell me—since the implementation of the annual certification process that's gone back to 1997, tell me about your confidence in the reliability of the nuclear weapons that are currently deployed—you make certifications, you now come to us and say, "We're doing teraflops and petaflops and 80 this, and quadrillion that," and so we're obviously muscling up in technology and capability. Has your confidence decreased at all in your certification?

Dr. ANASTASIO. Well, I would say first, I am confident in the stockpile today. The concerns I have, the risks going forward to the future. It is true that as we do our annual assessment process, and we do our continuous work during the year that we find issues with the stockpile that need to get addressed.

Some of those turn out to be small issues that are not consequential—some are very significant. And, the way we deal with those, that are significant, have caused us to restrict the scope of certification for some of the weapons systems that we have in the stockpile. And I can't say too much more, in this forum.

And so, we're still confident in the systems, but there are some restrictions that are a consequence with that. And my biggest concern is the trend of maintaining balance across the three elements that George Miller talked about in the program, and keeping those in balance, in light of the constrained funding that we have, and all of the challenges the program has to face.

Senator DORGAN. Director Hunter.

Dr. HUNTER. Yes, I'd break the confidence into a couple of pieces. The first piece is our confidence—and my personal confidence in being able to find and detect issues—that is up. That is, I feel like we can do a better job today than we did 10 years ago, to assess and understand issues.

We then, of course, have the question of the confidence in the stockpile, and we still report the stockpile as safe and reliable, and our confidence in that statement is quite high.

The question, though, is are there ever cases, as Mike just said, where we have to put restrictions on what we say about the nuclear weapons, and the answer is, we see those, and they're well-supported by our observations and our ability to detect them.

Senator DORGAN. I want to just—I'm going to call on Senator Domenici, but I want to say that we asked you to come today to talk about the weapons issues, so these are very important issues and your three laboratories play an important role. You do more than that in each of your laboratories. My interest is, no matter what we are doing on some of these programs, we're always going to have a Stockpile Stewardship Program as long as there are nuclear weapons, and we'll need that work to be done.

My interest at the end of the day is to maintain a robust workforce in our national laboratories to pursue aggressive new science, because I think that's a significant investment in the future of this country—in dozens of areas, not just the issue of certification of nuclear weapons.

So, I think that you should know, there's a lot of support on this subcommittee for the advancement of science, and for the work that you do in your laboratories. I think the national laboratories are jewels, and produce significant opportunities for this country's future.

I see this—you know, we do a lot of spending. We spend money. Some of it we invest. And a portion of what you do is a significant investment into the future of this country. We have to continue to lead the world in science, and that's part of the decision of this committee, as well.

Senator Domenici.

Senator DOMENICI. Mr. Chairman, I'm so pleased to hear your comments so early in your chairmanship, that it makes me feel very happy and, about having to leave here. I'll get back to the worry about the future.

But first I would like to make a deal with you, Mr. George Miller.

And I want to ask Senator Feinstein—have you ever visited the laboratories in New Mexico, Senator?

Senator FEINSTEIN. No, not in New Mexico. I've visited Lawrence Livermore, not——

Senator DOMENICI. Well, I want to make a deal with you. I have never been to Livermore to see the great big machine that costs $4.5 billion, and that I wasn't for, and that gave him and his predecessor gray hair, because we're all—big shot Domenici was going to kill that machine, and frankly I didn't, in the end, I gave into my most natural tendency to be a sucker for big science. And I have been that, for my whole career. I am a sucker for big science. I've missed on a couple, but on a couple that are very important, I've not missed.

And the theory that permeates me, my bones, because of that, has caused me to continue to be worried about our country, in terms of its greatness having been built around science and technology and we were the best. And I'm very worried about the fact that we're losing out, because that seems to be too hard for a lot of our young people—math, science, physics and engineering.

But George, I haven't been there, and if you will promise to appropriately welcome me, and to be happy about my visit, and to be——

Dr. MILLER. We would be honored to have you visit, anytime, Senator. And we will make sure that it is a joyous occasion.

Senator FEINSTEIN. Yes, I'll bet.

Senator DOMENICI. We want him to be joyous, too.

I'll try to do it before I leave, okay? And I was just going to suggest that maybe the—in return, maybe I could take the distinguished California Senator to New Mexico, we could make a swap, she could come and see our labs, and I go to see your big lab.

Senator FEINSTEIN. I would be delighted, thank you.

NATIONAL IGNITION FACILITY

Senator DOMENICI. I think you should know—I do think you should know, Senator, that I was fully aware when we funded the NIF, the National Ignition Facility, as part of Stockpile Stewardship, and it hasn't been functioning yet, in that capacity, unless it is in the last few months, because it wasn't ready. So a big addition to our Stockpile Stewardship awaits implementation when we open NIF, if it works. And it'll work in some respects, for sure, but will it work in all respects, in all the ways or not? We don't know.

But, I knew fully that Lawrence Livermore, without that machine, might be a Lawrence Livermore with a short life. The people of California should know that—it might have died on the vine. That's given it a new breath of scientific prowess that will bring many thousands of people there to use that machine, and they won't be part of Science-based Stockpile Stewardship, they'll be part of a pushing America yet further to the cutting edges of science, as they use the machine.

Los Alamos got a machine out of it, and it's finished and it's finished and it's doing a great job, and they also got great computers out of it, and other things. And Sandia got a number of things, the last, clearly, is a fantastic Mesa facility which we've both seen, which specializes in small things—when you go there you will thoroughly amazed at—and not so worried about—whether our country's going to lose out in nano and technology, and the manufacture of small things.

Small machines—so small that you can put all kinds of machines on little—machines, literally—on a little piece of metal. And those machines worked, in there pumping their little brains out, and we can't even see them, and we're wondering what to do with them, and that's what they're doing there, so—we've got those done.

So, a lot of things have been accomplished. I worry about our country on science and technology training, physics, engineering, math and whether we have good teachers, and whether we're producing students. One way I could find out would be to ask the three of you who are—you are a demand source for the best scientists that we can produce, you want them, right? You're out there hiring them. So, let's ask you—are you noticing a substantial decrease in the number of talented Americans that seek complicated science jobs at your laboratory?

Dr. ANASTASIO. Senator, and by the way, Senator Feinstein, we'd be honored to have you come visit any time you were able.

Senator FEINSTEIN. Thank you.

Dr. ANASTASIO. And I'd love to see you again, in that context.

Senator FEINSTEIN. Thank you very much, thank you.

Dr. ANASTASIO. Senator Domenici—I do see a drop off in the number of U.S. citizens who are at the top of their field in a number of key areas that are important to the laboratory. But I am encouraged that we're still able, at these laboratories, to attract some of the best and brightest people that are still available—whether they be U.S. citizens, or not. And I think that's important, that we can still attract very high-quality staff, but the ability or the success of this country in generating all of those folks, we are seeing a drop-off.

Senator DOMENICI. George? Excuse me, Mr. Miller?

Dr. MILLER. Yes, sir. I would agree with what Mike said, we have a very prestigious post-doc called a Lawrence Fellow, that's basically at the top of the line in terms of post-docs. Generally, 60 percent of the people who win those post-docs are not U.S. citizens.

So, it is a concern. The good news is we still get the very best and the very brightest at the laboratories, because of the science investments that we've talked about, because the science is so exciting, because the mission is so compelling. And quite frankly, even though our core mission is nuclear weapons, about 80 percent of what we do is actually publishable in peer-reviewed scientific journals, and so all of that is essential.

Senator DOMENICI. Dr. Hunter.

Dr. HUNTER. Yes, Senator Domenici—I'd like to add my welcome to Senator Feinstein, please come.

Nationally, we have a problem. We are not seeing enough students going into the fields of science and engineering and we're not seeing enough people coming out, the way we'd like to see them.

One thing we find about these laboratories is, they not only have places of excitement because of the work, but they're also places of values and character, and they support the national interests, and that brings a lot of the right people to our laboratories. So I can report, basically, that we're able to get the people we generally need, but the national problem is one of—very significant—and one I think all of us can do more to try to help.

Senator DOMENICI. I'm going to submit some questions for you to answer in writing, but we were—we've kind of gone over our stay here, today. And we still, perhaps, will want to go another round, I don't know.

But, I want to suggest to—here, and for all of you to hear it and the subcommittee to hear it—we cannot continue to want so much of these laboratories, as we're here today describing, expect them to do so much, if we don't spend more money on the science part of the laboratories. No question in my mind that we are getting squeezed out, science is getting squeezed out, especially math, science—math, physics, engineering, and the like—in our national picture, too, in terms of what's going on in our schools. And I'm very worried about it, and hope you will keep your laboratories exciting, because that's what young people are looking for, and I think we're giving you enough equipment to do that.

One question—while we have praised NIF, we should talk a minute about the little brother, or little sister to NIF, the one you

have at your place that's got a funny name, called the Z Machine, ZA Machine or something.

Would you tell the chairman and Senator Feinstein what that is, and——

Dr. HUNTER. Sure.

The Z Machine is a very complementary facility to the NIF facility, it is working now, we have just refurbished it.

It is another approach to providing very high-density, high-energy density environments which uses what we call pulse power—lots of big transformers dumped into a very small space. And so we've just finished refurbishing that, we're doing experiments today looking at implosion of fusion capsules, and experiments today looking at materials under very high pressures, and very high temperatures. And it's operating—it can operate as often as once a day, and we use it routinely and we work day in and day out with the other two laboratories to support experiments that they do.

Senator DOMENICI. Okay. Now, will you please tell us about why you're worried about your laboratories—availability of appropriate computers?

Dr. HUNTER. Sure, I think it's the same general issue that Mike and George commented, because as we look at the balance of the investment, or the resources that go into the stockpile itself, or the other parts of the complex infrastructure, and ask them, what is the remaining amount that's spent on science? We find a normal and natural competition there, and that science piece, and the application on G, on Z, has been reduced over time to where we're barely able to operate at the one shift a day level.

Senator DOMENICI. Thank you.

Thank you, Mr. Chairman.

Senator DORGAN. Senator Domenici, thank you very much.

I'm going to call on Senator Feinstein, but I want to observe, relative to this question of funding, I just came down the hall—as I think did Senator Domenici—from another hearing today, Senator Feinstein was at the hearing—in which the administration's requesting $196 billion as an emergency piece this year for Iraq and Afghanistan.

So, the result is, because we have that war going on, it's very expensive—that's $16 billion a month, $4 billion a week, just for that emergency piece, in this year. And the result is, we get a domestic discretionary request in the budget in this subcommittee that says, "Okay, we need to fund the nuclear weapons programs, the laboratories, science, and by the way we want you to cut $1 billion our of water projects," the Corps of Engineers, lost $800 million, the Bureau of Reclamation cut $200 million, roughly. The fact is, it doesn't add up.

And so, this subcommittee, you know, unless we find some additional funding, is left with a Hobbesian choice. And so, last year we found some additional funding to try to fix some of these problems in the President's budget, but it is—it's a difficult problem, and no one here wants to short science. Nobody on this panel wants to do that. It's just that the President has given us a budget that, we've got to fix it, because it doesn't work.

Senator Feinstein.

NATIONAL LABORATORY FUNDING

Senator FEINSTEIN. Thank you very much, Mr. Chairman.

First of all, it's very fine to see the three of you here, thank you very much—I have great respect for each of you. I have respect for what you do, I don't have respect for the product. I'm not a friend of nuclear weapons, and you have to know that up front.

I am a product of Nagasaki and Hiroshima, I grew up, I saw what 14 kilotons can do. I saw what 7 kilotons can do. I have not seen what 100 kilotons can do, and I've not seen what 400 kilotons can do, but I know they're out there, and I am very concerned.

I am not for a nuclear bunker-buster of 100 kilotons. To me, it was immoral. I am not for an Advanced Weapons Concept Program of building under 5 kiloton tactical battlefield nuclear weapons. I am not for 450 new plutonium pits.

So, I'm at a very different position. And I want to see the United States move away from nuclear weapons. I want to see us do it in a way that protects our national security. I want to see us take a real leadership role in non-proliferation. I want us to work with nations so they don't become nuclear weapons nations, and that's my heart, and that's my vision, and that's why I'm here today.

With respect to the budget in 2008, it was $1.091 billion, as passed. The President's budget is $1.036 billion—that's $55 million less than last year. So, it's the President's budget that we are essentially working from, in this subcommittee.

I am concerned about putting 500 highly trained scientists and engineers into the job market at this stage—I must tell you that right up. I'm concerned about it from a national security perspective.

And Dr. Miller, I don't know if there's anything we can do about that, I don't know if they can be employed at Sandia, or at Los Alamos, but I worry about it. Do you have any comments?

Dr. MILLER. Thank you, Senator Feinstein. I worry about it a lot. These are my colleagues, many of them I've known for 35 years, which is how long I've been at the laboratory, so this is an extraordinarily difficult time for the laboratory, and for the entire complex.

The fact of the matter is as Director of the laboratory, I have a fiscal responsibility to deal with the realities that the Federal Government gives me. And that's the reality of this particular situation. As you know very well, it's occurring at laboratories across the Nation. Mike has also lost 2,000 people over the last 18 months. There are layoffs anticipated at the Stanford Linear Accelerator, at Argon, at Oak Ridge. The fact of the matter is, as we have all said, in different ways, and from different origins, the investment in science and technology for the Nation's benefit is under siege.

So, I worry a lot about it, I do have responsibilities to maintain fiscal responsibility, and that's what has to happen.

Senator FEINSTEIN. Well, let me ask you something precisely, it's my understanding that the lab had expected about $80 million in increased costs, but the actual number spiraled to $280 million? What was the difference? What took up that difference?

Dr. MILLER. The $80 million went to $130 million, the extra $50 million is just inflation, which we knew about all along. The principal changes were—as I said before—the change from a public sector to a private sector.

Senator FEINSTEIN. How much is that?

Dr. MILLER. That's about $100 million.

Senator FEINSTEIN. In——

Dr. MILLER. Of the $130 million.

Senator FEINSTEIN. In what?

Dr. MILLER. Okay, so it is the fact that we are no longer tax-exempt, so we have certain taxes we have to pay. The healthcare, as a University of California employee, the healthcare benefits that the University offers are amortized over the entire State. Livermore has to deal with the healthcare in Northern California. The healthcare costs for the same benefits went up 47 percent.

Senator FEINSTEIN. How much in dollars?

Dr. MILLER. Sixty-five million.

Senator FEINSTEIN. So, in other words——

Dr. MILLER. We chose, we chose not use——

Senator FEINSTEIN [continuing]. Healthcare costs, equal to UC's increase cost $47 million, wow.

Dr. MILLER. Right. And the third was that, in the decisions that individual employees took about what kind of a retirement system to choose, they were given two options—one, a defined benefit plan like, identical to the University of California, one is a defined contribution plan. The defined contribution plan requires that the laboratory put money up front. We used an assumption that the same fraction of employees as took the defined benefit at Los Alamos, would take it at Livermore. That was not the case. More people picked the defined contribution plan, which again, increased the up-front costs for the laboratory.

Senator DORGAN. Senator Feinstein, might I interrupt for a moment?

Senator FEINSTEIN. Certainly.

Senator DORGAN. I'm—would you submit a report to this subcommittee on that $200 million—you said that it was a $200 million difference?

Dr. MILLER. Yes, it's about $280 million total, including Federal funding. But yes, I'll be happy to.

Senator DORGAN. Could you submit a report that outlines those costs, those added costs, so that we understand it?

Dr. MILLER. Yes, sir.

Senator DORGAN. And let me ask one other question, if I might. What—is any of this applied overhead that is——

Dr. MILLER. Let's see—those costs are collected through overhead so that it makes it look like the laboratory is more expensive in an overhead, even though we actually haven't added in the overhead people, and the fact of the 2,000 people, roughly two-thirds, are being reduced out of the overhead, or support side of the laboratory. So, we're actually reducing the number of people in the overhead, but the overhead costs are going up.

Senator DORGAN. The reason I ask the question is there's a lot of overhead expenditures applied—or overhead charges applied—to various Federal money that moves out, and so——

Senator FEINSTEIN. Well, but I think there were a lot of unintended consequences of this. And that's what concerns me. I don't think the people that made these decisions really understood that if they did this, there would be $47 million in additional costs for healthcare, that there would be fees that would go up, and the way these fees went up, and that the tax-exempt status of the University was going to change, so that it is a very hefty tax burden that's put in there now.

Dr. MILLER. And Mike could give you a similar story for Los Alamos.

Senator FEINSTEIN. See, this concerns me. And the problem was, as I understood it, from what I overhear, is the concerns over security at Los Alamos, in order to compete for the contract, you had to provide a different management structure from what had existed in the past—stop me if anybody thinks I'm wrong.

Senator DOMENICI. You're right.

Senator FEINSTEIN. Therefore, you took on all of these added costs by bringing in the private sector in a joint venture, which may or may not have been a good idea, I can't pass judgment on it. But one thing we know is there certainly are greater costs.

Senator DORGAN. Senator Feinstein, I'm going to ask Los Alamos to submit the same report that I've asked of Lawrence Livermore, with respect to——

Dr. ANASTASIO. Yes, sir, we'll be happy to do that, Mr. Chairman.

Senator FEINSTEIN. So, that when the President actually gave us a budget that was $55 million less—less than last year—just for, that's just for Lawrence Livermore, right?

Senator DOMENICI. Yes.

Senator FEINSTEIN. Just for Lawrence Livermore, that really put them behind the 8-ball with these other costs. Is that a correct interpretation?

Dr. MILLER. Yes, ma'am, that's exactly right.

Senator FEINSTEIN. And it seems to me that the administration has to take into consideration that when we go this way, it's going to cost more, and those costs have to be met. And that we also have to know that it's going to cost more.

So, the result is, I don't know whether these are senior scientists, whether they're junior people—but to quote you, they are highly trained scientists and engineers, that are now thrown into a job market—so let me ask you, between the three institutions, how many highly trained scientists and engineers are now being thrown into the job market? Being involuntarily—

Senator DOMENICI. Over what period of time? Three years?

Senator FEINSTEIN. Well, this—no, this last year.

Senator DOMENICI. Oh.

Dr. ANASTASIO. Yes, at Los Alamos, we've reduced the workforce by a little over 2,000 people over the last 18 months, and I would say, a little less than half of that number are technical people.

We were able to do that through an involuntary—a voluntary program. We did not have to do an involuntary, as George is doing, and in other, other turnover—managing the turnover, the normal turnover, without replacing people that leave, but year—I would say close to 1,000 people——

Senator FEINSTEIN. Okay.

Dr. ANASTASIO [continuing]. With a technical background, over the last 18 months.

Senator FEINSTEIN. And, Mr. Miller, could you comment—answer that same question?

Dr. MILLER. Yes, again, we have lost—by the end of this fiscal year, relative to the beginning of 2007, so again, roughly 2-year period, we will have lost 2,000, of whom about 500 are highly skilled engineers and scientists.

Senator FEINSTEIN. Mr. Hunter.

Dr. HUNTER. Thank you, Senator.

In the weapons program, we've actually reduced the workforce by about 500 or 600 people. The net number that exited the laboratory was more like 200 or 300, and of that, about half were scientists and engineers. The reason our numbers are smaller is because we added a lot of other work from other agencies to make up for some of the downfall in nuclear weapons.

Senator FEINSTEIN. All right, so now we have thousands of people floating around, when we know there's cyber warfare going on, there are all kinds of intrusions, there are all kinds of efforts to capture these scientific secrets. And I think it's really problematic.

Senator DORGAN. Dr. Hunter.

Dr. HUNTER. I may have been—I should clarify. In our case, we handled that reduction by normal attrition and limited hiring, as opposed to laying people off.

Senator FEINSTEIN. So, you didn't lay anybody off?

Dr. HUNTER. We did not lay anybody——

Senator FEINSTEIN. Okay.

Dr. HUNTER. This year we've laid off a few tens. I wanted to clarify that, thank you.

Senator FEINSTEIN. Thank you.

Senator DORGAN. Senator Domenici.

Senator DOMENICI. Yes.

Senator DORGAN. Thank you.

Senator DOMENICI. I wondered if Tom D'Agostino—I know you're not at the witness stand, but do you have any observations about this last 10 minutes of testimony?

Mr. D'AGOSTINO. Absolutely.

Senator DOMENICI. That might be helpful to us?

SCIENCE AND TECHNOLOGY FUNDING TRENDS

Mr. D'AGOSTINO. I think there's at least a sense after this discussion that the administration is not interested in science and technology—I want to clarify that right off the bat. Going back——

Senator FEINSTEIN. Who said that?

Mr. D'AGOSTINO. Well——

Senator FEINSTEIN. We didn't say that.

Mr. D'AGOSTINO. We do have a problem in science and technology, there's no question about it. I think it has to do with the levels of resources that ultimately end up at the institutions. And what we're seeing here, and I think maybe Tom Hunter alluded to it, it's the natural tension between maintaining a 50-year-old nuclear weapons infrastructure and dealing with flat budgets. This year is an exception—we requested about $9.1 billion or so for the

NNSA. In prior years, we were fairly consistent asking for money at about the $9.3 billion range.

And this subcommittee's been very supportive of, there's no question about it, the science and technology program. But when things get through, we've had a year-long continuing resolution in fiscal year 2007, we had an Omnibus last year, and the $9.3 billion typically gets reduced to the $9.1 billion range. That's been the trend over the last 2 years.

And so now we have a flat budget over the last few years. And as our facilities get more expensive to maintain, there is going to be reductions elsewhere.

What we're trying to do is aggressively reduce our fixed costs—those costs that are kind of below the radar, and George alluded to it when he talked about a two-thirds reduction in the workforce.

Since it's typically unpopular to ask for more money in nuclear areas—and we've seen 3 years worth of relatively flat budgets—we're trying to aggressively go after and reduce those fixed costs, so we can reinvest our resources into this infrastructure. And it's a hard management problem, there's no question about it.

I think we all agree that we want to reduce the costs of this program, without dropping the ball on the science and technology side. And what you're hearing, I believe, are those challenges we face.

Senator DORGAN. Yes, well, but let me just also say, as I said before, this subcommittee doesn't just deal with you, this subcommittee deals with a range of other things, and we have a budget that is sent to us without a lot of forethought, in my judgment, on another large area, and that is water. It's not nearly as large as nuclear. But the implication that this subcommittee should take a look at this country's water needs, and cut $1 billion out of water investment is preposterous.

Mr. D'AGOSTINO. Right.

Senator DORGAN. We're not going to do that. So, we also have a balancing problem, and it's because we've gotten a budget submitted to us that does not meet this country's needs.

And so, I think this subcommittee is very strongly in support of science.

Mr. D'AGOSTINO. Absolutely.

Senator DORGAN. And will be. But, we are also confronted with a budget that, in many ways, I think, is playing a game. We know what the water projects are, we know which ones have been started, we know which ones have to be invested in to be completed. And yet there's a bit of game being played, I think, in budget—Senator Domenici was chairman of the Budget Committee for many years, so he will recognize these issues.

This is not our only responsibility, but it's a very important one. And I just want to make a point, that we're put in a bad position by extraneous events, when the President sends us a budget and says, "Let's cut water projects by $1 billion," and that will not happen. This subcommittee's not going to do that.

So, we're going to try to do everything we can to make sure that we provide sound funding for science, and I've already made a statement on how I feel about the national laboratories. Senator Domenici, do you want to make final comment?

Senator DOMENICI. Yes, I just want to say, it does bother me that we end up testimony, seemingly, on a low note. But I don't think things are really on a low note. I think the laboratories have done quite well, considering that we really are going from a cold war to a non-cold war situation, you know, looking back at history, when America had giant projects that were good for war, and then the war ended, we just got rid of them, we didn't have anything left over. We've done that before with giant science projects that helped the government—the war ended, and we dismantled everything.

I think we've done quite well, building this down, and only in the last few years has it caught up with us.

But, I do want to say that I think you're telling us something, and just my interpretation—you know, if we're going to alter, change, or change the nuclear stockpile substantially—and I think you all are suggesting that we're probably going to—it's not going to look like it is today, in 15 years. It's going to look considerably different. It's going to be much smaller—smaller numbers, smaller weapons—we're hoping that that also will mean that we can—it'll cost less to maintain them and keep them, and make sure they're reliable.

But we're not moving head on that yet, we've solved the problem of not doing underground testing, and then we started Stockpile Stewardship out on a limb—nobody knew anything about it. When it was presented to me, I couldn't remember the three words, Science-based Stockpile Stewardship. I had to write them down, because they were so funny.

Now, they've just—it's pretty obvious, what we've done, we've accomplished a great deal. In the meantime, we need these laboratories living laboratories for the future, as I see it. And we spent a lot of money doing that.

But there are better laboratories for Science-based Stockpile Stewardship, wouldn't you think, Mr. Miller? They're better for it, than without it?

Dr. MILLER. Absolutely, sir. You said it very well.

Senator DOMENICI. I think that's right, and I think that's good for the country. And we'll try our best, and we hope the new management teams—which were the decision of the administration—and I don't blame them, that was their prerogative, that we were going to go with the new system—I hope it works.

Director Anastasio, I hope you all dedicated yourself to better management at Los Alamos, and I think it's gotten a little better. I don't have to say that about Director Hunter, you've always had the best management, you didn't even have to lay off any people—that comes with good management, incidentally.

And Director Miller, I'll find out more about you when I come to see you, okay?

Thank you all, very much.

Senator DORGAN. The interesting thing, Senator Domenici, is that we have a lot of nuclear weapons, we talk a lot about them, we can't possibly use one, ever, without catastrophic results for our planet.

Senator DOMENICI. Right.

Senator DORGAN. We've signed up, as a country, to go to zero nuclear weapons at some point in the future. We will not do that, of

course, until it is—if ever—it is determined to be safe and secure for our country to do that.

But, I think the other side of this subcommittee is nuclear nonproliferation, which is very important, and we will be talking more about that at a later time, as well.

ADDITIONAL COMMITTEE QUESTIONS

At this time I would ask the subcommittee members to please submit any questions they have for the record.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

QUESTIONS SUBMITTED TO HON. THOMAS P. D'AGOSTINO

QUESTIONS SUBMITTED BY SENATOR PETE V. DOMENICI

Question. Two months ago you named Dr. David Crandall as NNSA's Chief Scientist. In your announcement of his promotion, you stated that you "outlined your expectations for Dave in this new challenging assignment."

What are your expectations and can you please tell me how you intend to measure his success in implementing a comprehensive science strategy for the labs?

Answer. Dr. Crandall will advise me and represent the NNSA on science and technology issues for national security. He will work with NNSA program managers and with our national laboratories to define the nature of science and technology that NNSA can advance for national security and how to do that in collaboration with other parts of DOE and other agencies that have synergistic mission needs to those of NNSA. Measures of success will include defining strategic documents with more specifics on science and technology and agreements with other agencies on how to share resources to advance our respective mission needs.

ADVANCED COMPUTING

Question. When we faced the decision to proceed with the science-based Stockpile Stewardship program, it was decided that the labs would need to develop advanced computing capabilities that didn't exist at that time. I recall there was significant discussion regarding the potential to develop this capacity.

Fifteen years after we initiated this effort can you tell me if we have met or exceeded our computing goals at the time? What has this meant to Stockpile Stewardship?

Answer. NNSA has exceeded its computing goals in terms of both the platforms and the codes. In 1996, the Accelerated Strategic Computing Initiative, or ASCI, originally planned for a 100 Tera-Flop (TF) entry level system to support a high-resolution, end-to-end, 3D simulations. The original goal of 100TF was achieved in fiscal year 2005 with delivery of the ASC Purple machine. We also acquired the BlueGene/L machine clocked at 360TF for science applications.

Additionally, in 1996, the 100TF goal centered around performing a single calculation that was highly resolved enough to distinguish physical error from numerical error. The realization of Purple was accompanied by detailed simulations that revealed physics not previously seen in the 50-plus years of computational science. Today, we not only have the capability increase the physics basis in our simulations for annual assessments and other production work, but also have begun to adopt the codes for broader national security applications (i.e. threat reduction, secure transportation).

Question. What has this meant to U.S. leadership in computing?

Answer. To illustrate the program's impact on computing at the high-end: on the latest (Nov., 2007) Top 500 list of supercomputers around the world, the top 12 platforms shown have directly benefited from ASC-funded architectures. Of those 12, 9 are located in the United States. The United States has the top slot, with BlueGene/L at 478.2 teraflops (as measured on the Top500 benchmark), almost three times faster than the second-place machine. Of the entire top 500, fully 38 percent have major components that derived from ASC investments, and 25 percent employ internal networks developed through ASC collaborations and projects.

Your Advanced Computing and Simulation budget fails to provide any specifics regarding the proposed computer acquisition budget, including any mention of the Roadrunner platform and the status of the Sequoia platforms.

Question. Can you provide the specific details as to how much you have budgeted for each system and the status of each platform? What are the out year acquisition needs and how will this budget support the preferred alternative you have proposed?

Answer. The program has budgeted $25.9 million in fiscal year 2009 to cover the final payments for Roadrunner. Since the Sequoia procurement is about to release a Request for Proposals, a final payment schedule has not been negotiated. However, the funding profile for fiscal year 2009–fiscal year 2012 totals about $220.0 million. In addition, the program has a need to replace the Purple platform that supports the current National User Facility and has directed the LANL–SNL Alliance for Computing at Extreme Scales (ACES) team to begin the procurement process that will result in a platform, currently referred to as Zia, to be delivered in fiscal year 2010. While the program set an initial funding target of about $66.0 million for Zia, we are reevaluating the ability for that budget level to meet mission needs.

It is my understanding that the NNSA intends to acquire a third computer known as "Sequoia" for Livermore to support the Blue Gene/L and Purple platforms. Your budget is silent on this point as far as I can tell.

Question. Did the NNSA ever conduct a competitive solicitation for this new acquisition for Livermore?

Answer. The program documented a mission need in March 2008 for a petascale platform to address uncertainty quantification. That led to a decision to procure a system, code-named Sequoia, to be hosted at LLNL. While being housed at LLNL, it is not a follow-on to BlueGene/L or Purple. Sequoia is being acquired via a competitive process where the selection will be based on best value, determined by a combination of price and technical features related to NNSA workload. The release of the Request for Proposals is imminent and five major vendors have expressed interest in bidding.

Question. Did the laboratory or the NNSA consider any other vendors, other than IBM, regarding other technology or cost scenarios for this acquisition?

Answer. LLNL will evaluate all proposals received in response to the Request for Proposals and negotiate a contract with the winning bidder based on best value to the government.

Question. All of the most recent computing platform acquisitions are IBM products. What is your plan to consider alternative vendors or platforms to ensure we are considering the best alternatives in the business?

Answer. NNSA has directed LLNL to conduct a competitive solicitation for Sequoia, and to employ the traditional process of commissioning a tri-lab committee to advise the source selection authority on technical responsiveness of the bids.

Question. In the fiscal year 2008 Omnibus, language was included directing both the NNSA and the Office of Science to establish a joint advanced computing and algorithm R&D program. The objective of this language was to restore a world leading R&D capability in high performance computing architectures. The United States won't maintain its world leading role, if we don't continue to support research.

What is the Department doing to establish this capability and what goals have been set? Also, what is the strategy for achieving these goals?

Answer. The Department has established the Institute for Advanced Architectures and Algorithms (IAA). The goals of IAA have been set to:

—Undertake focused research and development in partnership with industry and academia on key impediments to high-performance computing;
—Promote the integrated co-design of architectures and algorithms;
—Develop and simulate prototypes to demonstrate advantages that allow application developers and algorithm researchers to explore advanced architectures; and
—Train future generations of computer engineers, computer scientists and computational scientists.

Both the DOE Advanced Scientific Computing Research (ASCR) and the NNSA Advanced Simulation and Computing (ASC) offices have approved the goals, structure and management of the IAA, including the requirement for every proposed IAA project to be submitted to ASCR and ASC for joint peer review and approval. Currently there are two technical workshops on memory and interconnect technologies being planned for the summer and the third on algorithms in the fall.

Question. As you know, I have had great concern about NNSA's high performance computing strategy. In your effort to reduce the computing investment at our national labs, you have directed that Sandia and Los Alamos form a partnership in

computing. The Labs have completed the negotiations and codified this deal in a Memorandum of Agreement.

Since your budget request for computing is extraordinarily vague can you explain what your plans are for this joint computing effort, how the NNSA will utilize it, what type of investments will be made and how this is an improvement over the existing three lab strategy?

Answer. The joint LANL–SNL MOU, formally establishing the Alliance for Computing at Extreme Scales (ACES), was undertaken to capitalize on each labs strengths as the preferred alternative was implemented and present an icon and entry point into the labs for academia and industry working with the ASC program at the New Mexico labs. The most immediate and visible impact will be that ACES will host the next National User Facility for ASC capability computing with the design team being directed by SNL and the operations team being led by LANL. The program expects a similar division of labor as future systems are acquired by ACES. As the program works to identify efficiencies we look to preserve and accentuate our strengths. ACES emphasizes the strengths resident in the New Mexico labs for current and future national security applications.

Question. As you are well aware I believe the NNSA has made a serious mistake in not pursuing a trilab advanced computing strategy to ensure that each lab works to develop cutting edge architectures as well as to support the world's best computer simulation capabilities.

Despite the fact that the NNSA has proposed to reduce computing investment as part of the preferred alternative, are you willing to keep an open mind to alternative approaches recognizing that computing has opened up significant modeling capabilities for the labs?

Answer. The NNSA labs are world leaders in designing, acquiring and operating supercomputers. Our approach for ensuring cost-effective, efficient, and sustainable operations that still met the needs of the Stockpile Stewardship program has led us to make some tough decisions. We have sought, and will continue to seek, technical advice from outside the headquarters as we develop strategic guidance and direct laboratory investments.

BUSH ADMINISTRATION—WEAPONS POLICY

Question. Mr. D'Agostino in your statement, you said that in 2004 the Bush administration ordered the nuclear weapons stockpile to be cut in half and then ordered an additional 15 percent cut just this past December. I believe critics of the President forget these facts. Many also have forgotten, or were never aware of the fact that this President recommended a shift in the role of the deterrent in the 2001 Nuclear Posture Review.

Can you explain to the subcommittee what this shift has been and the significance of this policy?

Answer. The 2001 Nuclear Posture Review addressed "strategic capabilities" not just nuclear forces. Its basic findings were:

—Russia is no longer an immediate threat—this fact itself has led to dramatically reduced U.S. reliance on nuclear weapons, and enabled very substantial reductions both in deployed forces and the overall nuclear stockpile.

—Precision conventional strike and missile defenses will further reduce reliance on nuclear forces.

—But nuclear weapons are still an important element of national security strategy.

—Substantial nuclear arsenals remain, and proliferation concerns grow—we can no longer predict when and where major new threats will emerge.

—Nuclear force planning is thus no longer threat-based (i.e., on cold war nuclear targeting model) but on broader concerns of defense policy.

—The defense R&D and manufacturing base, including the nuclear weapons infrastructure represented by NNSA's national laboratories and production facilities must be able to respond on needed timescale to emerging threats.

The ideas reflected in the 2001 NPR reflect a major reconceptualization of how strategic capabilities including nuclear and conventional strike forces, the supporting defense infrastructure and missile defenses interrelate in advancing the security interests of the United States and its allies.

Question. Consistent with the fiscal year 2008 Omnibus, the NNSA has adopted the congressionally directed level of 50–80 pits per year production capacity as the preferred alternative. Can you please explain the significance of this shift and the budgetary impact that will result?

Answer. The significance of the shift to 50 to 80 pits per year production capacity is acknowledgement by NNSA and the Department of Defense that any future re-

quirements, to include transformation of the nuclear weapons stockpile or life extensions of warheads, can be managed within the production levels that the capacity can support over a specific time period. The reduced capacity requirement also opens up the potential for upgrading/modifying the plutonium facility at the Los Alamos National Laboratory instead of building a completely new facility. The cost difference (savings) between building a new plutonium facility for pit production and upgrading/modifying the existing plutonium facility (PF–4) at LANL is estimated to be more than $1 billion. Either option requires a new capability for chemical and metallurgical activities to support pit manufacturing and other plutonium operations. The shift, however, comes with additional risk of both making the required improvements within an operating nuclear facility and meeting any future unknown stockpile requirements where time may be critical in sustaining the nuclear deterrent due to capacity constraints.

CHEMISTRY AND METALLURGY RESEARCH REPLACEMENT (CMR–R) PROJECT

Question. The NNSA's preferred alternative has proposed to build all three phases of the CMR–R facility at Los Alamos. There is a lot of misinformation being spread about this facility and its role as a production facility.

Can you tell me whether or not the CMR-Replacement facility will be used to manufacture pits? If not, where will pits be manufactured?

Answer. The CMR–R Nuclear facility will not be used to manufacture pits, but will support pit production through the availability of a vault to hold material and pits and through the required analytical chemistry and metallurgical analysis that ensures specification of material during production is being met. Pits will be manufactured within the Technical Area 55 (TA–55) plutonium facility (PF–4).

Question. What is the proposed role of the CMR–R and why can't the existing facility be used? Also, why is it important that CMR–R include a Category II nuclear facility behind the security fence?

Answer. The proposed role of the CMR–R is to provide analytical chemistry support currently conducted in CMR and add a vault for storage of material to support pit manufacturing and consolidation of plutonium missions. The existing CMR facility was built over 50 years ago and has significant facility infrastructure issues that impact personnel and safety. In addition, since its construction, further seismic analysis has revealed a seismic fault running under the building which has caused significant reduction in activities to maintain the safety basis. Upgrading the facility to meet modern seismic standards for nuclear facilities has been assessed as not being cost effective.

A Category II security facility is required due to the security requirements for a facility operating with the amount of special nuclear material required to accomplish the NNSA mission. The amount of activities using and handling special nuclear material and the required load of material within the vault necessitate this security. The Radiological Laboratory and Utility Office Building (RLUOB), the other facility within the CMR–R project, is only capable by design of handling very small gram quantities of special nuclear material.

Question. The budget request states that the CMR–R project total cost is estimated to be $2 billion, which is an increase from the initial estimates of $1 billion. The budget doesn't provide a specific justification for this increase.

Can you please explain why this estimate has increased?

Answer. The basis for the cost the CMR–R is being developed presently; NNSA does not envision having a validated cost baseline until fiscal year 2010. Specific quantification of the overall costs escalation cannot be performed now, but the factors that drive the increasing cost of CMR–R, especially for the Nuclear Facility, can be identified. These factors include: building commodity and construction support cost escalation in the marketplace (e.g., rapid increasing costs for steel, concrete, glass, formed shapes, like equipment and pipe, and fuel); facility structural design changes to accommodate higher seismic loads and enhanced security threats ("the design basis threat") recognized since Critical Decision-1 in May 2005; additional analysis of the detailed, specific quality assurance, safety, and security requirements for building nuclear facilities (e.g., the interactions associated with fire protection and ventilation systems, subject to severe seismic criteria); and continued schedule delays, which add carrying costs and future escalation.

ECONOMICS OF THE PROPOSED URANIUM PROCESS FACILITY

Question. Administrator D'Agostino, as you are well aware the CMR–R facility has come under intense scrutiny with Congress even prescribing the range of production in the fiscal year 2008 bill, which was included in your preferred alter-

native. I am quite confident that at the end of the day, the project will be better served by the intense scrutiny and review.

I am concerned, however, that the Uranium Process Facility and the new Kansas City Plant has not received the same level of review as the CMR–R Facility.

It is my understanding that the UPF Facility will cost between $1.4 billion and $3.5 billion and will support uranium mission of the complex. Also, I understand the Cost Analysis Improvement Group suggested that an alternative site other than Y–12 might improve the economics of this project.

Has the Department considered the precise throughput that will be required for the UPF to support the LEP or RRW mission and has this been vetted within other relevant Federal agencies.

Answer. The UPF is being designed with a throughput to support the most likely range of stockpile alternatives being considered jointly by the NNSA and DOD at this time. This throughput capacity supports future nuclear weapons stockpile requirements for either an LEP or an RRW strategy. The NNSA has worked closely with appropriate offices in the Department of Defense to properly define stockpile requirements affecting UPF throughput.

Question. What other sites are being considered and how will this impact the mission?

Answer. Uranium operations are currently accomplished at the Y–12 National Security Complex (Y–12) in Oak Ridge, TN. While Y–12 is designated as the preferred uranium center alternative in the Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement, NNSA continues to evaluate two alternative sites as the potential locations for the uranium mission. These alternative sites are the Pantex Plant (PX) in Amarillo, Texas, and the Savannah River Site (SRS) in Aiken, South Carolina. If uranium operations were moved from Y–12 to either PX or SRS, the primary impacts on the NNSA mission are the potential risks and added costs of relying on aging Y–12 facilities during an extended transition period, and the loss of workforce expertise that occurs when experienced staff choose not to relocate. Current planning schedules show that moving the uranium mission from Y–12 to either SRS or PX requires an additional 5 to 7 years of transition operations of existing Y–12 facilities while replacement facilities are completed. After the transition, regardless of which site is chosen, the uranium processes required to support the NNSA mission would be qualified and fully functional.

ENHANCED SURETY

Question. For the past several years, Congress has provided additional funding in the Engineering Campaign to support advanced surety research in an effort to encourage the Department to pursue state of the art use control technology to prevent the unauthorized use of our weapons.

This is the first year that the administration has included funding to support advanced surety research in its request. How will this funding be spent and what is your goal and timetable for developing and deploying this state-of-the-art technology?

Answer. The administration has developed advanced surety technologies for several years through the Engineering Campaign. The W76–1 life extension program (LEP) incorporates improved safety features, modern weak-links and strong-links, that were developed in the Campaign. Currently funded advanced surety activities include a laser-based advanced initiation system that, when fielded, will eliminate a safety concern for certain weapons in the existing stockpile. Additionally supported work includes security-related technologies that will improve the Department's response to current terrorist threat scenarios. The surety technologies included in the reliable replacement design would have provided greater performance margin against these postulated threats. All of these advanced surety technologies are fielded based on their technological maturity, and while some require an LEP to implement, others can be fielded without the need of a major refurbishment of a weapon platform.

Question. Are you aware of any statutory prohibitions to prevent the NNSA from integrating use control technology into our existing LEP program?

Answer. The current statutory definition of a Life Extension Program implies use of, or modification of, an existing pit or secondary (50 U.S.C. sec. 2529). Therefore, if a potential use control technology would require the manufacture of a new pit or secondary, that technology would not be allowed in a Life Extension Program. Any other use control technologies that can be used in concert with an existing pit or secondary would be allowed under the Life Extension Programs.

Question. Knowing that our present warheads are going to be in the stockpile for many years, maybe decades more, and with the growing threat of terrorist extrem-

ists, are we doing enough to implement modern surety technologies to keep these warheads secure?

Answer. Weapon security will always be met through a combination of engineered features within the weapons and the appropriate physical security measures, and, therefore, future surety improvements must balance the tradeoffs between long-term and short-term costs, time to implement and overall effectiveness. In addition, before any surety improvements can be implemented, the nuclear weapons laboratories must ensure that the weapon can be certified without the need of future underground nuclear testing. External technologies can provide surety improvements in a relatively short time and at a low cost compared to either an LEP or replacement weapons but may have significant operational impacts and limited effectiveness. An LEP or replacement designs provide the opportunity for the greatest surety improvement but with a longer development time and additional work required to certify the nuclear package without underground nuclear testing. While we have made progress in fielding technologies to enhance the surety of the stockpile, some of the opportunities for greatest improvement have not made it into the stockpile to include the W80 LEP and the Reliable Replacement Warhead. The surety of the stockpile is only as good as the weakest link. Therefore, to ensure the security of the enduring stockpile, we maintain a program to evaluate the stockpile, system-by-system, and implement the appropriate level of surety for each system, accounting for all other aspects of weapon security for the system being evaluated.

LANL PERFORMANCE—ON THE RIGHT TRACK

Question. Administrator D'Agostino, we are approaching the 2 year anniversary of the new management team's take over of Los Alamos. It appears to me that things are on the right track with several deliverables met in pit manufacturing, supercomputing, and improved site security.

What is your impression of the operations at LANL?

Answer. I agree that there has been progress in meeting goals at Los Alamos in the areas that you cite. LANL has continued to meet mission deliverables and, in particular, is up-to-date in meeting their deliverables in pit manufacturing. The supercomputing deliverables for the Roadrunner computer system are being met, and LANL is working with us to understand the upgraded power and cooling needs of their computing facility. Their site security objectives have been largely met, including a balanced inventory of special nuclear material and the reduction of the amount of CREM (Classified Removable Electronic Media) as well as its improved management. LANL, by all measures, continues its tradition of outstanding science and technology. Recent positive progress has been made in the management of their LDRD (Laboratory Directed Research and Development) program to ensure that it is better aligned with strategic directions. There are some areas that still need improvement. Management costs have gone up since the new team has taken over and have added to the cost of doing business. Hiring is a crucial area to ensure future scientific success but has been slow because of budget difficulties. Overall, there has been steady improvement in most operational areas since the management transition.

LOS ALAMOS NEUTRON SCIENCE CENTER (LANSCE)

Question. Administrator D'Agostino, as you are aware, I have sent you a letter encouraging you to better define the long term science strategy and investment in the our national labs as part of the Complex Transformation effort. I believe strongly that the NNSA must identify a long term science strategy for the NNSA labs. More specifically, I also suggested you develop a refurbishment strategy for LANSCE.

Do you agree that the NNSA must have a long term science infrastructure investment plan?

Answer. Yes, we agree that a long term science infrastructure plan is required. The success of the stockpile stewardship program is a testament to the execution of the science investment strategies that were crafted in the 1990s. These strategies brought us the modern computational systems and experimental facilities that can be integrated to allow us to maintain the stockpile without underground testing. We are also seeing the closure of Significant Finding Investigations that had been open for many years because the tools were not available or capable. Now they are. In the immediate future we see the fruition of many more of the investments such as DARHT second axis, ZR, Omega EP, and NIF. Along with LANSCE and smaller facilities, these science tools will significantly advance our capability to certify and assess the stockpile. Presently, we are engaged in developing science, technology and engineering roadmaps. Many of these have pointed to the need for LANSCE during

the next 10 years or so to address key nuclear physics, hydrodynamic and material issues. Science facility needs beyond the next 10 years is being studied but will require more results from the planned work in the next 5 years that may identify gaps. Other national missions may also be weighed in defining new science facilities at laboratories.

Question. Do you believe LANL needs a new science facility to continue supporting the ongoing stockpile stewardship mission as well as support non-weapons scientific research?

Answer. The NNNA needs LANSCE for the future to support critical stockpile stewardship missions; however, we have not yet determined a driving need within NNSA for a new science facility at LANL. LANL has discussed ideas that could provide benefit to other science missions and also to NNSA. LANL plan some major technical workshops to refine their ideas, and they will continue to bring these forward to the Department of Energy and NNSA. NNSA believes that LANL will continue to have exciting science missions within NNSA either with or without a new facility.

Question. When will NNSA pursue a CD–0 for the LANSCE project?

Answer. NNSA granted CD–0 for the LANSCE refurbishment project in December 2006, and is working to complete CD–1 by the first quarter of 2009.

MATERIALS CONSOLIDATION—MOX

Question. Can you please summarize for the subcommittee where the NNSA is in terms of consolidating special nuclear material and what the Department will gain as a result?

I strongly believe that if the NNSA is going to consolidate the special nuclear material, it must also develop a final disposition strategy for the excess plutonium. Today, the current disposition pathway is the MOX plant at Savannah River.

Question. The MOX plant serves as our only plutonium disposition path forward. Is the Department considering any other alternatives? Alternative paths were considered, both by the Department of Energy and outside experts, and ultimately rejected as not the most cost effective approaches.

Answer. No, the Department is not considering any other alternative plutonium disposition paths for the approximately 43 metric tons (MT) of surplus weapon-grade plutonium planned to be processed at the MOX facility. While the Department is planning to use the Savannah River Site's H-Canyon Complex to dispose of up to 5 MT of impure, non-pit plutonium, the H-Canyon Complex is not suitable to dispose of large quantities of pure plutonium.

Question. If Congress were to cancel the MOX project, how much longer would it take to develop and implement another disposition pathway?

Answer. If the MOX project were cancelled, the Department would have to re-evaluate viable alternatives for the disposition of surplus weapon-grade plutonium. The Department has previously considered immobilization to be a possible alternative and would likely reconsider it as a disposition path for the approximately 43 MT of weapon-grade plutonium currently planned for the MOX facility. Research and development of a ceramic immobilization process was halted 7 years ago and restarting such a program now would require at least 10–12 years to complete the necessary R&D, repository licensing, design and construction before such a facility were able to become operational in the 2018–2020 timeframe, assuming essentially unconstrained funding were available to support such an aggressive schedule. (Total project costs for MOX immobilization were estimated to be roughly equal, there is much more technical and financial risk associated with immobilization because the technology is less mature.) The amount of time necessary to immobilize this large quantity of weapon-grade plutonium would extend beyond the planned operating life of the Defense Waste Processing Facility (DWPF) at the Savannah River Site and an insufficient quantity of high-activity waste remains at DWPF to immobilize this quantity of plutonium. This would force consideration of shipping surplus plutonium to the State of Washington and performing some, if not all, of the can-in-canister immobilization operations at the Waste Treatment Plant (WTP) at Hanford.

Question. What is the earliest you believe it could be operational? How much more would it cost?

Answer. As I mentioned, it would take a minimum of 10–12 years to complete the necessary R&D, repository licensing, design and construction before an immobilization facility could become operational.

Cost estimates for immobilization are highly uncertain since the technology supporting the immobilization of plutonium is still in the R&D stage and the immobilized waste form has yet to be qualified for acceptance in the planned geologic repository. It is likewise impossible to estimate, with any reasonable accuracy, the

cost of shipping surplus plutonium to the State of Washington and performing some, if not all, of the immobilization operations at the Waste Treatment Plant at Hanford. Moreover, if the Department were to change its disposition program midstream and cancel the MOX project, the cost implications would be significant. With construction already significantly underway, there would be some physical stabilization of the construction site to bring an orderly close to the ongoing work at the site. An immobilization facility would still require some form of pit disassembly capability. Canceling the MOX program would also complicate the Department's proposed nuclear materials consolidation strategy, potentially forcing the Department to complete expensive security upgrades at the Hanford Site (about $200 million) and Pantex (about $27 million), and requiring the Department to continue to pay storage costs for plutonium estimated to be hundreds of millions of dollars per year, in addition to the possible payment of economic and impact assistance of up to $100 million per year to the State of South Carolina for failure to meet the MOX production objective as defined by section 4306 of the Atomic Energy Defense Act.

NNSA SCIENCE STRATEGY

Question. Administrator D'Agostino, your testimony makes a thorough case for the consolidation of materials, mission and manpower. However, in the 13 pages of written testimony, I only find the reference to science in a handful of examples, primarily focused on past scientific achievements. There is absolutely no mention of a scientific path forward or a strategy to sustain the scientific excellence at the labs.

Could you please explain to the subcommittee, what this budget provides in terms of long term planning to sustain the science capabilities at the laboratory?

Answer. With respect to Science and Technology at the NNSA Laboratories, my most important new initiative is Special Focus Area 4: Future Vision and Mission for the NNSA and its Laboratories. I believe that the NNSA laboratories can play a central role in national security R&D, and complimentary to the transformation of the weapons complex, I would like to transform the science and technology base from one primarily focused on nuclear weapons, to one which also meets the broader national security needs of the Nation. I expect a more detailed discussion of this vision in the budget formulation we are currently preparing. We expect that this exciting new direction will attract new talent to the laboratories, thus allowing us to execute our core mission at the same time bring scientific innovation to solving emerging national security issues.

RELIABLE REPLACEMENT WARHEAD

Question. Administrator D'Agostino, this budget provides $10 million to advance the feasibility work on the RRW study, but not enough to complete the research. It is my understanding that an additional $55 million is needed to complete this phase of study.

Can you tell me what will be gained if Congress provides the full $65 million needed to complete the feasibility study? What would then be the next steps?

Answer. The purpose of the joint Department of Defense and National Nuclear Security Administration Reliable Replacement Warhead Phase 2A study is to develop the detailed cost, scope and schedule baseline for a Navy Submarine Launched Ballistic Missile warhead application. This information is needed by the National Nuclear Security Administration, the Department of Defense, and the Congress in order to make informed decisions on whether and how to proceed with development and production.

Question. Please clarify for the subcommittee whether or not you have the authority to expend funds to support the engineering phase of the RRW. Under existing authorities can the NNSA build a RRW system if it desired at this point?

Answer. For refurbishments which use the Phase 6.X process, the Nuclear Weapons Council approves entry into the development engineering phase and the NNSA informs Congress. However for a new weapon development project, there are explicitly identified Congressional approval points. In the case of the Reliable Replacement Warhead, the National Nuclear Security Administration does not have authority to expend funds to support the engineering development phase, nor to build a Reliable Replacement Warhead.

Question. Mr. D'Agostino it is my understanding that the existing nuclear nations are all making modifications to their nuclear weapons programs and we know that both Iran and North Korea have pursued a clandestine nuclear program for years.

Do you believe that the completion of the RRW feasibility study would encourage any other nation to change their nuclear weapons policy?

Answer. No, there is not one shred of evidence that U.S. nuclear weapons activities including our contemplation of replacement warheads has had any impact on

either horizontal or vertical proliferation. With the end of the cold war came the cessation of the nuclear arms competition between the United States and Soviet Union in which one side's weapons modernization cycle generated a reaction in the other. Today, there is no coupling between Russian and U.S. nuclear weapons programs—indeed, the Russians are modernizing their nuclear arsenal and we are not.

U.S. nuclear programs will not increase incentives for terrorists to acquire WMD—those incentives are already high and are unrelated to U.S. nuclear (or conventional) defense capabilities. Nor are such programs likely to have any impact on rogue state proliferation, which marches forward independently of the U.S. nuclear program. Indeed, there is no indication at all that very significant reductions in the numbers of U.S. (and Russian) nuclear weapons, and in the alert levels of nuclear forces, over the past two decades, coupled with no U.S. nuclear testing and very little U.S. nuclear modernization, has caused North Korea or Iran to slow down covert programs to acquire capabilities to produce nuclear weapons. On the contrary, these programs have accelerated during this period. Nor did such U.S. restraint convince India and Pakistan not to test in 1998, or North Korea in 2005. Rather, North Korea and Iran appear to seek WMD in response to their own perceived security needs, in part, to deter the United States from taking steps to protect itself and allies in each of these regions.

But even more importantly, the credibility of the U.S. extended nuclear umbrella is a significant restraint on proliferation. Continued U.S. engagement in security cooperation with allies including a military presence, modern and flexible U.S. military forces, and the extension of a smaller but safe, reliable and capable nuclear deterrent to allies are key elements in assuring allies that they can count on the United States, and do not need their own nuclear forces.

Question. Last year, Congress directed the Department to answer several critical questions posed by the JASON report regarding the RRW program and the subcommittee provided $20 million to provide answers to their questions.

Does this work have application to warheads other than the RRW?

Answer. Many of the issues raised during the JASON review of RRW are directly applicable to Life Extension Programs of existing systems and annual assessments of existing systems. The advanced certification sub-program as outlined in the two reports to Congress is focusing on those issues that are relevant to all systems that may be changed from the tested designs by the use of new materials, enhanced surety features, and component modifications.

Question. Has the NNSA used these funds to secretly fund or subsidize the RRW feasibility study?

Answer. No. The advanced certification sub-program will look at the certification issues raised by the JASON regarding RRW but it will address a sub-set of those issues that are common to legacy systems as well. The RRW funding line that is in the fiscal year 2009 budget is intended to address specific JASON issues that pertain specifically to the WR1 design.

UNIVERSITY ROBOTICS PROGRAM

Question. What is your out year budget plan for the University Robotics Program.

Answer. The University Research Program in Robotics (URPR) was placed in the Enhanced Surveillance sub-program of the Engineering Campaign. Based on funding priorities within this sub-program, it is the intent of NNSA to fund the URPR at about $1.8 million for the out-years.

Question. Do you believe this research initiative adds value to this program or would it be better suited with another office?

Answer. Although the URPR has produced some worthwhile ideas and concepts for sensors and control systems, the weapon program does not consider this work to be priority.

Z MACHINE

Question. Administrator D'Agostino, you have recently completed the $90 million refurbishment of the Z machine making it more efficient and with a greater research potential. I have heard that the out year budget requests could reduce the budget for this facility by 50 percent.

Is this NNSA planning to shut this facility down in the near future and how can you justify spending all this funding, but not operating the facilities?

Answer. The Z machine at Sandia National Laboratories is an important part of the Stockpile Stewardship Program and has made important contributions to the program in materials properties, weapons effects, pulsed power fusion, and other areas. In the 2008 President's budget request, NNSA asked for $63.9 million for the Z machine, and in the 2009 President's budget request, NNSA asked for $64.0 mil-

lion. In both of these years, there were additional funds requested for targets. In future years, the NNSA intends to request adequate funding to make effective use of the Z machine and meet Stockpile Stewardship Program requirements. There are no plans to shut down this unique, world-leading facility.

Z MACHINE AND NATIONAL IGNITION FACILITY

Question. NNSA has made a major investment in the construction of laboratory facilities to support the Stockpile Stewardship Program including the NIF at LLNL, the OMEGA at the University of Rochester and the refurbishment of the Z facility at Sandia. However, NNSA budget requests are below what is needed to fully utilize these facilities.

Does this year's request and the out year budgets support the full utilization of these facilities? If not, what process has the Department used to prioritize the value and funding for these facilities?

Answer. The NNSA is requesting adequate funding to meet Stockpile Stewardship Program goals in accordance with a balanced, technically-based prioritization. Our responsibility is to adjust our budgets to meet the needs of the program according to our assessment of national priorities that Defense Programs must satisfy.

The level of facility funding is determined through a rigorous process involving the weapons laboratories, the Science Campaigns, and the Directed Stockpile Work program. Weapons science priorities are set by a process that considers where the advancement of scientific knowledge can make the most impact on weapons confidence synchronized with the development of experimental and computing capabilities. Funding for experimental facilities follows from the weapons science priorities and consideration of costs, benefits, and customer commitments.

Question. Given the progress and the opportunities provided by pulse power, the subcommittee also expressed their expectation that the Department will provide adequate funding for the full utilization of the Z machine in the out-year budgets.

What has the Department done to follow these directions?

Answer. NNSA recognizes the promise and progress of pulsed power and the important contributions to stockpile stewardship that the Z facility has been making and will make in the future. In fiscal year 2009, NNSA is requesting $64.0 million for operation and use of the Z facility. This amount will enable a strong program of over 180 shots which will meet all 2009 requirements for stockpile stewardship. Additional funding is requested for targets for the Z facility. In future years, the NNSA intends to request adequate funding to make effective use of the Z machine and meet Stockpile Stewardship Program requirements.

Question. The baseline ignition approach on the NIF is x-ray or indirect drive. This approach was chosen after detailed review of its maturity and value to the weapons program. Significant challenges remain for this approach as independent reviews have concluded and even now there appears to be uncertainty in the baseline target, requiring several different approaches to be funded. In the 2008 budget process this subcommittee expressed this concern and again asks the Department to justify why it does not defer the direct drive approach to ignition on NIF until after achievement of x-ray driven ignition or after experiments have shown that the baseline approach will not succeed.

Given the present and future budgetary pressures on the Stewardship Program, why does the Department continue using significant resources on other approaches to ignition such as direct drive?

Answer. In response to the present and future budgetary pressures on the National Ignition Campaign and the Stockpile Stewardship Program, resources have been shifted to maintain the indirect drive program. Those portions of the direct drive physics program that directly support the indirect drive effort are funded, along with a small polar direct drive program.

As confirmed by independent reviews, success in inertial fusion and an ignition demonstration depend on a detailed technical understanding of the implosion process. Many of the key scientific and technical challenges associated with ignition are independent of the drive method—direct or indirect drive. The OMEGA laser system is flexible and is used to study implosion physics with direct and indirect drive. The choice of direct or indirect drive is a technical decision based on experimental capabilities and requirements.

Studies at OMEGA examine physics and technology issues required for the success of indirect drive, including aspects of implosions using direct drive that are currently inaccessible with indirect drive. Implosion target physics is an integral part of the National Ignition Campaign. An important recent example is the achievement of record compressed densities in cryogenic deuterium-tritium capsules using direct drive on the OMEGA laser. This critically important result provided new knowledge

regarding capsule physics and the operation of cryogenic systems—information directly applicable to indirect drive.

Since its inception, the National Ignition Campaign has included direct drive as a risk mitigation strategy (contained in the approved NIC Execution Plan). Polar direct drive remains the only near-term back-up strategy for indirect drive ignition on the NIF. The mainline strategy remains indirect drive, and the bulk of NIF resources are devoted to it. Only if major unforeseen problems arise with indirect drive will a change to direct drive be considered.

Question. Has the Department conducted an external and independent review of the direct drive approach on NIF taking into account the non-ideal geometry on this facility? Has the Department considered any other approaches other than direct drive as the back-up to indirect drive on NIF? If so, what process was employed in this decision?

Answer. Yes. The polar direct drive approach for achieving ignition on the NIF was reviewed by an external and independent committee as part of the larger program review in 2005. It was recommended that direct drive research be continued as a risk mitigation strategy for achieving ignition. Polar direct drive is optimized for the initial NIF geometry. An NNSA Level-1 milestone in fiscal year 2009 provides a decision point for moving forward with development of polar direct drive for the NIF. The mainline strategy remains indirect drive and polar direct drive is the only current back-up. The committee also recommended that risk mitigation include planning for the use of green (2-ω) instead of blue (3-ω) light. Other approaches to ignition on the NIF, such as fast ignition and shock ignition, are primarily supported through multi-institutional grants by the Department of Energy's Office of Fusion Energy Sciences and by Laboratory Directed Research and Development (LDRD) at the national laboratories.

Please describe how the additional funding provided in the 2008 budget was used in accordance with the language of Congress. In particular was an additional $13 million provided to Sandia National Laboratory to fully fund single shift operation of Z, and how many "additional shots to support the goal of an ignition demonstration at the National Ignition Facility (NIF) in 2010" are being performed for the $9 million extra that University of Rochester received in fiscal year 2008?

Answer. For the Z facility for fiscal year 2008, the NNSA requested a total of $63.9 million for its operation and use. There were additional funds requested to fabricate targets for Z. In the Energy and Water Appropriations Act of 2008, the Congress added $13.0 million to fully fund single shift operations. Of the $13.0 million in additional funding, $7.9 million was provided directly to the Z facility and $2 million was provided to General Atomics Corporation to meet target needs for Z. The remaining $3.1 million was used for the Congressional rescission and the program's share of Defense Programs site infrastructure charges.

In addition, the Congress provided $62.0 million for the Laboratory for Laser Energetics operations, an increase of $9.0 million over the budget request, to provide additional shots to support the goal of an ignition demonstration at the National Ignition Facility in 2010. After the Congressionally mandated rescission and $1.0 million for the program's share of Defense Programs site infrastructure charges, the amount of funding provided to the University of Rochester over the fiscal year 2008 President's budget was $7.4 million. This funding has provided 262 additional shots on the OMEGA laser system and 115 shots on the OMEGA Extended Performance laser system in support of achieving ignition at the National Ignition Facility.

QUESTIONS SUBMITTED TO DR. TOM HUNTER

QUESTIONS SUBMITTED BY SENATOR BYRON L. DORGAN

ADVANCED COMPUTING

Question. The fiscal year 2008 Omnibus language directed both the NNSA and the Office of Science to establish a joint advanced computing and algorithm R&D program at Sandia. The objective of this language was to restore a world leading R&D capability in high performance computing architecture. The United States won't maintain its world leading role if we don't continue to support research.

What has the Department been doing to establish this capability and what goals have been set and how will Sandia contribute to this research program?

Answer. The Institute for Advanced Architectures and Algorithms (IAA) has been established with centers of excellence at Sandia (SNL) and Oak Ridge (ORNL) National Laboratories. A joint SNL–ORNL management structure along with strategic

directions have been established. These strategic directions are aligned to the known technical gaps that must be closed for the United States to retain its leadership in high performance computing (HPC). However, the pacing elements in closing these gaps will be Federal funding and engagement by the both the U.S. semiconductor and HPC industry.

Working with Federal Program Managers in DOE Office of Science Advanced Scientific Computing Research (ASCR) and NNSA Advanced Simulation and Computing (ASC), a competitive proposal and external review process has been developed for deployment of the initial $7.5 million fiscal year 2008 funding. We expect the selection of winning proposals will be completed in Q4 fiscal year 2008 with most of the research activity occurring in fiscal year 2009. Although this has taken longer than we originally anticipated, we believe having concurrence from all parties on the funding process is placing IAA on solid footing for the future.

As you are aware, the appropriations language instructed both DOE OS and NNSA to establish the IAA. This language has been interpreted to require that ASCR fund ORNL while ASC funds SNL. It our belief that a very successful IAA briefing to ASCR and ASC management in January 2008 lead to Dr. Orbach inserting language at the last moment into the fiscal year 2009 President's budget requesting the continuation of IAA. However, no funding stream was identified. It is our understanding that ASCR plans to ask for additional appropriations in the fiscal year 2010 Presidents budget request. NNSA is supportive of the creation of IAA at SNL but has asked SNL to prioritize their future ASC computer science funding to support the NNSA contribution to IAA. Evidence of NNSA's support can be found in stability of SNL computer science FYNSP funding during a period of significant declines in the ASC budget. However as pressures increase in the overall NNSA budget, we are concerned that there is significant risk in SNL IAA FYNSP funding.

Question. The Complex Transformation Preferred Alternative proposes to eliminate future investment in a super computing platform at Sandia, despite a very strong track record in developing the first massively parallel computing architecture, which has become the standard for high speed computers.

How will this impact the laboratory in the future and what will you do with the experienced staff without this mission responsibility?

Answer. Our response to NNSA's decision to reduce capability platform sitting to LLNL and LANL has been to develop a strong partnership with LANL called the Alliance for Computing at Extreme Scales (ACES). On March 7, 2008, Tom Hunter and Mike Anastasio signed a Memorandum of Understanding (MOU) creating ACES. In this MOU, SNL has the leadership for architecting and engineering platforms to be sited at the Metropolis center at LANL while LANL has the leadership for deploying and operating the platforms. Although this might appear like a handoff, both labs have equal representation on creating and operating the next generation of capability computers. Other than NNSA reversing its decision, we believe this partnership provides the lowest risk path to retaining the SNL experience staff that developed and deployed the most successful HPC platform to-date, RedStorm.

For ACES to be successful, NNSA must assign a near-future tri-lab platform to the partnership. The NNSA ASC computing strategy calls for a replacement for the Purple platform in fiscal year 2010. SNL and LANL were lead to believe that once the MOU was signed, NNSA would announce that ACES would provide the "purple replacement". SNL remains concerned that after almost 3 months, NNSA has not made an announcement.

The MOU does not preclude SNL from developing, procuring and operating HPC capability platform for non-DP missions. For example with NNSA's support, SNL is developing a strategy for supplying HPC computing for the enormous challenges associated in turning information into knowledge through computational analysis (informatics). An example of informatics for national security would be the discovery of terrorist networks. We believe that moving in this direction provides new opportunities for SNL staff to make significant impacts in the U.S. national security through the development of new HPC architectures and state-of-the-art algorithms for informatics.

SANDIA FUNDING DIVERSITY

Question. Dr. Hunter, your lab has been the most successful of the three labs in diversifying your budget. However, it is my understanding that investment from other Federal agencies in limited and generally doesn't provide sufficient resources to make long term investments.

Can you explain to the subcommittee the challenges in seeking outside Federal customers?

As a result of your funding diversity, do you believe that NNSA uses this as an excuse for cutting corners and not making the same level of investment as the other?

Answer. Our Nation is facing a diverse set of emerging threats ranging from traditional strategic nuclear threats to threats from other nation states, terrorists, natural disasters, and threats from technological surprise. As the Nation interacts with a changed world in which monolithic threats no longer dominate, the means to disrupt an increasingly technology-based society are rapidly multiplying. In my role as President and Director of Sandia National Laboratories, I view the NNSA's national security laboratories, with their world-class scientists and engineers and many one-of-a-kind facilities, as national assets and as a unique resource for the Nation in anticipating and responding to hostile actors and actions.

I'd like to address three basic challenges, however, that currently limit the NNSA laboratories' ability to fully engage with other Federal agencies (OFAs), including: a long-term commitment to funding the foundational capabilities and resources of the NNSA Complex; enabling easier access to the NNSA's resources by OFAs; and a shared commitment through strategic partnerships between the NNSA complex and OFAs to ensure the Nation's security.

At Sandia, our Work for Other's (WFO) program has existed for more than 50 years and has expanded significantly over the past two decades. There are many examples where the nuclear weapons program has benefited from WFO program activities, including radar, safety and risk assessment, and improved modeling and simulation capabilities. Likewise, various WFO customers have benefited from the long history of DOE investment in capabilities at the national laboratories. It is becoming increasingly difficult, however, for any one funding source to maintain the needed foundational capabilities of the laboratories.

As we go forward, it will be essential to maintain the science, technology and engineering foundation of the Labs and define its vital role in responding to the Nation's security. This foundation, historically highly leveraged by other agencies with national security interests, faces dramatic reductions consistent with the downsizing of the nuclear weapons mission. We must find a way to sustain this foundation so that the statutory nuclear weapons mission and the broader national security commitments are effectively met.

In addition, it is imperative that OFAs should be provided easier access to the NNSA Complex's science, technology, and engineering capabilities. Commensurate with this, the NNSA and it laboratories are examining the existing NNSA Work for Others (WFO) program regulatory, policy, and procedural framework in order to identify improvements to current roles, responsibilities, policies, processes and requirements. Collectively, changes in these areas have the potential to provide easier access to the NNSA Complex's capabilities and allow NNSA sites more responsibility and accountability for meeting national security needs while still meeting statutory requirements.

Overall, the common missions and shared interests of a number of Federal agencies with a stake in the Nation's security provide a strong basis for collaborative activities, mutual prioritizing of resources, and enduring partnerships. Such mutual missions and interests have the potential to develop into true strategic partnerships and enhance the Nation's approach to meeting national security challenges. Building trust among such Federal agencies is difficult, and open and consistent communication will be essential. Relationship development among Federal organization is time consuming and requires resources. However, I believe that we can better leverage these shared missions and interests of Federal agencies with the NNSA laboratories.

Much of Sandia's work is sponsored by DOE's National Nuclear Security Administration (NNSA), but we also work for other Federal agencies, including the Department of Defense and Department of Homeland Security. And we work cooperatively with a number of government, U.S. industry, and academic partners to accomplish our missions and to help ensure the Nation's security. Many recognize that the threats the Nation faces are more diverse than ever. From my position at Sandia, I believe that the NNSA national security laboratories and my own lab are well positioned to offer the new science, technology, and engineering solutions to address these threats.

Z MACHINE

Question. Dr. Hunter, we have struggled to keep full funding of the Z machine, which has turned out to be a fantastic research facility at a fraction of the cost of many of the other facilities. I recall, with the recent refurbishment, this facility cost less that $200 million to construct.

Is the Z machine continuing to deliver important scientific data? How much more funding will you need above the fiscal year 2009 request to restore full operation?

Answer. First of all, your recollection on the facility cost is correct. Over the past 25 years, the capital investment in the facility, including the addition of major diagnostic systems such as the Z-Beamlet and Z-Petawatt lasers and the recently completed Z refurbishment project, is less than $200 million. (Major capital investments over the past 25 years have included: Particle Beam Fusion Accelerator II (1985) $45 million; Z Conversion (1996) $12 million; Beamlet Laser (2001) $13 million; Z Refurbishment (2007) $90 million; and Z Petawatt Laser (2007) $30 million; Total $190 million)

Today the Z machine is the most powerful and energetic laboratory x-ray source in the world. Z's strength is its ability to produce copious x-rays, large plasma environments, and controlled high pressures to evaluate weapons science phenomena. Z provides critical data for weapons primaries, secondaries, and non-nuclear components as part of NNSA's Stockpile Stewardship program. Achieving high energy density conditions is critical to develop and validate advanced theoretical models and codes and to characterize weapons component performance.

Z provides essential data on the effects of soft x-rays on weapon components that cannot be obtained with any other laboratory source. Z's material property capability is unique, produces the most accurate weapons material data available in high energy density pressure regimes, and is required to validate new physics models of the response of weapons materials, such as plutonium. Z is also essential for evaluating the feasibility of achieving thermonuclear fusion ignition with pulsed power. Pulsed-power-driven fusion has the potential to be a very efficient and low cost approach to producing high fusion yields in the laboratory for weapon science and over the long term energy.

At present, Z is funded to operate at 75 percent of full capacity to meet the essential requirements of NNSA's stockpile stewardship program. This partial capacity permits about 170–180 shots per year allocated as: 60 shots for material properties, 50 shots related to magnetically-driven Z-pinch implosions for fusion, 25 shots testing radiation effects, 25 shots supporting weapon secondary assessment, and about 10–20 pulsed power shots associated with facility operations and enhancements. An additional $12 million in funding is required to restore full single-shift operations, which would enable many other important opportunities to be pursued in the areas of weapon science, inertial confinement fusion, and fundamental science. Included in these additional tests are those in support of weapon primary and secondary assessment, nuclear survivability, and university science for the joint NNSA/OS High Energy Density Laboratory Plasma program. Allowing necessary ramp up time for training of new staff to support the full mission, the full single shift operations will support about 240 shots annually.

Question. For several years, I have pressed the Department to establish a joint High Energy Density Plasma research program utilizing NNSA facilities to support non weapons research. Finally, the fiscal year 2008 budget request provided $24 million to support this research.

Is this joint program utilizing the Z machine and do you believe more could be done to expand its use by the DOE Office of Science?

Answer. The joint High Energy Density Laboratory Plasma research program is still being formulated by the Defense Science Division within NNSA and the Office of Fusion Energy Science within the DOE Office of Science. We believe that the Z facility as well as the Z-Beamlet and Z-Petawatt laser capabilities should be a significant component of this program. These facilities can also provide experimental environments for the basic research needs for materials under extreme environments.

At the proposed funding level it is not likely that the new joint program will include a large effort in utilizing the Z facility and the other excellent high-energy-density science facilities at the NNSA laboratories. There are tremendous opportunities for university and national laboratory researchers to use NNSA's high-energy-density science facilities to access experimental conditions of interest for fundamental science in the areas of planetary physics, material properties at extreme temperatures and pressures, and laboratory astrophysics. A basic science program on high energy density laboratory plasmas would be a strong component of full utilization of the Z facility.

SUBCOMMITTEE RECESS

Senator DORGAN. We invited the three laboratory Directors, and I'm really pleased we did. I'm pleased you've come, and I hope we will be able to do this again next year.

And thank you for your work.

Director.

Dr. ANASTASIO. Thank you very much.

Senator DORGAN. This subcommittee's recessed.

[Whereupon, at 4:40 p.m., Wednesday, April 16, the subcommittee was recessed, to reconvene subject to the call of the Chair.]