

Stenographic Transcript  
Before the

Subcommittee on Strategic Forces

COMMITTEE ON  
ARMED SERVICES

## **UNITED STATES SENATE**

TO RECEIVE TESTIMONY ON THE DEPARTMENT OF  
ENERGY'S ATOMIC DEFENSE ACTIVITIES AND PROGRAMS IN  
REVIEW OF THE DEFENSE AUTHORIZATION REQUEST FOR  
FISCAL YEAR 2022 AND FUTURE YEARS DEFENSE PROGRAM

Wednesday, May 19, 2021

Washington, D.C.

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1 TO RECEIVE TESTIMONY ON THE DEPARTMENT OF ENERGY'S ATOMIC  
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4 DEFENSE PROGRAM

5  
6 Wednesday, May 19, 2021

7  
8 U.S. Senate

9 Subcommittee on Strategic

10 Forces

11 Committee on Armed Services

12 Washington, D.C.  
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14 The committee met, pursuant to notice, at 5:06 p.m. in  
15 Room SR-232A, Russell Senate Office Building, Hon. Angus  
16 King, chairman of the subcommittee, presiding.

17 Committee Members Present: Senators King [presiding],  
18 Rosen, Kelly, Fischer, Rounds, and Sullivan.  
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1           OPENING STATEMENT OF HON. ANGUS KING, U.S. SENATOR  
2 FROM MAINE

3           Senator King: I foolishly thought a 15-minute Senate  
4 vote would take 30 minutes. It actually took 50 minutes,  
5 and I apologize for that naïve assumption on my part.

6           This is hearing on the Department of Energy's atomic  
7 defense activities and programs in review of the Defense  
8 Authorization Request for Fiscal Year 2022. First I want to  
9 thank the witnesses for appearing at today's hearing on your  
10 defense-related programs to maintain our nuclear weapons  
11 stockpile, design the reactor to power our Navy's nuclear  
12 fleet, and clean up former Cold War defense production  
13 sites.

14          Dr. Verdon, you are representing the NNSA. You are  
15 undertaking the modernization of five warhead systems to  
16 meet Department of Defense requirements. This has put a  
17 tremendous strain on your production plants, and at the same  
18 time you are rebuilding the infrastructure required to  
19 handle nuclear and related materials, which, in some cases,  
20 dates to the Manhattan Project.

21          There are single point-of-failure risks to our  
22 deterrent. I want you to explain to the subcommittee how  
23 you are managing these programs and their key risks.

24          Admiral Caldwell, you uphold a lineage dating back to  
25 Admiral Rickover to design and build power reactors for our

1 Navy's aircraft carriers and submarine fleet, including the  
2 Columbia class ballistic missile submarine whose fuel will  
3 last over 40 years, the life of the boat. Like Dr. Verdon,  
4 I would like you to explain to the committee the challenges  
5 you face, especially in rebuilding nuclear infrastructure to  
6 support the Navy's operational fleet.

7 Finally, Mr. White, you have perhaps the hardest job in  
8 the Department of Energy, which is the cleanup of former  
9 Cold War nuclear production sites. At the Hanford site in  
10 Washington State alone, you are responsible for 55 million  
11 gallons of radioactive waste and 177 underground storage  
12 tanks, some of which are leaking. I will want to know from  
13 you what the Department is doing to meet the commitments it  
14 has made to the communities in the region to clean up these  
15 sites.

16 Again, let me thank everyone for appearing today.  
17 After Senator Fischer's opening statement each witness will  
18 have 5 minutes for their opening statements and then we will  
19 alternate with members present for 5-minute rounds of  
20 questions.

21 Senator Fischer?  
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1           OPENING STATEMENT OF HON. DEB FISCHER, U.S. SENATOR  
2 FROM NEBRASKA

3           Senator Fischer: Thank you, Mr. Chairman, and thank  
4 you to our witnesses today.

5           One point that I always find interesting is that the  
6 witnesses before us today represent about 75 percent of the  
7 Department of Energy's budget, and yet the important roles  
8 the Department of Energy and the NNSA, in particular, play  
9 in supporting our nuclear enterprise is often overlooked.

10          But their contributions are absolutely vital. As  
11 nuclear posture reviews of the last two administrations have  
12 affirmed, a modern and responsive nuclear infrastructure is  
13 absolutely necessary to support our nuclear deterrent.

14          While progress has been made toward achieving this  
15 goal, significant challenges remain, and like the Department  
16 of Defense's modernization efforts, there is simply no  
17 margin for additional delay. As Admiral Richard noted  
18 earlier this year, the consequences of failing to modernize  
19 our infrastructure are immense. In his testimony, he  
20 stated, quote, "If the nation does not continue to address  
21 these concerns, no amount of money will be able to  
22 adequately mitigate operational risks associated with key  
23 stockpile and infrastructure capability losses," end quote.

24          That is a powerful statement, and it reflect the  
25 Department of Energy's importance to our national security.

1 So, gentlemen, I thank you for the vital work that you each  
2 do and for appearing before us today, and I look forward to  
3 your testimony.

4 Thank you, Mr. Chairman.

5 Senator King: Mr. Verdon?

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1 STATEMENT OF HONORABLE CHARLES VERDON, ACTING

2 ADMINISTRATOR, NATIONAL NUCLEAR SECURITY ADMINISTRATION

3 Mr. Verdon: Chairman King, Ranking Member Fischer, and  
4 members of the subcommittee, thank you for the opportunity  
5 to testify today. On behalf of the men and women of the  
6 nuclear security enterprise I express our appreciation for  
7 this subcommittee's strong support, bipartisan support, for  
8 NNSA's nuclear security mission, as demonstrated most  
9 recently in the fiscal year 2021 National Defense  
10 Authorization Act and the fiscal year 2021 budget for the  
11 Department of Energy.

12 Chairman King, a written statement has been provided to  
13 this subcommittee and I respectfully request that it be  
14 submitted for the record.

15 Senator King: Without objection.

16 Mr. Verdon: So we meet today against the backdrop of a  
17 world marked by growing security challenges. China and  
18 Russia are modernizing their nuclear arsenal, investing  
19 significantly in resources and delivery platforms, and have  
20 made clear that nuclear weapons will be a vital element of  
21 their state craft.

22 At the same time, the risk for proliferation of nuclear  
23 weapons and weapons of mass destruction pose profound and  
24 existential dangers. Recognizing these global security  
25 challenges, the President's FY 2022 Discretionary Funding

1 Request for NNSA reflect support for the three enduring  
2 missions which Congress charged the NNSA in the year 2000:  
3 ensuring the safety, security and effectiveness of the U.S.  
4 nuclear stockpile; reducing the threat of nuclear  
5 proliferation and nuclear terrorism around the world; and  
6 providing nuclear propulsion for the U.S. Navy's fleet of  
7 aircraft carriers and submarines that are critical to the  
8 U.S. national security and our allies.

9 NNSA continues to focus on ensuring the safety,  
10 security, and military effectiveness of the U.S. nuclear  
11 stockpile. Our alignment and synchronization with the  
12 Department of Defense, coordinated through the Nuclear  
13 Weapons Council remains essential and continues to improve.  
14 The FY 2022 Discretionary Funding Request enables NNSA to  
15 execute its warhead modernization and infrastructure  
16 modernization efforts begun under the Obama administration.

17 The administration is beginning its undertaking of a  
18 formal review of the efforts to modernize our nuclear  
19 deterrent to include the DOD delivery platforms, the nuclear  
20 weapons required for those platforms, and the NNSA  
21 infrastructure needed to produce and maintain those weapons.  
22 Regardless of the review's specific findings, so long as we  
23 retain a nuclear arsenal we must have the infrastructure and  
24 the science, technology, and engineering to produce and  
25 maintain the nuclear weapons stockpile.



1           Unfortunately, the NNSA production infrastructure has  
2 atrophied considerably, both in terms of the physical  
3 infrastructure and the capabilities needed within those  
4 facilities. Continued recapitalization is an imperative.  
5 The potential impacts to the U.S. deterrent, if not  
6 addressed, are no longer over the horizon. They have become  
7 visible.

8           Key also are attracting and retaining the personnel  
9 needed to continue to ensure our stockpile remains safe and  
10 effective and to operate and maintain NNSA facilities safely  
11 and securely. As NNSA mission scope increases, so does the  
12 demand for increased personnel to execute the missions to  
13 include supporting new facilities and capabilities brought  
14 online and moving to 24/7 operations at many sites across  
15 the complex.

16           In addition our mission to ensuring continued  
17 effectiveness of the nuclear stockpile, nonproliferation  
18 also remains an important and growing priority. NNSA's  
19 Office of Defense Nuclear Nonproliferation is critical to  
20 implementing the President's call to "lock down fissile and  
21 radiological materials around the world." The FY 2022  
22 Discretionary Funding Request enables NNSA's Office of  
23 Defense Nuclear Nonproliferation to continue to work  
24 worldwide with our partners to prevent states and non-state  
25 actors from developing nuclear weapons or acquiring weapons-

1 usable nuclear or radiological materials, equipment,  
2 technology, and expertise.

3 With regards to our third mission of providing nuclear  
4 propulsion for the United States Navy, the Office of Naval  
5 Reactors remains at the forefront of technological  
6 development in naval nuclear propulsion by advancing new  
7 technologies and improvements in naval reactor performance.  
8 This preeminence provides the U.S. Navy with a commanding  
9 edge in naval warfighting capabilities. Again, the  
10 discretionary budget put forth for FY 2022 supports the  
11 Office of Naval Reactors to continue their programs that are  
12 so vital to our security of our nation and our allies.

13 And then finally, despite the challenges posed by the  
14 COVID-19 pandemic, I am pleased to report that NNSA did not  
15 miss a single milestone or DOD requirement during this  
16 period. This achievement is a testament to the  
17 professionalism of the NNSA's world-class workforce and the  
18 leadership of our sites and their deep commitment to our  
19 national security missions.

20 So I thank you again for the strong support of this  
21 committee and the opportunity to testify before you today,  
22 and I stand ready to answer any questions you have.

23 [The prepared statement of Mr. Verdon follows:]

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Senator King: Thank you, Dr. Verdon. Mr. White?

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1           STATEMENT OF WILLIAM WHITE, ACTING ASSISTANT SECRETARY  
2 OF ENERGY FOR ENVIRONMENTAL MANAGEMENT

3           Mr. White: Chairman King, Ranking Member Fischer, and  
4 members of the subcommittee, it is an honor to appear before  
5 you today.

6           As the largest environmental cleanup program in the  
7 country, the Department of Energy's Office of Environmental  
8 Management is committed to cleaning up to the legacy of the  
9 national defense programs that helped end World War II and  
10 the Cold War. Even as we grappled with the COVID pandemic,  
11 2020 represented an inflection point for the EM mission.  
12 The dedication and resiliency of the workforce, composed of  
13 Federal and contractor employees, resulted in a ramp-up in  
14 transformational tank waste capabilities, historic skyline  
15 changes, and a continued shrinking cleanup footprint.

16           EM achieved a first by completing removal of a former  
17 uranium enrichment complex at Oak Ridge in Tennessee. The  
18 last major component of the tank waste cleanup system at  
19 Savannah River was completed, accelerating our ability to  
20 tackle a key environmental risk there.

21           Our work was completed at the Tonopah Test Range in  
22 Nevada and at Separations Process Research Unit in New York,  
23 enabling this land to be transferred from EM.

24           EM has entered an era of progress built on the  
25 accomplishment of our workforce. Across this new era, EM is

1 well positioned to protect the environment, support broader  
2 national security missions, and prepare for the future.

3         Radioactive waste stored in underground tanks at  
4 Hanford, Savannah River, and Idaho is among the largest  
5 environmental challenges and risks facing the Department.  
6 After decades of preparation and support from Congress, and  
7 with construction of facilities required for the Direct Feed  
8 Low Activity Waste approach complete, Hanford is poised to  
9 begin tank waste treatment in December of 2021.

10         In South Carolina, the tank waste mission is  
11 accelerating through operation at both the Salt Waste  
12 Processing Facility and the Defense Waste Processing  
13 Facility.

14         In Idaho, we are working toward startup of the  
15 Integrated Waste Treatment Unit, which will treat the  
16 remaining sodium barium liquid radioactive waste there over  
17 the next decade.

18         EM is also focused on decontamination and  
19 decommissioning of excess contaminated facilities across the  
20 complex. We have made significant progress this year with  
21 the demolition of the Biology Complex facilities at Y-12,  
22 and preparations and work are underway on similar efforts at  
23 Oak Ridge National Laboratory, Lawrence Livermore, Lawrence  
24 Berkeley, and other sites. This important effort reduces  
25 risk and it also benefits the broader national security and

1 scientific research missions.

2 Modernization efforts are also underway at the Waste  
3 Isolation Pilot Plant to equip the facility to meet mission  
4 needs into the future. At the same time, EM is pursuing  
5 world-class technology development as the Savannah River  
6 National Laboratory develops innovative solutions in the  
7 fields of environmental cleanup, national security, science,  
8 and energy.

9 While remarkable progress has been achieved, the EM  
10 mission has decades to go. EM is undertaking a rational  
11 planning approach that will boost the ability to make  
12 progress in the short term and also advance longer-range  
13 mission goals. EM has an ambitious slate of priorities that  
14 span the next decade, and these are outlined in our  
15 Strategic Vision, a roadmap of priorities through 2031.  
16 Among the priorities, completion of our cleanup at four  
17 sites: the Nevada National Security site, Moab, Lawrence  
18 Livermore, and Sandia.

19 In order to support sustainable progress, EM is also  
20 investing in building and sustaining a workforce with future  
21 talent that promotes diversity and inclusion. We are also  
22 building on efforts to improve cost and schedule  
23 performance. In recent years, EM has demonstrated an  
24 ability to deliver results, completing several projects  
25 ahead of schedule and under budget. As the GAO indicated in

1 the latest high-risk report for the Department, EM has made  
2 strides in strengthening program and project management  
3 capabilities, and based on GAO recommendations, we will  
4 continue to focus on improving in this important area.

5 EM is putting the Federal investment in environmental  
6 cleanup to work. As we advance the cleanup mission for  
7 communities across the nation, a safety-first culture is  
8 paramount. Cleanup decisions will be based on sound  
9 science, and EM's mission will be informed by input from a  
10 diverse range of stakeholders, including those most impacted  
11 by the environmental legacy of the past.

12 I sincerely appreciate the subcommittee's continued  
13 support for the EM mission, and I look forward to working  
14 with you to continue to deliver progress.

15 Thank you, and I look forward to your questions.

16 [The prepared statement of Mr. White follows:]

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1           Senator King: Thank you, Mr. White, and thank you for  
2 that progress report, and we look forward to probing some of  
3 those questions with you.

4           Admiral Caldwell.

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1           STATEMENT OF ADMIRAL JAMES CALDWELL, DEPUTY  
2 ADMINISTRATOR FOR OFFICE OF NAVAL REACTORS, NATIONAL NUCLEAR  
3 SECURITY ADMINISTRATION

4           Admiral Caldwell: Chairman King, Ranking Member  
5 Fischer, and distinguished members of this subcommittee,  
6 thank you for the opportunity to testify here today. I also  
7 thank this subcommittee for consistently supporting Naval  
8 Reactors. This enables my team to provide the Navy with  
9 propulsion plans that give our nuclear-powered warships the  
10 incredible advantage of unmatched reliability, speed, and  
11 endurance to conduct national security missions around the  
12 world. Naval Reactors' historical investment in advanced  
13 technologies has maintained our competitive edge in the  
14 maritime environment for decades. The Navy's highly capable  
15 nuclear-powered submarines and aircraft carriers have  
16 ensured our warfighting advantage over potential  
17 adversaries.

18           Today's strategic environment is dynamic and  
19 increasingly complex. Near-peer rivals are pursuing robust  
20 military modernization programs aimed at eroding our  
21 maritime preeminence and narrowing the capability gap. I am  
22 focused on renewing Naval Reactors' investment in cutting-  
23 edge technologies to deliver enhanced capabilities to the  
24 existing fleet and for future ships.

25           There are three areas vital to our ability to provide

1 24/7 support to the nuclear Navy. First is our small but  
2 highly skilled Federal workforce. It is our most important  
3 resource. I am focused on ensuring sufficient Federal  
4 staffing to meet the demands of sustaining today's fleet and  
5 growing future capabilities.

6 Second, we are renewing our investment in Naval Nuclear  
7 Laboratory research and development so that we can maintain  
8 superiority over our competitors. These efforts focus on  
9 technologies with the potential to deliver greater  
10 capability with lower acquisition and lifecycle cost.  
11 Specific areas of investment include advanced fuel systems,  
12 reactor core automated manufacturing and inspection, and  
13 next-generation instrumentation and control technologies.

14 Finally, I am investing in modernizing critical  
15 infrastructure and reducing my program's legacy  
16 environmental liabilities. Many of our facilities date back  
17 to the inception of the program over 70 years ago. We are  
18 increasing our emphasis on retiring facilities no longer in  
19 use, and we will do that in an environmentally responsible  
20 and cost-effective way.

21 In addition to these three areas, this committee's  
22 continued support has enabled significant progress on our  
23 three national priority projects. The first is the  
24 development of the reactor plant for the Columbia-class  
25 ballistic missile submarine. This supports the Navy's

1 number one acquisition priority. We began manufacturing the  
2 lead ship reactor core in FY 2019. This reactor will serve  
3 for the life of the ship for more than 40 years. We started  
4 construction of the lead ship in this year, 2021.

5 The second project is the refueling and overhaul of our  
6 land-based prototype reactor in New York. There is a dual  
7 benefit to this effort. It enables continued research and  
8 development to support the fleet and it will provide more  
9 than 20 years of training for the Navy's nuclear fleet  
10 operators.

11 The third project is the construction of the Naval  
12 Spent Handling Facility in Idaho, which will enable long-  
13 term, reliable processing and packaging of spent fuel from  
14 the Navy's nuclear-powered warships. Your support of this  
15 project has allowed us to make significant progress. To  
16 date, we have poured approximately 100,000 cubic yards of  
17 concrete. That represents nearly 30 percent of the required  
18 foundation concrete volume.

19 In closing, continued congressional support allows us  
20 to balance the investments in today's fleet with the future  
21 fleet, it allows us to expand the Navy's ability to project  
22 power and control the seas, and it allows us to remain ready  
23 for the high-end fight.

24 Thank you for this committee's longstanding, strong  
25 support of Naval Reactors, and I look forward to answering

1 your questions.

2 [The prepared statement of Admiral Caldwell follows:]

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1           Senator King: Thank you, Admiral. I will begin with  
2 questions and we will rote through the committee.

3           Mr. Verdon, something you said caught my ear. A lot of  
4 what this committee, the sort of fundamental premise of this  
5 committee is deterrence. It is something that we are  
6 concerned with, and deterrence involves credibility of the  
7 deterrent itself. You said something about the limitations  
8 from not modernizing are no longer over the horizon but they  
9 are visible. My concern is they are also visible to our  
10 adversaries. Would you agree that that fact alone  
11 undermines the deterrent?

12          Mr. Verdon: I would certainly agree that that is a  
13 danger, and it is something, why we are moving as quickly as  
14 we can to address.

15          Senator King: And modernization across the nuclear  
16 enterprise is a part of maintaining deterrence.

17          Mr. Verdon: That is right.

18          Senator King: And the other thing that I think you  
19 mentioned that is very as part of your work is  
20 nonproliferation. One of the things that worries me is to  
21 flip deterrence on its head. Deterrence does not  
22 necessarily work with a non-state actor, with a terrorist  
23 organization. Sometimes they are okay with being blown up.

24          So in order to prevent attacks of that nature,  
25 nonproliferation becomes all the more important, so they

1 cannot get their hands on the material in the first place.

2 Talk to me about your activities in nonproliferation.

3 Mr. Verdon: So yes, I totally agree with your  
4 assessment and we continue to work very, very hard with  
5 partners, you know, certainly within the United States but  
6 with partners around the world to make sure that we can  
7 track and prevent any theft of material, acquisition of  
8 material, technologies. That is something that we spend a  
9 considerable amount of time on to try to minimize the chance  
10 of any non-state actor getting the materials and/or the  
11 technologies necessary to do something, you know --

12 Senator King: I am going to ask you to make a  
13 qualitative judgment. How good are you at that? Are we  
14 able to follow nuclear materials with a high level of  
15 fidelity?

16 Mr. Verdon: You know, it is one of these things that  
17 you have -- I think based on evidence, I think we are doing  
18 a good job. Ourselves and our partners are doing a good job  
19 with this. We continue to look to improve. We do not rest  
20 on our laurels. We are always looking for new ways to see  
21 whether we can improve on how we do this. But, you know, we  
22 run tests, we run drills, we run all sorts of, you know --  
23 we try to run tabletops to make sure that we are really  
24 exercising the skills correctly and we have everything we  
25 need in place. But we continue to advance the capabilities

1 in those areas to make sure that we never make a mistake.

2 Senator King: Are you receiving full cooperation and  
3 support from all of the agencies of the intelligence  
4 community? I do not want to hear if we have a problem about  
5 stovepipes.

6 Mr. Verdon: No. I think this is an area where I think  
7 everybody works very well together, that everybody  
8 recognizes the importance of this, and we see strong support  
9 and respect for roles and responsibilities and sharing of  
10 information and transparency as required. I think everyone  
11 does recognize the importance of this.

12 Senator King: Well, it is critically important, and I  
13 hope you will advise this committee if you feel that there  
14 is any limitation on the data that you are receiving.

15 Admiral Caldwell, I understand we stopped enriching  
16 fuel in 1992, and basically we are working off the  
17 stockpile. When do you see a need to further enrichment?

18 Admiral Caldwell: Sir, we have enough fuel to support  
19 our nuclear fleet through the mid 2050s, and that will  
20 depend on the Navy's decisions on force structure. But  
21 right now I am in good position through the 2050s. So  
22 eventually the nation is going to have to figure out how we  
23 provide that asset. We are working closely with the  
24 National Nuclear Security Administration and DOE on  
25 alternatives, and, you know, so we would be looking to have

1 some capability to produce the highly enriched uranium that  
2 we need by the 2040 time frame.

3 Senator King: Fine. I am going to have questions, Mr.  
4 Verdon, on pit production, and Mr. White, on where the  
5 progress is, but I am going to yield my time to Senator  
6 Fischer.

7 Senator Fischer: Thank you, Mr. Chairman. Dr. Verdon,  
8 at our hearing last week, Senator Rosen brought up  
9 underground testing, and Deputy Assistant Secretary for  
10 Nuclear Matters, Mr. Walter, he made the point that  
11 investment in NNSA's scientific capabilities were essential  
12 to help avoid the need to ever return to explosive testing.  
13 And he noted, in particular, the role that the Enhanced  
14 Capabilities for Subcritical Experiments program plays in  
15 that effort.

16 Can you talk about the connection between modernizing  
17 the complex and avoiding the need for testing, as well as  
18 the role subcritical experiments play?

19 Mr. Verdon: Certainly. So in terms of avoiding the  
20 testing, the examples that you brought up of Enhanced  
21 Capabilities for Subcritical Experiments as an example of an  
22 area where we recognized that we had a gap in some  
23 experimental data that we needed to help better improve our  
24 understanding of nuclear weapons in the absence of testing.  
25 So the subject matter experts identified a real state-of-



1 the-art facility that we call the Enhanced Capabilities for  
2 Subcritical Experiments that, if worked as designed, will  
3 actually give us the data that we used to acquire through  
4 nuclear testing. So if it works as designed, it actually  
5 will move us further away from the technical need for  
6 requiring a nuclear test.

7 And so we are working to do that. It will be located  
8 in the Ula tunnel complex at the Nevada National Security  
9 Site. And that, coupled with a recognition that we still  
10 need higher capability in computing, so that we will be  
11 putting online our first exascale machine in 2023, to  
12 address that gap as well.

13 So we still do invest in the scientific capabilities  
14 that, in particular, the laboratories and plants are key in  
15 identifying as gaps in their understanding that they need to  
16 fill to support our ability to do the work we need to do in  
17 the absence of testing. So all of these act to help us to  
18 forestall the need to technically have to return to testing.

19 Senator Fischer: And these experiments, they are vital  
20 to be able to certify the life-extended warheads of the  
21 older pits, right?

22 Mr. Verdon: They are vital for both ongoing and  
23 planned warhead modernization programs. So again, they are  
24 slated to come online in time to support, in particular, the  
25 W80-4 LEP, and the W87-1 modification program. We are using

1 those as drivers, the timeline drivers, to get those  
2 capabilities up.

3 Senator Fischer: Congress created the Stockpile  
4 Responsiveness Program several years ago in order to ensure  
5 that our scientists were exercising the full spectrum of  
6 skills necessary to support all phases of nuclear weapons  
7 lifecycle process. Dr. Verdon, can you give us your  
8 assessment of the contribution this program has made so far,  
9 and what role do you see it playing in the future?

10 Mr. Verdon: So, yes. I have been very impressed with  
11 the work that is being carried out in the Stockpile  
12 Responsiveness Program. I have seen it firsthand, both when  
13 I was still present at Lawrence Livermore National  
14 Laboratory as the leader of the weapons program there, and  
15 from here, from headquarters, that the workforce is  
16 exercising skills that are necessary, that they normally  
17 would not have gotten a chance to exercise. And some of the  
18 tasks we provided to them, the creativity that has come out  
19 from it has been impressive to see.

20 And so we do view it as a very important role in the  
21 training of our workforce, and I think we see very positive  
22 results from that, in that people can go from that program,  
23 train on that program and then move into the actual warhead  
24 modernization programs.

25 Senator Fischer: Doctor, what lessons has NNSA learned

1 from the delays it has encountered in the B61-12 Live  
2 Extension Program, and also the W88 Alt, and are there  
3 process improvements that can be applied to future life  
4 extension programs?

5 Mr. Verdon: So, yes. One of the first things we did,  
6 as soon as we started it, when we encountered the situations  
7 that we had in the 61 and the 88, we formed, actually, one  
8 inside review team and then a congressionally directed  
9 review team that went out and looked and really scrubbed  
10 hard. In fact, the Admiral was kind enough to lend us some  
11 people from his organization to be on one of the teams. And  
12 we really did a scrub of just what occurred, what happened,  
13 what lessons did we need to learn. And, indeed, very  
14 extensive reports and reviews were written, and we have  
15 embraced them and are actually implementing many, if not  
16 just about all of the recommendations, onto the W80-4 and  
17 the W87-1, as we speak.

18 So we have taken it very seriously. We are  
19 implementing changes based on the lessons that were  
20 identified, and we are already seeing benefit from those  
21 lessons being applied.

22 Senator Fischer: Thank you. Thank you, Mr. Chairman.

23 Senator King: Senator Kelly.

24 Senator Kelly: Thank you, Mr. Chairman, and thank you  
25 to our three witnesses for testifying today. This question

1 is for Admiral Caldwell.

2 So, Admiral, you have often described the Navy  
3 submarine force as being in high demand with a high OPTEMPO.  
4 And given our adversaries' significant investment in  
5 undersea capabilities, I think it is safe to say that this  
6 high demand will continue.

7 I would like to get your thoughts on the state of our  
8 industrial base. As you well know, we work closely with the  
9 private sector to deliver the Navy's nuclear-powered  
10 submarine capabilities. So how would you assess the health  
11 of our highly specialized shipyards who support these  
12 capabilities?

13 Admiral Caldwell: Sir, thanks for the question, and I  
14 do agree with you that our submarine force and our undersea  
15 forces are going to remain in high demand. I would like to  
16 break your question into a couple parts. First I would like  
17 to talk about the nuclear industrial base that supports my  
18 ability to deliver reactor cores, components,  
19 instrumentation, and the things to build the reactor plans.

20 As we downsized after the Cold War, we downsized that  
21 industrial base to the need to support our needs. That is a  
22 highly capable, small industrial base that I have a lot of  
23 confidence in. We spent a lot of time engaging with our  
24 partners in industry. We monitor their performance. We  
25 project ahead and forecast, as accurately as we can, what

1 the nation's needs are, and they have been able to continue  
2 to deliver what we need.

3 As an example, even during COVID, I am on track to  
4 deliver all my reactor plant components to the Columbia with  
5 margin. I think that is a real testament to the strength  
6 and the depth and the coordination and cooperation we have  
7 with the nuclear industrial base that supports me.

8 On the shipbuilder side, we have some challenges. If  
9 you think about where we have been as a nation, in the '80s  
10 and the early part of the '90s we built 30-plus Los Angeles-  
11 class submarines in about a 10-year period, and we walked  
12 away from that investment in being able to do that. We  
13 built a few submarines in the early 2000s. We started again  
14 on one Virginia per year, and then about the 2014-2015 time  
15 frame we started to build two Virginia-class submarines per  
16 year.

17 So in that vendor base you have a lot of things going  
18 on. First, you have an experienced workforce that was here  
19 in the '80s and '90s. A lot of those folks went home. So  
20 we have inexperienced folks that are now learning new  
21 trades, including at the supervisory level.

22 Additionally, you have existing vendors who we have  
23 now, with going to two Virginia per year and Columbia and  
24 even Ford aircraft carrier construction, we have increased  
25 the demand on those existing suppliers. And we have also

1 had to go reach out to new suppliers as well. So there is  
2 pressure on those suppliers to perform.

3 We have had some challenges. Senator King asked me, in  
4 a phone call earlier, about missile tubes. That was an  
5 example of problems in the vendor base. We have come  
6 through that with a lot of government oversight and a lot of  
7 detailed engagements, and we are going to get back on the  
8 cadence for that.

9 But I think if we are going to continue to build the  
10 submarine force and the carrier force that we need, we are  
11 going to have to continue to grow that industrial base. We  
12 are doing that with an enterprise-wide plan that looks at  
13 all of the vendors that support all those programs I just  
14 talked about, and I think what is key we have got to get  
15 after the basics, we have got to develop the workforce, and  
16 we are going to have to have the right oversight at the  
17 primes and also by the government.

18 Senator Kelly: Thank you. And on the training side,  
19 it sounds like you are building a new reactor in  
20 Schenectady, would be my guess there, right?

21 Admiral Caldwell: If I could comment on that, sir that  
22 is a reactor that has been in the program for decades.

23 Senator Kelly: Yeah.

24 Admiral Caldwell: In fact, I trained there when I  
25 first entered the Navy back in the early '80s.

1           Senator Kelly: And you are still able to use that  
2 reactor that was from the 1980s?

3           Admiral Caldwell: Yes. We are still able to use that  
4 reactor plant, which I think is an incredible testament to  
5 the way it was designed and the way it has been maintained.  
6 It has been refueled once, and we are now refueling it a  
7 second time. When we complete that refueling we will use  
8 that reactor for research and development for the U.S. Navy,  
9 and we will train operators for another 20 years. So if you  
10 think about that, that is going to be out to the 2040 time  
11 frame, and I trained on that in the early '80s.

12           Now in that modernization, we are modernizing the  
13 infrastructure and the instrumentation and control, so it  
14 will be an incredible asset for us going forward.

15           Senator Kelly: I was just assuming that by now you  
16 would have been building a new one there. Many of my  
17 classmates at the U.S. Merchant Marine Academy went to work  
18 there and are instructing, you know, the world's finest  
19 nuclear power plant operators are in the United States Navy.

20           Admiral Caldwell: I am ready to take you up there,  
21 sir, and show it to you.

22           Senator Kelly: Thank you.

23           Senator King: Thank you, Senator Kelly. Senator  
24 Rounds.

25           Senator Rounds: Thank you, Mr. Chairman. Gentlemen,

1 once again thank you for your service. Thanks for being  
2 here today.

3 Admiral Caldwell, the GAO has noted the challenges in  
4 maintaining ballistic missile submarines, the SSBNs, with  
5 regard to their operational capability due to unplanned  
6 delays and extended middle-life maintenance, refueling,  
7 overhauls, and refit periods. This is kind of following  
8 along some of the comments that you have just made with  
9 Senator Kelly.

10 Can you tell us how the efforts of the NNSA's Naval  
11 Reactors program, with respect to the life-of-ship reactor  
12 cores for the Columbia-class might address these issues, and  
13 whether there are other areas where the Naval Reactors  
14 program can support the Navy in improving turnaround times  
15 for SSBNs as well as carriers in the future?

16 Admiral Caldwell: Yes, sir. Thanks for the question.  
17 With regards to Columbia, we are building this life-of-ship  
18 core, which is designed to last 42 years. That is, in my  
19 opinion, a remarkable technological and manufacturing  
20 achievement. When you consider where we started with the  
21 program in refueling Nautilus at the 18-to-24-month point,  
22 and all that learning and all that growth in technology and  
23 manufacturing, we are now going to fuel a submarine that  
24 will last over 40 years.

25 That has tremendous benefit for the Navy. It will take



1 out that midlife refueling. It is going to allow us to  
2 operate that strategic deterrent mission with 12 boats  
3 versus the 14 we have today. That simple fact saves the  
4 U.S. Government \$40 billion in total ownership costs to buy  
5 two additional ships. That is really, really important to  
6 the Navy.

7 Now in addition to that, we are investing in technology  
8 for today's fleet and the future fleet. So we are trying to  
9 get after adding capability to the fleet, and do that in a  
10 cost-effective way that reduces the construction spans. And  
11 so to get to your point, I am looking to see how can I build  
12 even more reliable components that last longer? How can I  
13 collect data and used advanced sensors and data analytics to  
14 analyze and do condition-based maintenance? And then my  
15 time is intimately involved with the shipyards in trying to  
16 make sure we have the right rigor, training, oversight in  
17 executing the availabilities.

18 I would like to say that, to your point about overhauls  
19 and whatnot, even in the midst of COVID, the shipyard that  
20 is refueling the Louisiana was able to achieve a best-of  
21 record in terms of the refueling timeline. That is  
22 remarkable, even in the midst of COVID.

23 Senator Rounds: May I ask, with regard to those such  
24 as the Boise, which has been in drydock, literally for  
25 years, it sounds to me like what you are sharing is that the

1 challenges for the Boise in terms of the extended delay for  
2 its midlife refueling and so forth was not because of the  
3 need for a delay with regard to the refueling of the reactor  
4 itself but rather the other shipbuilding portions of that  
5 refueling and midlife rerigging.

6 Admiral Caldwell: Fair statement. That is correct,  
7 sir. And if I could add a little context on that. Boise  
8 was headed in for an engineered overhaul, not a refueling.  
9 And the challenge with Boise is that we did not have the  
10 capacity in the shipyard to induct her. And rather than  
11 simply induct the ship and have her sit idle, we decided to  
12 roll her into the shipyard environment when we could  
13 accommodate that, and also take advantage of the capacity in  
14 the private sector.

15 So we are working hard to improve the capacity and the  
16 performance in our shipyard, and that will affect the Boise  
17 outcome as well. But just for the record, she is not being  
18 refueled, sir.

19 Senator Rounds: Thank you, sir.

20 Dr. Verdon, could you provide your perspective on the  
21 legality and practicality of the government entering into a  
22 partnership with the largest civilian enrichment service  
23 operating in the U.S., Urenco, for supplying low-enriched  
24 uranium to the Watts Bar Nuclear Plant, to produce tritium  
25 for weapons. I understand that the GAO wrote a report

1 saying that exercising this course of action is a policy  
2 question, and that national security needs for enriched  
3 uranium could be met if the government took this approach.

4 Could you share with me your thoughts on whether that  
5 is an appropriate path forward?

6 Mr. Verdon: Yes, sir. So we have actually conducted a  
7 pretty extensive analysis of alternatives of how to provide  
8 low-enriched uranium for our defense needs, and that was  
9 certainly one option that we carried forward amongst  
10 technical options of using centrifuges. So we kept it on  
11 the table because it was brought up.

12 We actually thought it was a pretty big lift to  
13 actually do it, but since it is potentially achievable,  
14 depending on the allies, we carried forward with the option  
15 on the table. But we are pursuing a technological path  
16 forward as well, and, you know, we are investing in  
17 centrifuge technologies so that we can offer the country a  
18 decision in the future of which way we want to go.

19 Senator Rounds: My time has expired, but I would like  
20 to pursue that perhaps at a later time. Thank you, Mr.  
21 Chairman. Thank you, gentlemen.

22 Senator King: Thank you, Senator Rounds. Senator  
23 Rosen via Webex, please.

24 Senator Rosen: Thank you, Chair King and Ranking  
25 Member Fischer, for holding these hearings. It is, of

1 course, a really important topic and important to us here in  
2 Nevada.

3 And so last week, of course, Deputy Assistant Secretary  
4 of Defense for Nuclear Matters, Andrew Walter, told this  
5 subcommittee that the Enhanced Capabilities for Subcritical  
6 Experiment program, or, much easier to say, the ECSE, will  
7 enable the NNSA to, quote, "continue gathering the data to  
8 conduct subcritical experiments to certify the nuclear  
9 stockpile and ensure that the designs we use in the future  
10 remain safe and reliable," unquote.

11 So, Dr. Verdon, could you provide us with an update on  
12 upgrades to the ECSE facility in the Ula complex at the  
13 Nevada National Security Site, and can you tell us how the  
14 new facility will help to improve our stockpile stewardship  
15 program, scientific capabilities of course including our  
16 understanding of plutonium.

17 Mr. Verdon: Yes. Thank you for the question. Yes,  
18 ECSE--easier to say than Enhance Capabilities for Critical  
19 Experiments--yes, as I mentioned, it is a state-of-the-art  
20 facility that will give us capabilities that we do not  
21 presently have within the complex to--in essence, you can  
22 think of it is take dental radiographs of an imploding  
23 primary, and getting multiple images of it as well other  
24 diagnostics. And it is just a capability that we do not  
25 have in the complex today.

1           So bringing that system up online will provide us data  
2 that we have not had since we did underground testing. And  
3 so we identified it as an important gap in our capabilities  
4 and we are moving out to implement it as we speak. And as I  
5 mentioned, its timelines are driven to support warhead  
6 modernization activities within the stockpile.

7           So it is a very important capability, and we are  
8 putting all effort into making sure that it comes up on time  
9 and within budget.

10          Senator Rosen: So we have lots going on, of course, in  
11 Nevada at--I still call it the Test Site. I have lived in  
12 Nevada over 40 years. But, you know, your mission is to  
13 secure the integrity of our nuclear stockpile, but what are  
14 you doing to improve and invest in areas such as resources  
15 and support for our workers in the site, and also building  
16 the people pipeline, and do you think that you have the  
17 funding that you need to bring up your functionality  
18 overall, as far as hardware and, of course, the people who  
19 work there?

20          Mr. Verdon: So, as I say, the Nevada National Security  
21 Site is a very important site for us, not only for the NNSA  
22 mission but I would for broader national security missions  
23 writ large. There are a lot of activities that take place  
24 at that site that are important.

25          And so we have a prioritized list that we revisit every

1 year for infrastructure improvements at the site, and we are  
2 executing infrastructure improvements that range from  
3 utilities to road, to, as I say, the Enhance Capabilities  
4 for Subcritical Experiments. They run the gamut.

5 You know, clearly we cannot move as fast as we would  
6 like to move, but I think we have a very methodical way that  
7 we are moving through it to upgrade, prioritized based on  
8 risk to program and risk to workforce safety, and we are  
9 moving through those in a very methodical manner to upgrade  
10 them over time.

11 Senator Rosen: Thank you. I appreciate that. And, of  
12 course, you know, quickly in the time I have left, we had a  
13 secret shipment of plutonium that ended up in Nevada, from  
14 South Carolina, and as a part of an effort to restore trust  
15 with the people of Nevada we know that NNSA is committed to  
16 removing that material, starting no later than this year and  
17 completing it by 2026.

18 Can you provide us, of course in this nonclassified  
19 setting, any updates on the removal of the plutonium?

20 Mr. Verdon: So I can't go into details but I will  
21 assure you that we are honoring the commitment that we made.  
22 So we are acting on what the commitment was, and we will  
23 continue to do so.

24 Senator Rosen: Thank you. I see my time is just about  
25 up. Maybe we can meet in a classified setting and get the

1 latest updates on that and some other updates on the pits  
2 and what is going on down there. Thank you so much.

3 Senator King: Thank you, Senator Rosen. Senator  
4 Sullivan.

5 Senator Sullivan: Thank you, Mr. Chairman. Admiral  
6 Caldwell, I wanted to talk a little bit about the culture of  
7 the nuclear Navy. I have always been fascinated by it. It  
8 is quite unique, I think exceptional in many ways. Were you  
9 interviewed by Admiral Rickover? Are you young enough, or  
10 old enough?

11 Admiral Caldwell: I am old enough to have been  
12 interviewed by Admiral Rickover.

13 Senator Sullivan: And how did that go?

14 Admiral Caldwell: I did not get to spend much time  
15 with him. He was unhappy with some of my academic  
16 performance and he kicked me out pretty quickly.

17 Senator Sullivan: Interesting. So it was a short  
18 interview?

19 Admiral Caldwell: It was a very short interview and I  
20 had to promise that I would improve my performance. But he  
21 accepted me, and I have to tell you, as I sit here today I  
22 am honored to have been in this program for what will be 40  
23 years. And you are right, it has got an incredible culture.  
24 We hire fantastic people, and we work hard to retain them,  
25 and they do amazing work for us.

1           Senator Sullivan: So that is what I wanted to ask  
2 about. Oftentimes you have hearings when Senators or others  
3 think the culture has gone bad and something horrible has  
4 happened. And, you know, I never like talking about the  
5 nuclear Navy with its exceptional record and then you do not  
6 want an accident or anything. But it is quite unique, even  
7 within the military, even within, I think, American society.  
8 What is it that has enabled generations of naval officers  
9 and enlisted to operate our nuclear aircraft carriers, our  
10 nuclear subs in a way that is both focused on operational  
11 excellence and attention to detail, in an enterprise which  
12 is complicated, to say the least? But the Rickover culture,  
13 I think, some people criticize. I happen to think it is  
14 pretty remarkable. What do you think the secret sauce has  
15 been, and how do we make sure we continue to do it?

16 Obviously, he is gone, but it is really remarkable, I think.

17           Admiral Caldwell: It is a remarkable culture, sir, and  
18 I invite you to have a further, deeper dialogue with you.  
19 But if I could summarize some of the key points is, first  
20 off, going out and finding and recruiting the best people  
21 that we can. And Admiral Rickover interviewed all of the  
22 officers coming into the program. I continue to do that  
23 today. And, in fact, in my job I have interviewed over  
24 4,000 people to come into the program.

25           Senator Sullivan: So that continues.



1 Admiral Caldwell: That continues today, sir.

2 Senator Sullivan: You do not throw them out after 5  
3 minutes, do you?

4 Admiral Caldwell: I am probably not as colorful as  
5 Admiral Rickover.

6 Senator Sullivan: Okay. I mean, if you do, that is  
7 okay too, I guess.

8 Admiral Caldwell: We aim to have high standards. We  
9 are absolutely dedicated to deep technical knowledge. We  
10 are brutally honest with ourselves in terms of our  
11 performance, and we expect that from all of our teams. We  
12 report when we do not do things well, and then we aim to  
13 learn from those things and roll that back into our culture.  
14 And we try to manage problems when they are very small,  
15 before they get big.

16 So there are many aspects to this, but it is the self-  
17 critical culture. It is this commitment to perpetually  
18 improving your team and continuing to learn from others and  
19 mistakes and continue to drive your performance. Admiral  
20 Rickover really set high expectations for his people, and we  
21 continue to do that today for all the folks in my  
22 headquarters as well as our officers and our sailors.

23 Senator Sullivan: And is there anything we can do?  
24 Sometimes that is a dangerous question, particularly when  
25 things are going well.

1 Admiral Caldwell: Well, I think the --

2 Senator Sullivan: Or should we just keep our hands up?  
3 What should we do to enable that?

4 Admiral Caldwell: The important thing about Naval  
5 Reactors is its alignment of authorities, responsibilities,  
6 accountability, and the money that supports us. This  
7 subcommittee's continued support for my program enables me  
8 to deliver what I need to for the U.S. Navy. It allows me  
9 to do the design and to maintain the high standards and keep  
10 our ships at sea. All of this stuff is wrapped together.  
11 So that is key, I think, and I will continue to convey to  
12 you what I think I need to run the program.

13 Senator Sullivan: And when Admiral Richardson became  
14 CNO, I remember that was considered a little, I don't know,  
15 "controversial" may be too strong a word. But it took the  
16 traditional, I think it is an 8-year, 4- to 8-year billet  
17 that you currently occupy. Is that a statutory billet, and  
18 does that help you, and is it 8 years and then you are done?  
19 And was it controversial? I thought Admiral Richardson did  
20 a great job when he was CNO, but what is your thinking on  
21 your billet, which is a little bit of a hard question.

22 Admiral Caldwell: It is an 8-year responsibility. It  
23 was outlined in an Executive order 12344. It was later  
24 codified into law. And it allows the director to gain  
25 continuity in the program and to live with their decisions.

1           Now Admiral Rickover is an extraordinary leader, and I  
2 think he had the opportunity to go lead our Navy, and I  
3 think that was great for our Navy. And I think for me and  
4 for the program it is good to have an 8-year director to get  
5 fully immersed, to make decisions, and then deal with the  
6 consequences of those decisions. That is part of being a  
7 nuclear-trained officer is owning the results and owning the  
8 path to get to success.

9           Senator Sullivan: Thank you very much. Thank you, Mr.  
10 Chairman.

11           Senator King: Thank you, Senator Sullivan. Admiral,  
12 following up Senator Sullivan's questions, I had the  
13 opportunity to spend a couple of days and a night on the USS  
14 New Mexico under the ice in the Arctic Ocean. And one of my  
15 clearest memories was -- they were enlisted people who were  
16 managing that reactor, and it was their reactor. You came  
17 away feeling that they had an ownership and a commitment to  
18 excellence that was quite extraordinary. And that was a  
19 clear memory from that trip, right up there with breaking  
20 through the ice when it was time to go home. But I  
21 compliment you on maintaining that culture that Senator  
22 Sullivan described.

23           Admiral Caldwell: Thank, sir. I think you said the  
24 optimal word: ownership. And when I think about it, we  
25 have young nuclear operators, maybe a 21-year-old operator

1 at the panel, controlling the reactor. It is pretty  
2 impressive what they can do. We are pretty proud of them.

3 Senator King: That was exactly my thinking.

4 Dr. Verdon, I have been to several storage facilities  
5 of nuclear warheads and there seemed to be a lot of them.  
6 Let me ask a question my constituents might ask if they were  
7 sitting here. Why do we need new warheads?

8 Mr. Verdon: So many times -- well, "new" is how you  
9 want to define it. Some of them are basically the  
10 modernization programs, they are actually replacing like for  
11 like, just using newer components, replacing, you know, aged  
12 materials or aging components.

13 Senator King: So to be clear, that are not entirely  
14 new warheads. They are components that are being changed to  
15 modernize.

16 Mr. Verdon: That is for a vast majority of what we  
17 have been doing to date has been what we call regular Life  
18 Extension Program, where you basically try to reuse as much  
19 of the componentry as you can and only replace that which  
20 you have to. And it is driven by age or, you know, in some  
21 cases these warheads were designed to only be in the  
22 stockpile for 20 years. So you run out of logistic supplies  
23 because the components have gotten so old and they are no  
24 longer made, so you have to upgrade them to the newer  
25 technologies.

1           So they are not new in that regard. There is no new  
2 military characteristics associated with the warheads.

3           Senator King: Thank you. Pits is a matter of some  
4 discussion. We have not been making pits, which are an  
5 essential component of a nuclear warhead, for some time.  
6 Number one, is it necessary to restart pit production?

7           Mr. Verdon: So my assessment, technically, is yes, it  
8 is. I think there are a number of reasons, one being to  
9 mitigate risks against what are presently now large  
10 uncertainties associated with what is called plutonium  
11 aging. It is really the cumulative impact of plutonium  
12 decay, radioactive decay, on an existing pit. And then also  
13 to address and be able to improve the safety and security of  
14 the warheads, based on new safety and security requirements.  
15 And then a third would be to potentially respond to what  
16 peer adversaries might challenge our deterrent for the  
17 future.

18           So I do assess that manufacturing, having the  
19 capability, a modest capability, of manufacturing new pits  
20 is important for our deterrent in the long term.

21           Senator King: So they have been manufactured at Los  
22 Alamos, but I understand that the plan now is to restart the  
23 program at Los Alamos but also to have a sister facility at  
24 the old MOX facility in South Carolina. Why two facilities?

25           Mr. Verdon: So when we explored the options of how to

1 re-establish pit manufacturing we looked at obviously one  
2 site and we looked at two sites. And, in particular,  
3 because we had the existing facility at Los Angeles, the  
4 Plutonium Facility Number 4, PF4, and what we formerly  
5 referred to as MOX facility at Savannah River, having those  
6 two existing facilities identified a way to implement pit  
7 production at a modest level of around 80 pits per year,  
8 which is the goal, but also having resiliency, because we  
9 have found at Los Alamos that we have had outages that have  
10 lasted a few months to 3 years.

11 Senator King: What do you mean by an outage? That is  
12 not a power outage.

13 Mr. Verdon: An outage, that a situation occurs at the  
14 production site that causes it to be offline for 3 years.  
15 And we have had that. We have actually experienced that.  
16 And having that kind of issue occur when you are trying to  
17 produce the warheads is not acceptable. It is hard to  
18 recover from.

19 So we identified that the two-site solution,  
20 particularly leveraging the existing facilities, was an  
21 efficient schedule and cost approach to re-establishing pit  
22 manufacturing for the United States.

23 Senator King: Aside from the resilience issue, was  
24 there any comparison made of costs of one versus two?

25 Mr. Verdon: So we have looked at that, and again, if

1 you factor in resiliency, if look at two sites that can  
2 produce 80 pits a year, you have to compare it to one site  
3 that is about 140 pits a year. And when we estimate that  
4 cost we estimate that to be almost twice as expensive as  
5 doing the two-site solution that have put forward today.

6 Senator King: Thank you. Mr. White, I keep promising  
7 I am going to get the questions, and they are still coming,  
8 but it is now over to Senator Fischer.

9 Senator Fischer: Thank you, Mr. Chairman. I am going  
10 to follow up a little bit on the pit production. While we  
11 know that Los Alamos and Savannah River are the primary  
12 production sites, I got to visit you out at Lawrence  
13 Livermore a few years ago as well. Can you talk a little  
14 bit about the role that Lawrence Livermore is going to be  
15 playing in this, as we look at the efforts, the plutonium  
16 efforts of NNSA?

17 Mr. Verdon: So the present example is a perfect one of  
18 the W87-1, where Lawrence Livermore is responsible for the  
19 design of that warhead and responsible for the design of the  
20 pit that is going to go into that warhead. So they are  
21 actually playing a key role as the design agency, working  
22 with the Los Alamos production agency. It is not enough  
23 just to put the equipment in. You actually have to show  
24 that what is produced with that equipment is acceptable for  
25 use in the stockpile, and Lawrence Livermore will be playing

1 a key role in showing that what Los Alamos, and ultimately  
2 Savannah River, would produce is acceptable for use in the  
3 stockpile.

4 Senator Fischer: And will the technicians at Livermore  
5 be able to produce those pits as well? Will you be training  
6 them to do that?

7 Mr. Verdon: Right now there is expertise at Lawrence  
8 Livermore in pit production that is being used to peer  
9 review the Los Alamos and Savannah River efforts, but right  
10 now there is not plans to have them doing hands-on work.

11 Senator Fischer: If Livermore was going to start in  
12 pit production, what kind of investments would have to be  
13 made there?

14 Mr. Verdon: There was a pit production capability at  
15 Lawrence Livermore but it was decommissioned. So it would  
16 be, again, a pretty big expense to stand it back up. And it  
17 was not of the size that would be necessary right now. We  
18 would have to increase the size of it.

19 Senator Fischer: Okay. Thank you all. I appreciate  
20 you being here today. Thank you, Mr. Chairman.

21 Senator King: Just a couple more questions. Mr.  
22 White, I mentioned in the opening statement 177 leaking  
23 tanks at Hanford. Is that the right number, and what are we  
24 doing?

25 Mr. White: So that is the total number of tanks that



1 we have at Hanford, sir, but it is not the number that we  
2 believe are leaking.

3 Senator King: Do you have a number on those which you  
4 think are leaking?

5 Mr. White: Yes, sir. There are two tanks at Hanford  
6 that we believe are actively leaking. Over the 70-year life  
7 of the site, we believe over 60 of the single-shell tanks  
8 have leaked at some point in the past.

9 I think this highlights the importance of a couple of  
10 things in terms of our ability to manage that aging tank  
11 infrastructure. One is it highlights the importance of the  
12 mitigation measures that we have taken over the past three  
13 decades to ensure that we are managing the risk of that  
14 aging infrastructure. For those single-shell tanks that are  
15 the most vulnerable, we have pumped out most of the  
16 drainable liquids from those tanks starting in the 1980s.  
17 And so for the actively leaking tank we identified recently,  
18 for example, most of the liquids in that tank had been  
19 pumped out.

20 Senator King: So you are triaging the tanks according  
21 to their risk.

22 Mr. White: Yes, sir. And we have also installed pump-  
23 and-treat systems in the tank farms that prevent the  
24 contamination from the history of operations at the site  
25 from reaching the groundwater. We have built up a tank

1 integrity program to ensure that we are monitoring very  
2 closely the levels in the tanks and also monitoring the  
3 integrity of the infrastructure.

4 Senator King: Do you feel confident in your  
5 groundwater protection efforts, because this site, I  
6 understand, is not all that far from the Columbia River.

7 Mr. White: The tank farms are several miles from the  
8 Columbia River, so depending on your --

9 Senator King: Groundwater travels.

10 Mr. White: And the groundwater does travel. It takes  
11 a number of decades for contaminants to migrate from the  
12 tanks to the groundwater, but we have every indication that  
13 the pump-and-treat systems that we are putting in place are,  
14 in fact, very effective.

15 I think this does highlight, though, the importance of  
16 moving forward to the ultimate solution, which is to treat  
17 and dispose of the tank waste at Hanford.

18 Senator King: My understanding is there a  
19 classification process for what is coming out of the top  
20 part of the tanks, but what about the really bad stuff that  
21 is in the bottom? Is that going to be the same process?  
22 There is a grout process, I understand. Is that the answer  
23 for the more contaminated?

24 Mr. White: For the low-activity vitrification  
25 capability we are standing up now, that treats the low-

1 activity part.

2 Senator King: Right.

3 Mr. White: The sludge that you are talking about, that  
4 typically is in the bottom of tanks, will most likely be a  
5 high-level waste component. There is also a vitrification  
6 capability that we need to stand up to treat that as well.  
7 We are currently in discussions with the State of Washington  
8 on the best approach to use to stand up that vitrification  
9 facility over the course of the next decade or so.

10 Those two capabilities together, however, do not treat  
11 all of the tank waste at Hanford, and this gets to the need  
12 for supplemental treatment capability. This committee, in  
13 the past, has been very interested and very helpful in  
14 pushing us to do research and development into options to do  
15 that treatment of the supplemental waste streams. We had an  
16 FFRDC look at those in 2017. There were options ranging  
17 from grouting to vitrification to steam reforming.

18 We have not made a decision yet on those options. Last  
19 year's NDAA asked us to update that R&D effort, and we are  
20 in the process of doing that. We have contracted with  
21 Savannah River National Lab to do that update. We are also  
22 working with the National Academies to look at the study as  
23 the labs do that R&D effort.

24 At some point over the course of the next few decades  
25 we will begin to also need to stand up those supplemental

1 capabilities in order to really get to the bulk of the 50 or  
2 more million gallons of tank waste that exists.

3 Senator King: I sit on the Energy and Natural  
4 Resources Committee with Senator Wyden and Senator Cantwell,  
5 so I am channeling them now. But you have used "decades"  
6 twice. One is in the motion of groundwater and the other is  
7 finding the solution. There is a danger here. I mean,  
8 there are some deadlines, and do you feel that we are making  
9 adequate progress?

10 Mr. White: I do. I am very impressed with what the  
11 site has done in terms of our ability to stand up the  
12 initial vitrification capability on the low-activity side.  
13 I believe we will meet our regulatory milestone of having  
14 that up and running by the end of December 2023.

15 We are currently working with the State of Washington  
16 and the EPA, trying to figure out what the next approach is  
17 going to be on the high-level side. I am hopeful we can  
18 come up with something that is feasible and practical, from  
19 a technical perspective. But I agree with you, time is of  
20 the essence.

21 Senator King: Thank you. And, Admiral, you deal with  
22 waste at Idaho National Lab. Is that program on track? Can  
23 we feel some confidence there?

24 Admiral Caldwell: Yes, sir, you should feel some  
25 confidence there. I ship my spent fuel to Idaho, and

1 package it for interim storage in steel containers, and then  
2 put it in concrete overpacks. I have, today, over 75  
3 percent of my spent fuel is in a concrete overpack in road-  
4 ready storage, and additionally, we have responsibilities  
5 and commitments to the State of Idaho. I have a near-term  
6 commitment to have any fuel that was in the pool before  
7 January 1, 2017, had to be out of the pool by January 1,  
8 2023, and I am going to meet that milestone 18 months in  
9 advance of the milestone.

10 So you should have confidence with what we do, and we  
11 will continue to do that. The spent fuel handling facility  
12 that we are building out there will allow us to continue to  
13 process that fuel and also to continue to meet our  
14 responsibilities with the State of Idaho, and to do so in an  
15 environmentally responsible way.

16 Senator King: Thank you. Senator Fischer, any further  
17 questions?

18 I want to thank all of you for your testimony here  
19 today. Again, I apologize for being late at the beginning  
20 of the meeting. But I also want to thank you for the  
21 important work that you are doing. This is some of the most  
22 sensitive and important work in our society. Each of you  
23 has a different aspect of it, and I just so respect your  
24 attention to the detail. And know that you have the support  
25 of this committee, and also know that you are doing a

1 significant service to the country. So thank you all.

2 Without further questions, the hearing is adjourned.

3 [Whereupon, at 6:11 p.m., the subcommittee was  
4 adjourned.]

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