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Before the

Subcommittee on Strategic Forces

COMMITTEE ON
ARMED SERVICES

UNITED STATES SENATE

HEARING TO RECEIVE TESTIMONY ON
UNITED STATES NUCLEAR DETERRENCE POLICY
AND STRATEGY

Wednesday, June 16, 2021

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U.S. Senate
Subcommittee on Strategic Forces
Committee on Armed Services
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The subcommittee met, pursuant to notice, at 4:31 p.m. in Room SR-222, Russell Senate Office Building, Hon. Angus King, chairman of the subcommittee, presiding.

Subcommittee members present: Senators King [presiding], Warren, Rosen, Kelly, Fischer, Rounds, and Sullivan.

OPENING STATEMENT OF HON. ANGUS KING, U.S. SENATOR FROM MAINE

Senator King: We are talking today about the United States nuclear deterrence policy and strategy. I want to thank the witnesses today for appearing at this hearing to give their views on our nuclear deterrence policy and strategy. Together, these witnesses represent a wealth of experience in public service and academic thought. This is our second hearing on nuclear deterrence and I believe it is critical to expose the public to a diverse set of viewpoints on this issue.

I wrote my college thesis on nuclear deterrence 55 years ago, but the topic remains as relevant today as it was back then; however, the environment in which U.S. deterrence policy operates has significantly changed. We have moved from a Cold War stance with the Soviet Union to a multipolar nuclear world with space and cyber domains that also affect strategic stability.

While we haven't built new types of nuclear weapons or delivery vehicles in the past 30 years, other nations, such as Russia, and especially China, have done so. I hope this hearing can bring out the implications of these new and often disturbing trends.

While nuclear deterrence may seem to be a simple concept, it is, in practice, a complicated system with many

different elements, including the thousands of women and men who contribute to this mission in the Departments of Defense and Energy. We owe it to them, especially those in uniform, whose mission is no fail 24/7, to educate the public on a topic that is now undergoing significant change.

We will open with 5-minute witness statements and then go to 5 minutes of questions between each side of the table for each member.

Senator Fischer and I are going to have to pop in and out because there is a third vote that is probably starting right about now, but it will only take a couple of minutes.

So, with that, Ranking Member Fischer, for your opening comments.

STATEMENT OF HON. DEB FISCHER, U.S. SENATOR FROM NEBRASKA

Senator Fischer: Thank you, Mr. Chairman. And welcome to all of our witnesses.

Ms. Gordon Hagerty, it is wonderful to see you again and I am happy that you, along with Ms. Creedon, are here today to be able to share your expertise about the infrastructure that we need.

Too often, conversations about deterrence and nuclear posture focus exclusively on military capabilities, but as Admiral Richard testified before this committee earlier this year, he said that simply counting warheads is a crude measure of a nation's overall strategic capability. The state of a foreign nation's nuclear infrastructure must also be included in our assessments of their nuclear programs and incorporated into our analysis of that strategic stability.

In the same way, the state of our own infrastructure must be discussed as we examine our own posture. And while previous nuclear posture reviews have concluded that a responsive nuclear infrastructure is a key component of sustaining our nuclear deterrent, pacing threats, and hedging against both technological surprise and geopolitical uncertainty, progress towards achieving this goal has been uneven and much work remains to be done.

So, we look forward to hearing more about this both

from you on this issue as we consider the programs and policies and the overarching strategy behind our nuclear deterrent.

Thank you, all.

Senator King: Each of you has a very distinguished background, but in the interests of time, I am not going to list your resume, except to introduce you according to your current association.

We are going to start with Tom Z. Collina, Director of Policy, at the Ploughshares Fund.

Mr. Collina, the floor is yours.

STATEMENT OF TOM Z. COLLINA, DIRECTOR OF POLICY, PLOUGHSHARES FUND

Mr. Collina: That would be helpful. Thank you very much.

Mr. Chairman, Senator Fischer, members of the committee, thank you for inviting me. I am delivering this statement on behalf of myself and former Secretary of Defense, Bill Perry, who regrets he could not be here today, and I request permission to submit the statement for the record.

Senator King: Without objection.

[The statement of Mr. Collina follows:]

Mr. Collina: And I would like to thank you, Mr. Chairman, for holding this second hearing on nuclear policy and I appreciate your willingness to hear from a wider spectrum of speakers and views and I hope this sets a norm for the committee going forward, and I really appreciate it.

Let me start by saying, we welcome the statement made today by Presidents Biden and Putin in Geneva, that a nuclear war cannot be won and must never be fought. They also reaffirmed their commitment to arms control and their attention to seek new arms control talks and we hope those talks succeed.

Many of the ideas I will talk about today are based on the book Dr. Perry and I co-wrote, called, The Button: The New Nuclear Arms Race and Presidential Power from Truman to Trump. The main conclusion of that book is that U.S. nuclear policy is focused on the wrong threat and by focusing on the wrong threat, we have adopted the wrong policy.

U.S. nuclear policy has for decades been built on one central assumption: that Russia might launch a disarming first nuclear strike, a bolt from the blue, against the United States. But looking back at the Cold War, we found no compelling evidence that either side would have launched a surprise attack and as STRATCOM Commander Richard recently said, a bolt out of the blue is unlikely.

Yet, by preparing for this unlikely threat, U.S. policy creates a greater danger, that these forces could be used by accident. This is not just a theoretical possibility. We came very close to nuclear disaster several times during the Cold War and the advent of cyber threats only increase the risks of false alarms and mistakes.

So, in our view, the Biden administration now has an opportunity to modify dangerous nuclear policies and give the President more decision time and here is how. First, we should end sole authority for starting nuclear war. The last weeks of President Trump's term in office demonstrated the extreme danger of giving one person unilateral authority over launch. In the state of emotional turmoil, the President could have ordered the use of nuclear weapons. This danger was so acute that House Speaker Nancy Pelosi actively looked for ways to prevent, quote, the unstable President from accessing the launch codes and ordering a nuclear strike, unquote.

Mr. Chairman, we have learned this lesson too many times now. Presidents should not have sole authority over nuclear war.

Second, the administration should declare sole purpose. The Biden campaign stated that the sole purpose of the U.S. nuclear arsenal should be deterring, and if necessary, retaliating against a nuclear attack. To provide the

greatest benefit, a sole-purpose policy should clearly prohibit the United States from starting nuclear war, should rule out preemptive nuclear attacks and prohibit launching nuclear weapons before an unconfirmed attack arrives. A sole-purpose policy will require consultations with allies, but allies should not be given veto over U.S. policy.

Third, the Biden administration should take land-based missiles off alert. If early warning sensors indicate that missiles are end route to the United States, the President would have to consider launching ICBMs before those missiles arrive. This is known, of course, as launch on warning. But, as you know, once ICBMs are launched, they cannot be recalled and the President would have less than 10 minutes to make this terrible decision.

If the President orders a launch and the attack is a false alarm, he or she would have started nuclear war by mistake. We should take ICBMs off alert and end the policy of launch on warning.

In addition to extending decision time, the administration can deter an intentional attack with a smaller and more affordable nuclear force than currently planned. Deterrence depends on a credible second-strike capability, which is provided by our submarines at sea and backed up by bombers. The United States does not need ICBMs to deter nuclear war.

So, in our view, we can safely cancel the ground-based strategic deterrent and save much of the $264 billion lifetime cost. At a minimum, this program should be delayed while the administration explores new arms to control negotiations with Russia, and I would just note the initial progress made in Geneva today. In the meantime, the existing Minuteman missiles can be refurbished at a fraction of the cost of buying a new missile.

So, to conclude, by making these important policy shifts, we can save hundreds of billions of dollars, reduce the risk of nuclear war, and still protect the United States and its allies.

Thank you, and I look forward to your questions.

Senator King: Thank you very much, Mr. Collina.

Next, we have Dr. Sharon K. Weiner, Associate Professor at the School of International Service, American University.

STATEMENT OF DR. SHARON K. WEINER, ASSOCIATE PROFESSOR AT THE SCHOOL OF INTERNATIONAL SERVICE, AMERICAN UNIVERSITY

Ms. Weiner: Thank you very much. Thanks for the invitation to come and speak to you today.

Senator King: Can you get a little closer to the microphone.

Ms. Weiner: Yes, indeed.

Thanks for the invitation to come and speak today. In my written statement, I acknowledge the organizations have that funded my research, but I just want to --

Senator King: Would you like your written statement submitted for the record?

Ms. Weiner: I would, please.

Senator King: Without objection.

[The statement of Ms. Weiner follows:]

Ms. Weiner: Thank you.

I also want to make clear that the views I am expressing today are my own, okay. So, in my written statement, I make the argument that there are multiple ways to maintain a safe, secure, and effective nuclear deterrent and that requirements, and I am going to put those in air quotes, are not a precondition that is necessary for deterrence, but rather, they are one choice among many.

This afternoon, I would like to give you three examples of current choices about nuclear modernization and frame them not as so-called requirements, but as choices about deterrence. The first I would like to look at is a deliver system, GBSD. So, originally, the argument for GBSD was that it was basically cost, that it was cheaper to build a new system than to maintain Minuteman-III, but independent analysis called that into question and then the argument shifted.

Then it was Minuteman-III couldn't be sustained; it had to be replaced. That has also been called into question by independent analysis, as well as Air Force witnesses, and so now increasingly, the argument for GBSD is that it is needed to cover new threats that can't be covered by Minuteman-III, thus, GBSD is a requirement for deterrence.

But let's consider, for example, that GBSD is required for deterrence because it is needed to hold, at risk, a

particular set of targets. Hypothetically, let's pick a set of targets in China. And so, from the perspective of deterrence we have to ask a couple of questions about making this choice. One is, to what extent does deterring China depend on holding at risk this particular set of targets or is China already deterred by the certainty that the U.S. SSBN fleet has enough destructive capability to inflict significant damage upon China.

The second question is, if our SSBN force can hold at risk, say, 95 percent of the nuclear targets in China, is it worth the estimated $264 billion life-cycle cost of GBSD to increase that to hold at risk, say, 97 percent of those targets; in other words, is GBSD a requirement for deterrence or is it nice to have because it buys down a small amount of risk, or is it one option among many that we have for deterring China.

Example number two, and this is warheads, specifically, pit production. So, we are told that pit production soon, and in fairly large quantity is necessary, that without it, nuclear weapons may not function as, again, air quotes, required.

Certainly, if nuclear weapons don't work, then we have a problem with deterrence, but the current debate over pit production isn't that the weapons don't work; it is how they work. If we have 95 percent confidence that a nuclear

weapon will explode on target with 98 percent of its anticipated yield, does that deter more or less, than a weapon in which we have, say, 96 percent confidence.

Given that we have just over one and a half thousand deployed warheads, plus twice that number in the hedge, how many of these weapons have to work at what level to deter or do we have enough redundant capability to at least call into question, the need to spend $18 billion or, likely, much more on the, quote, required pit production capacity.

So, I offer these examples to illustrate that a safe, secure, and effective nuclear deterrent can be achieved in multiple ways, but also to point out one enduring legacy of the U.S. nuclear force posture, which we know, and that is the imbalance between what is actually required for deterrence and the stockpile that we build and maintain. In the early 1960s, Secretary of Defense McNamara, decided that he would try to come up with a criteria for what it would take to achieve the assured destruction of the Soviet Union. So, he decided that that would be the ability to destroy 20 to 25 percent of the Soviet population and half their industrial capability. At the time, that equated to about 400, one megaton warheads. The U.S. at that time, had almost 18,000 megatons of warheads, okay. That was the 1960s.

More recently, in 2012, the military concluded it could

meet all of its necessary requirements with about a thousand deployed strategic warheads, a third less than we have now under New START. Most recently, in April, in front of the House, Admiral Richard said the triad is designed to meet all presidential requirements, even if one leg is lost. So, these examples suggest that there is room for significant reductions without compromising deterrence.

Our choice about modernization need to consider each component of the nuclear arsenal, not in isolation from each other, but as part of a collective contribution to deterrence. Too much modernization sends a signal about deterrence, that we are willing to risk a costly arms race and instability. That we are interested in more than just nuclear deterrence of existential threats to the United States, that we are interested in either nuclear superiority or nuclear warfighting, and I would argue both of those are significant costs to modernization. Thank you.

Senator King: Thank you very much for your testimony.

The next witness is the Honorable Madelyn Creedon, Research Professor at George Washington University.

STATEMENT OF HON. MADELYN R. CREEDON, NONRESIDENT SENIOR FELLOW ON FOREGN POLICY, CENTER FOR SECURITY, STRATEGY, AND TECHNOLOGY, BROOKINGS INSTITUTE, RESEARCH PROFESSOR, GEORGE WASHINGOTN UNIVERSITY, ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

Ms. Creedon: Thank you very much for the opportunity to appear before the Strategic Forces Subcommittee on the most difficult, but important topic of nuclear deterrence.

At the outset, I just want to be clear that I appear here today in my personal capacity and that my remarks and views are my own.

This subcommittee and this committee, actually, has a very difficult job. You must examine the variety of changing geostrategic conditions while trying to predict the future, hoping that the decisions made today will result in U.S. strategic systems able to counter the evolving threats that future decades present; in short, ensuring that the U.S. develops and maintains a powerful deterrent and that the nuclear aspect of the deterrent remains safe, secure, reliable, and effective, and fit for purpose, whatever that purpose may be over time, however the threat evolves.

In 2005, Thomas Schelling opened his Nobel Prize lecture by saying, the most spectacular event of the past half-century is the one that did not occur. We have enjoyed 60 years without nuclear weapons exploded in anger; what a

stunning achievement or, if not an achievement, what stunning good fortune. Then adding, can we make it through another half-dozen decades?

Since that lecture, we have made it through another decade and a half, but the question remains valid: can we continue to avoid nuclear use or a nuclear conflict?

Today, the U.S. is most likely the only state with nuclear weapons that is not increasing the size of its nuclear arsenal. Russia, China, India, Pakistan, and North Korea, are all making qualitative and quantitative improvements to their nuclear arsenals. Even our close ally, the United Kingdom, has recently announced that it, too, is making a very small increase the size of its arsenal because of the changing geopolitical situation.

While Russia remains the pacing nuclear threat, China, as Secretary Austin recently said, is the tracking threat for the future and will require a whole-of-government approach to counter.

How does the U.S. regain leadership to reduce the number and role of nuclear weapons, prevent nuclear proliferation, and avoid an arms race, all while maintaining a credible nuclear deterrent to protect ourselves and our allies in the face of these new challenges, and be prepared, if deterrence fails, to respond.

In his 2009 Prague speech, President Obama set the U.S.

on a long-term path to seek the peace and security of a world without nuclear weapons. The first step was to obtain the New START Treaty, but after that, the world chose a different path.

China is expanding its nuclear arsenal and is developing a true Triad of bombers, submarines, and ICBMs, many of which will be road-mobile and have regional and intercontinental capability. This expansion, although relatively early, is rapid and could at least triple the size of China's arsenal, maybe more, and the accompanying delivery vehicles. What is the incentive for China to reverse course?

Russia, on the other hand, is much farther along in its modernization efforts, deploying a wide variety of new systems, in addition to modernizing its Triad; more importantly, Russia has a well-functioning nuclear infrastructure, capable of producing hundreds of additional warheads and hot production lines for missiles.

Previously, U.S. efforts to lead by example, such as declassifying the total number of warheads to provide transparency were not reciprocated and are there now, unilateral, or bi- or trilateral steps that could improve transparency and confidence that might ultimately be reciprocated and result in mutually beneficial reductions? Are Russia and China interested in such discussions and is

the U.S. willing to put on the table those things such as missile defense that must be included in any serious stability or transparency conversations.

Maybe the results of today's summit will provide an opening. In the meantime, the U.S. is behind. The NNSA has completed a life-extension program for just one nuclear warhead. The Air Force's long-range stand-off missile, the AGM-181, just entered engineering and manufacturing development, EMD, this year, and the Air Force awarded the EMD contract for the ground-based strategic deterrent, the new ICBM, at the end of last year.

These missiles, as well as the new strategic bomber, and the Columbia-class submarine, both of which are in development, won't begin to deploy until the early 2030s. And while the NNSA has an exceptional science infrastructure to underpin the warhead life extension and surveillance programs, new scientific capabilities will be needed, such as additional computational capability and the new enhanced capability for subcritical experiments in Nevada.

And the weapons production complex, on the other hand, needs attention. Although significant work has taken place over the last 10 years, to say that it is in dire straits is probably not an exaggeration.

In time, NNSA will also need new facilities to produce materials, such as lithium, tritium, and eventually highly

enriched uranium. As GAO noted in its recent report, the long-anticipated bow wave of nuclear modernization is here.

As the Biden administration said in its interim national security guidance, the U.S. can maintain a credible deterrent, sure our allies, and get back on the road to a world without nuclear weapons, even in the face of increasingly greater challenges and worsening geopolitical circumstances. We need the small steps and the bold moves to make this happen.

Thank you, and I look forward to your questions.

[The statement of Ms. Creedon follows:]

Senator King: Thank you. Next, we have the Honorable Lisa E. Gordon Hagerty, former administrator at National Nuclear Security Administration.

And I apologize, I will have to go vote and Senator Fischer will be in charge and I will be back momentarily.

Go ahead.

STATEMENT OF HON. LISA E. GORDON HAGERTY, FORMER ADMINISTRATOR, NATIONAL NUCLEAR SECURITY ADMINISTRATION

Ms. Gordon Hagerty: Thank you.

Chairman King, Ranking Member Fischer, thank you for the invitation to testify before you today on the state of the U.S. nuclear deterrent, the nuclear complex, which supports it, and policies affecting it.

My perspective today is from that of a career professional, having served more than 35 years in the U.S. Government, both in national and nuclear security programs, as well as for a period of time in the private sector.

My most recent position was as the fifth administrator of the National Nuclear Security Administration. I was honored to return to the Government to serve our great nation once again and work with the dedicated men and women and women of the nuclear security enterprise, Armed Forces, the interagency and international partners.

I would like to submit a statement for the record.

Senator Fischer: [Presiding.] Without objection.

[The statement of Ms. Gordon Hagerty follows:]

Ms. Gordon Hagerty: Thank you.

And today, I would like to make sure that the positions that I take and the opinions are expressed are my own.

For 7-plus decades, the cornerstone of our great nation's security has been grounded in our nuclear deterrent. Throughout this period, our allies and partners have chosen to rely on the strength and the commitment of the United States to extend our defense on their behalf against a myriad of potential threats. We have advanced, however, to an era where near-peer nuclear competitors, adversaries, and malign actors, pose new and asymmetric threats against us.

In addition to the ever-present strategic nuclear threat against which we have planned for many decades, it is now commonplace to learn about high-profile, cyberattacks, or ransomware incidents. While we should prepare for and defend against these new challenges, I urge policymakers not to lose sight of the bedrock of our security.

Now, more than ever, our near-peer competitors and adversaries are monitoring our policy decisions and actions, or in some cases, inactions, and either perceive or believe that the United States is close to the breaking point in modernizing our deterrent.

The United States can no longer afford the luxury of time, nor should it delay its efforts and willingness to

preserve our strength. Russia's strategic forces are currently undergoing comprehensive nuclear modernization and are also pursuing novel nuclear weapons, not covered by New START. China continues to increase the number, capabilities, and protection of its nuclear force and its lack of transparency in its programs raises questions regarding its future intent. Both are investing significant resources and delivery platforms, such as hypersonic live vehicles.

These nuclear powers have made clear that their nuclear weapons will be a vital component of their respective security postures, which continue threatening the United States' interests around the world for the foreseeable future.

While the United States often speaks to the robustness of our deterrent, which keeps the peace, we are at a crossroads. At the end of the Cold War, U.S. leadership took an important step to reduce the tending and distress that marked relations with the Soviet Union by significantly reducing its nuclear weapons stockpile, determining that maintenance was its singular priority.

U.S. nuclear security laboratories developed life-extension programs for systems in the stockpile, whose designs were based on nominal 10-to-20-year service lives and are now being extended to 50 years and beyond; a

testament to U.S. scientific and engineering communities.

However, I would contend to you that those decisions failed to anticipate future challenges, as the U.S. finds itself as the only nuclear weapon state that is neither designing, nor building new nuclear weapons. This is yet another reason that full funding of and support for the nuclear security enterprise infrastructure is more important than ever.

Modernization will support existing stockpile maintenance and prepare for the design, development, and fielding of future modern stockpile systems. Let me be clear, I am not advocating for massive reconstruction of the nuclear weapons complex, as it was 30 years ago, though we should all agree that there must be some resilience built into our enterprise.

And while this hearing is important to does the desperately needed modernization, I would remind you that is only a fraction of the NNSA budget. It also funds the workforce, the world-class scientists, engineers, technicians, and administrative support staff that support critical military application, arms control and disarmament, and other vitally important national security programs that only they can execute.

Simply put, when budgets are decreased, the staff is cut. At a time when the U.S. is focused, and rightfully so,

on educating and hiring STEM-qualified, best and brightest into our national security sector, there is an obvious disconnect when the focus is exclusively on bombs and warheads, yet here we are, knowing that the NSC is nearing the breaking point, the Obama administration embraced that reality, supporting a comprehensive modernization program and the Trump administration did, as well.

Recently, NNSA reported that the anticipated two-site, plutonium pit production strategy will be delayed, unable to meet Congress' direction and DOD mission requirements to field the GBSD in 2030. This is another stark reminder that over the past two decades, several previous administrations refused to proceed with construction of a modern pit manufacturing facility, replacing a critical production capability that was shuttered more than 30 years ago at the Rocky Flats Plant.

While complaints continue over the cost of the GBSD, every business case has borne out that if the Minuteman-III's life is extended, it will cost more than the GBSD. The GBSD has been designed to be adaptable and responsive to new technologies, incorporate common parts, and respond quickly to emerging threats. Bottom line, GBSD will be more reliable and easier to maintain.

I strongly urge you to continue providing your unwavering support for these national security missions,

doing everything to ensure the success and pursuit of global nuclear security. For the past 2-plus years, both sides of aisle agreed with and committed to the modernization and I am cautiously optimistic that leadership will continue to do so.

Nuclear weapons are horrific means of warfare, yet they have kept the peace and have prevented World War III with robust policy and programs. I would urge you to focus on the importance of our future national security, not for today or tomorrow, but for what we must maintain to ensure that our freedoms are secure in the decades to come.

Thank you, and I look forward to your questions.

Senator Fischer: Thank you very much.

Mr. Kroeing, Dr. Kroeing?

STATEMENT OF DR. MATTHEW KROEING, PROFESSOR OF GOVERNMENT AND FOREIGN SERVICE, GEORGETOWN UNIVERSITY, DEPUTY DIRECTOR, SCOWCROFT CENTER FOR STRATEGY AND SECURITY, ATLANTIC COUNCIL

Mr. Kroeing: Great.

Ranking Member Fischer, thank you for the opportunity to appear today to discuss U.S. nuclear strategy. I would like to request that my written statement be entered into the record.

Senator Fischer: Without objection.

[The statement of Mr. Kroeing follows:]

Mr. Kroeing: U.S. nuclear strategy is distinctive for three reasons. First, unlike other countries, the United States doesn't just use its nuclear weapons to defend itself; it uses its nuclear weapons to protect the entire free world. The United States extends nuclear deterrence to over 30 formal treaty allies, some of the world's best governed democracies. Combined, they make up, roughly, 60 percent of the global GDP.

So, these countries rely on U.S. nuclear weapons for their security and it is also in the U.S. national interest to maintain geopolitical stability and these important regions and to prevent the spread of nuclear weapons as these countries don't need to build their own nuclear weapons, as they can rely on a U.S. nuclear deterrence.

So, the Biden administration has rightly made strengthening alliances and strengthening the rules-based international system a top priority of its foreign policy, and in order to do that, we are going to need a robust, modernized, and flexible nuclear force. U.S. nuclear weapons are a central pillar of the U.S. alliance network and the rules-based international system.

U.S. nuclear weapons are distinctive for a second reason. The United States, unlike other countries, practices so-called counterforce nuclear targeting. Other countries, such as China, we believe, in the event of a

nuclear war, would use their nuclear weapons against U.S. population centers, attempting to slaughter large numbers of innocent civilians.

The United States, on the other hand, practices counterforce targeting; only targeting legitimate military targets. And we do that for two reasons. One is legal and ethical. We want to abide by the law of armed conflict.

But the second reason is strategic. If an adversary were to decide to launch a nuclear attack, U.S. counterforce strategy could limit damage to the United States and its allies, saving millions of U.S. and allied lives. That has implications for U.S. force posture. A larger arsenal is needed for a counterforce strategy.

The third thing that is distinctive about U.S. nuclear strategy is we can afford it. Other countries like France and China, considered superpower arsenals in the past and decided that they just couldn't afford it. The United States has been blessed with the largest, most innovative economy since 1945 and has been able to field a robust nuclear force at a small fraction of its Defense budget.

So, in short, the United States asks more of its nuclear weapons than other countries, and so it makes sense that we require a more robust force. As President Kennedy put it in 1961, the United States needs a nuclear arsenal, quote, second to none.

The nuclear threat environment is deteriorating as you are heard in many hearings over the past several weeks. Autocratic revisionist countries, Russia, China, North Korea, are expanding and modernizing their arsenals. Russia is building battlefield and exotic nuclear weapons that are not constrained by New START, arguably giving Russia a quantitative and qualitative advantages over the United States. China is on pace to double, if not triple, or quadruple its nuclear arsenal over the coming decade. This means for the first time in U.S. history, it faces two distinct adversaries with meaningful nuclear capabilities. And then North Korea is on the verge of becoming only the third U.S. adversary with the ability to threaten nuclear war against the U.S. homeland.

So, the nuclear security environment is deteriorating. So, to deal with this challenge, the United States does need a robust, flexible, modernized force. It should continue the bipartisan modernization plans, started by President Obama, continued by President Trump. So, this means modernizing all three legs of the Triad: ICBMs, submarines, and bombers, the LRSO, NC3, and the underlying nuclear complex.

Also, the United States should continue with the supplemental capabilities called for in the 2018 Nuclear Posture Review, the low-yield, submarine-launch ballistic

missile, and the low-yield, submarine-launch cruise missile.

Now, some are arguing that the United States should delay or cut the plan modernization, but that would be a mistake. It would weaken U.S. nuclear deterrence. It would cause U.S. adversaries to question our resolve and it would cause U.S. allies to doubt our commitment to their security.

Instead, I would recommend that Congress ask DOD to study whether existing requirements or existing plans are sufficient to meet deterrence requirements or whether quantitative and qualitative enhancements may be necessary. It is hard to imagine that the program of record that was started in 2010 in a very different security environment, is still sufficient in 2021, as Russia, China, and others build up their nuclear capabilities.

So, in short, I think if the United States wanted to have a more isolationist foreign policy, pullback from its alliances, ignore international law, then it could afford to make deep cuts to its nuclear arsenal.

But so long as the United States wants to continue to play its international leadership role, support its allies, and uphold the rules-based international system, then it will continue to require a robust nuclear force.

Thank you, and I look forward to your questions.

Senator King: [Presiding.] Thank you, sir.

We will now have 5-minute rounds of questions and see

where the discussion takes us.

Let's just pick up where Mr. Kroeing left off. Mr. Collina, wouldn't our failure to modernize, given the age of the Minuteman or your view is we should abandon the ICBMs, wouldn't that, in itself, send a negative deterrent signal, if you will, to our adversaries?

Mr. Collina: Senator, thank you for the question.

Senator King: Turn your mike on, please. Thank you very much.

Mr. Collina: Senator, thank you for the question.

You know, when you look at deterrence, the basis of deterrence in my view is assured retaliation, that we must be able to retaliate to any nuclear strike that may come.

The land-based ballistic missiles, the ICBMs simply play no role in that. They are not an assured deterrent and here is why. If there were notice of an incoming attack, but that attack has not yet landed, that launch could turn out to be a false alarm. So, launching our ICBMs before that attack lands, we could be starting a nuclear war by mistake.

I think everyone would agree that would be a nightmare scenario that we would never want to be in, so we can't launch those ICBMs first. But you can't launch them second either, because if it is a real attack, then those ICBMs have been destroyed in the ground, because they are

vulnerable. They are immobile in silos.

So, there really is no use case for the ICBMs, in my opinion, but they are quite dangerous, because as long as they are there, any President would be attempted, might even be advised to launch those nuclear weapons in an alert situation where there may be an incoming attack.

Senator King: Well, because we know they are all targeted, the temptation is use it or lose it is --

Mr. Collina: That is exactly right.

And so, there is this built-in incentive once they are there, as they are there now, to use them before the attack arrives, but that raise the daunting prospect that we would start nuclear war by mistake. And, again, I think we want to agree or should all agree that that is not a scenario that we want to be a part of.

Senator King: Well, one of the arguments that I -- really, what you suggest is just vulnerability of the submarines. They are there.

My concern is we thought space wasn't normal, too, several years ago and now it is not and what if in 5, 10, 15 years from now, our adversaries figure out ways to track our submarines, then suddenly, they are not [inaudible] I worry about the perpetual [inaudible].

Mr. Collina: Senator, I agree with you that we need to worry about future threats to the submarine force. The

concerns about the subs becoming vulnerable as been a concern for decades. It hasn't happened yet, in part, because of the very capable research and development program that the Navy has to stay ahead of threats to submarines.

We need to keep doing that. We need to keep investing in RND for submarine survivability. At the same time, we are deploying a new generation of more stealthy submarines. So, on top of that, we have the bombers as a backup to that. So, I would say that we have three forms of insurance to the possible future vulnerability of submarines. Those three forms are enough.

And as I said, the ICBMs don't really provide any insurance because they are simply not usable in any of the scenarios that you can imagine.

Senator King: Let me ask a question, if any of you that want to jump on this. Why is China reluctant to the point of refusal to enter into any kind of nuclear talks? Apparently, they were invited. They didn't even want to observe the New START discussions with Russia.

Mr. Kroeing, any ideas on that?

Mr. Kroeing: Yes, I would be happy to answer that. I think part of it is a lack of history and experience with arms control. You know, we think of arms control as a broad category of policy instrument, but, essentially, it is really been an instrument used between the United States and

Russia.

So, I think there is some chance that over time, the Chinese could be brought into the arms-control fold, although it will be difficult. I think a second reason is Chinese strategic culture, the idea, I think in the West, we often think that transparency means security, being open, showing the Russians what we have, seeing what they have. I think for the Chinese, they see things very differently, that secrecy equals security, hiding capabilities.

And, you know, I am told that when some Chinese heard about the way we do New START inspections, they were shocked at this, that we allow Russians to come and look at our capabilities and vice-versa.

So, I think it will be difficult, but I think if arms control is to be meaningful in the 21st Century China will have to be brought in. It is not the 1970s anymore with the United States and Russia, and strategic forces is not the only adversary or the only types of capabilities we would like to control.

Senator King: Well, it may be as China reaches a more mature level of their nuclear force, then, perhaps, they will feel confident enough to enter into these discussions. I certainly hope so.

Senator Fischer?

Senator Fischer: Thank you, Senator King.

Dr. Kroeing, opponents of ICBM force often describe it as vulnerable; meanwhile, advocates point out that there is only one nation, Russia, that has the means to destroy it, and argue that it is contradictory to talk about something that could require as many as 800 Russian nuclear warheads to destroy as being vulnerable.

Can you describe the principal benefits of maintaining the Triad, and in particular, retaining the ICBM leg.

Mr. Kroeing: Yes, I would make a couple of points. First, there has been a bipartisan consensus since the 1960s with the United States regarding the Triad and the ICBMs. Even some national security officials who came in skeptical about the ICBMs, like Secretary Mattis, said once they have really looked at the problem, they realize that the United States does need ICBMs for deterrence.

And so, if you look at the 2018 Nuclear Posture Review, we set out four major goals of U.S. nuclear strategy: deterrence, assurance, hedging against an uncertain future, and achieving objectives if deterrence fails. And ICBMs, I think, are necessary for advancing all four of those goals. They strengthen deterrence. As you pointed out, it would be very difficult to disarm the U.S. ICBM force. Only Russia would have a hope of even trying that. It strengths assurance, and to Senator King's question to Mr. Collina, I have talked to allies who said that they are watching U.S.

modernization plans closely and they would see a scaling back of our program as contributing to their concerns about America's willingness to meet its alliance commitments. It helps us to hedge against an uncertain future. For some of the reasons that Chairman King mentioned, we can't be certain that we can rely on the survivability of the submarines. And they also help us to limit damage if deterrence fails by providing additional capabilities that the adversary would have to target before they could kill millions of Americans.

So, for all of those reasons, I think ICBMs are critical. The last point I would make, it is interesting that we have this debate in the United States, because if you look at other nuclear powers, the Russians, the Chinese, and the others, they see ICBMs as the mainstay of their deterrent, the most important leg, where in the United States, some think that they are expendable, but I do think they are critical for deterrence.

Senator Fischer: I am very concerned about staying on schedule for modernization of all of our platforms. So, as we look at this with the Triad and the importance that we place on each leg of that Triad, could you address bombers, specifically, and the fact that they are not armed and ready and what that does to the planning of different options that could be presented to the President.

Mr. Kroeing: Yes, that is a good question.

We often talk about how we have a Triad, but when you talk about capabilities that are actually ready and could be used promptly, it is only the ICBMs and the SLBMs. The bombers are not on a day-to-day alert.

And so I think all three legs bring unique characteristics to U.S. nuclear deterrence and, again, for decades, there has been a bipartisan consensus that all three legs are necessary for U.S. nuclear strategy.

Senator Fischer: Could you also address, sometimes ICBMs, it is referred to as being on a hair trigger. And we heard Mr. Collina talk about a President being able to make maybe an emotional decision, an irrational decision that would viewed by many as being irrational. By law, that can't happen.

Can you go through, step-by-step, how decisions are reached and what the options are, then, and who they come from when it is presented to the President.

Mr. Kroeing: Yeah, so when people say that ICBMs are on a hair-trigger alert, I think that is misleading, and when people talk about de-alerting ICBMs, really, what that means is physically removing warheads from the missiles and putting them somewhere else and to only be uploaded in a crisis or a war. And so, I think that doesn't make sense. It does make sense to keep the warhead mated.

This idea that the President would face a use-or-lose situation, I think there is actually a logical contradiction in those arguments because people say we should get rid of ICBMs so the President doesn't have to face this terrible "use it or lose it" decision, but if we can afford to get rid of ICBMs, then the President could afford to wait out the nuclear attack and that is an option available to the President. He could wait to ride out a nuclear attack.

On the other hand, if these capabilities are so important that the President might want to use them immediately in a crisis, then that also means that we can't afford to get rid of them. So, I think that these arguments that we can get rid of them because they are destabilizing, again, rests on a contradiction.

My view is that these are critical capabilities and, therefore, we should keep them.

Senator Fischer: Thank you.

Senator King: Senator Rounds?

Senator Rounds: Thank you, Mr. Chairman.

And thanks to all of our panelists today for visiting and taking time to come in and visit with us on this issue.

Ms. Gordon Hagerty, the National Nuclear Security Administration's 2022 budget is 28, the submission is $28 million less than the fiscal year 2021 request. From your experience as the former administrator of the NNSA, do you

believe this year's request contains sufficient funding to continue to bring the agency's infrastructure and capabilities into the 21st Century, and can you describe the consequences if the NNSA is denied full funding for addressing its deferred maintenance backlog.

Ms. Gordon Hagerty: Senator Rounds, in my previous capacity as administrator of the NNSA, we put together a very comprehensive 5-year national security plan known as the 5-year [inaudible]. And that started in 2021. That saw some significant growth over 18 percent or so budget overall and the Congress supported that budget, went forward with that for fiscal year 2021.

Part of that decision-making process was putting together what was called a zero-base budget. So, we relied on the expertise of the labs, plans, and sites, and headquarters experts to determine what the modernization program should be, given that we can't fund everything up front, but what were the internal priorities, what were the priorities for defense programs for nuclear nonproliferation, and for naval reactors.

Once that floor was supported, which was at the $19.8 billion budget for fiscal year 2021, the plan activity was to grow nominally 2.1 percent per year over year over year for the foreseeable future, vying any catastrophic issues. In fact, I will give you one. Last year, the NNSA,

throughout the summer during the pandemic, did not miss a delivery schedule to the Air Force or to the Navy, and worked through the pandemic. So, we asked at the time, as administrator, asked our workforce to continue to operate through the pandemic and they did so.

Now, we put certain priority or certain lesser priorities aside in order to execute the mission, the ongoing missions for the Air Force and Navy and made every delivery on time. And so, I would say that we had to reprioritize, and that is what they have done in the NNSA for larger programs.

I am concerned that, in my opinion, I am concerned that if it is not fully funded in all the different three areas of the NNSA's budget, either the personnel will be affected, as I mentioned in my opening statement, when budgets are cut, people are cut, and second of all, the modernization programs need to be supported fully. And I am not quite sure that the budget that was submitted for fiscal year 2022 does that. I believe Defense programs was fully funded. That is good, however, they took resources out of research and development and other critical areas.

So, I am very concerned that they are not paying attention to the priorities. And what happens, as what we have seen in the past, is once something slips to the right, if you will, everything slips, and it has impacts across the

entire enterprise. So, I am very concerned about that, yes.

Senator Rounds: Thank you.

Mr. Collina, I have to admit, your testimony to me was eye-opening and it is going to make it tough to sleep at night thinking that that might be a possibility as to what you are suggesting, and not so much the threat of nuclear war being accidental, but the thought that we would actually, seriously consider not doing a Triad.

I know that you indicated that you participated and authored a book in which you had analyzed, based on the Russian threat to the United States. How did you, in your book, address the issue of the China threat, which clearly is the focus today in terms of what we see over the next 20 to 25 years?

Mr. Collina: Thank you, Senator.

I think we definitely need to be concerned looking at China, where they are today and where they may go. But I think we have to keep it in perspective. The United States has over 10 times as many nuclear weapons as China does.

Yes, China may be increasing. They may or may not double their arsenal over the next decade; we will have to see.

Senator Rounds: May I just ask, where did you get the impression that we had that many more than the Chinese did, I am just curious.

Mr. Collina: It is just open-source information, Senator.

Senator Rounds: Thank you.

Mr. Collina: They have, roughly, 4,000 nuclear warheads --

Senator Rounds: Well, that is the reason why I asked. I want to know whether or not where the information was.

I am just curious, Mr. Kroeing, would you agree with the assessment that China is one that we should observe, but following along the lines as Mr. Collina suggested, one to be observed, but not necessarily the peer competitor that many of us see, and I don't mean to put words into Mr. Collina's mouth, but I think that is kind of, I think most of us see them as being the peer competitor for us in the next 10 to 25 years.

Mr. Kroeing: Yes, I do see China as the most significant national security threat to the United States and its allies, like the Trump administration did and like the Biden administration does. And I am quite concerned about the nuclear threat, as well, because Mr. Collina is referencing the entire size of the U.S. nuclear arsenal, including stockpile and other things, but if you look at deployed, strategic nuclear weapons, the United States has 1,550. The Russians also have 1,550. China, if it doubles, triples, or quadruples, then it becomes not quite a peer to

the United States, but it is getting closer.

And I am also concerned about the non-strategic nuclear advantages that Russia and China have in the theater. Russia has a large stockpile of non-strategic nuclear weapons. China has a large stockpile of intermediate, short, and medium-range missiles that they could use to deliver nuclear weapons against U.S. allies, bases, and forces in the region. And the United States' non-strategic nuclear capabilities are quite minimal.

So, I am worried about this buildup and I think the United States needs to think hard about deterrence with both, Russia and China together, which I think is a distinct challenge that we haven't fully faced before.

Senator Rounds: Thank you.

And Mr. Chairman, thank you. I just would point out that I think perhaps one of the most challenging things for us in this committee and perhaps as a Congress, is to be able to share appropriately how quickly China is making changes to their nuclear capabilities, and I suspect that is going to be one of the biggest changes we are going to have is how do you get that information out, because a lot of people are making assumptions based on information that may not be accurate.

Senator King: And we will continue to does this topic as we move along.

Senator Rosen, via Webex, please? There she is.

Senator Rosen: And our witnesses, of course, for being here to testify, as well.

And Ms. Gordon Hagerty, it is so good to see you again. It was a pleasure touring the Nevada National Security Site, I guess it was 2019, so not so long ago.

But the nuclear command and control and communications, or NC3 systems of the United States, are connected, of course, through a network of communications, data processing systems, and that potentially leaves us vulnerable to cyberattacks.

So, DOE's Inspector General's audit concluded in April that cybersecurity weaknesses persist throughout the Department's unclassified networks, including those of the NNSA or the Nevada National Security Site.

And so, Ms. Creedon and Ms. Gorton Hagerty, given that NNSA's networks were compromised by the SolarWinds attack in December, how concerned are you that strategic rivals of the United States may try to infiltrate and harm U.S. nuclear infrastructure and how can we make our systems there more resilient against cyber threats, whether it is proactive detection, analysis, mitigation of threats, incidents, and the like.

So, Ms. Creedon, you can go first, please.

Ms. Creedon: Thank you, Senator.

It is certainly confusing and troubling to look at the wide variety of capabilities that Russia and others have when it comes to cyber capabilities or at large, not just the SolarWinds, but also the Russian criminal adventures with Colonial Pipeline and also with the meat-packing facility.

The good news is that the classified networks of NNSA remained secure and it was the unclassified networks that were apparently penetrated, based on public reports.

The problem, though, as you mentioned going forward, is as we modernize our nuclear command and control systems across the board, not only at NNSA, but also at DOD, we have to be extraordinarily careful that we look at all the potential avenues for compromise, if you will, and that as we design these things, they have to be as flexible and they have to be as capable as possible, and they also have to be extraordinarily redundant.

So, those are the things that I would look for as you examine where the NC3 system goes in the future; ironically, a lot of the current NC3 system is so old that by the virtue of the fact that it is really old, although it is not terribly vulnerable to cyberattacks, but the flipside is that it is also very hard to maintain.

So, just keep in mind that we have to have these new capabilities and they have to be as good as we can make

them.

Senator Rosen: No, I understand about IT modernization.

Ms. Gordon Hagerty, do you want to speak to this?

Ms. Gordon Hagerty: Yeah, it is very nice to see you, too, Senator. Thank you.

I would agree with everything that Ms. Creedon said. We are constantly being attacked and penetrated by adversaries, whether they are internal crime syndicates or whether they are adversaries, China, Russia, and others, appearance and those attacks take place on a daily basis.

We need to be highly flexible. We need to put together a 21st Century and beyond cybersecurity capability. And I know Chairman King talked about it a couple of weeks ago, and it is disconcerting that we have systems that are somewhat antiquated, but we are moving as quickly as we possibly can, I believe.

We have to be ever-vigilant and have flexibility in terms of putting together a highly effective cybersecurity program, whether it is an NC3 or whether it is against classified systems. Great progress has been made over the last couple of years, but we need to be flexible in order to deal with incoming threats on a regular basis. Thank you.

Senator Rosen: Well, thank you.

And I want to stay with you, Ms. Gordon Hagerty,

because as the last NNSA administrator, you were responsible for ensuring the U.S. nuclear weapons stockpile remained safe, security, and reliable, without the use of underground nuclear weapons testing. I know we had a chance to talk about this a lot.

Part of that mission included, of course, conducting those subcritical and physics experiments at the Nevada National Security Site, combined with advances in nuclear modeling and these, of course, reduced the need for explosive testing, while ensuring the effectiveness of our nuclear stockpile.

So, can you speak to the importance of the Nevada National Security Site to the stewardship of our nuclear stockpile and the importance of upgrading the U1-A complex at the site?

Ms. Gordon Hagerty: Yes, I certainly will.

In my capacity as administrator, I had an opportunity to work very closely with all eight labs, plants, and sites, especially with the Nevada national security organization, which I still fondly call the Nevada test site.

Senator Rosen: Me, too.

Ms. Gordon Hagerty: For those of us who have been in the community for a long time, it is incredibly imperative to be able to retain the capabilities at not only U1-A, but throughout the entire Nevada National Security Site. It is

a single location throughout the United States where we can conduct unique testing, underground testing using subcritical experiments. It is where the NNSS a putting its enhanced subcritical capabilities for future testing and capabilities to ensure that our stockpile remains safe, security, and effective, in the absence of returning to underground explosive testing.

So, it is incredibly important that U1-A continue to be fully funded. The research and development programs that are being put in place, the ECSA and ECSE, and others at U1-A, should be completely supported.

In addition to that, many other programs are being supported at the NNSA, including counterterrorism programs, nonproliferation programs, arms control, and other incredibly important national security missions that need to have a location at which to conduct those activities and the NNSS is the perfect location at which to do that.

So, it is a vitally important element of the National Nuclear Security Administration and our entire national security complex throughout the United States Government.

Senator Rosen: Well, thank you. I appreciate that and all the work that you did with us in Nevada and I look forward to trying to be sure that we do our part to keep our nuclear stockpile safe. Thank you.

Senator King: Thank you, Senator.

Now, via Webex, Senator Warren.

Senator Warren: Thank you, Mr. Chairman.

And thank you for calling this hearing with a panel of witnesses that truly reflects the diversity of thought that exists within the community of nuclear policy experts. It is critical that our subcommittee hears this full range of views.

Just a few weeks ago, President Biden released his presidential budget request, which included more than $42 billion to modernize the United States' nuclear arsenal. The Congressional Budget Office estimates that these modernization efforts will cost taxpayers nearly $1.7 trillion over the next 30 years. That is a staggering amount of money.

But experts, and even former Defense secretaries have cast doubt on whether these investments will actually deter our adversaries and make us safer.

So, Dr. Weiner, you are an expert on deterrence and its intersection with nuclear modernization. Let me just ask you, will these levels of spending on very expensive nuclear weapons result in a significant improvement in the United States' strategic deterrence?

Ms. Weiner: So, thank you, Senator, very much for that question.

So, let me respond with what the U.S. military has said

about this. As I mentioned in my testimony in 2012, they concluded that the U.S. can meet all of its deterrence requirements with one-third fewer nuclear weapons. So, this would suggest that deterrence will not necessarily be improved with a modernization program.

I mean, no one should doubt that the U.S. arsenal has enough to achieve assured destruction of both, Russia and China, our two supposed main competitors. And any attempt to really improve upon this capability assumes that we can somehow micromanage deterrence, that we can tailor it for individual adversaries and situations, and that we can somehow magically predict when our deterrent will be challenged with what and how, but we can't. We can't predict the future of those things. We don't know who is going to challenge us how, when, and where, and the enemy always gets a vote.

So, the more nuanced our deterrent becomes, the higher the consequences if we are wrong about predicting that future. I think it is safer to actually assume the deterrence is robust is assured destruction, the assured destruction, which we currently have, and that modernization comes with additional costs; costs of instability, arms races, and the dangerous notion that somehow nuclear weapons are useful for more than deterring existential threats to the United States.

So, I would actually argue that modernization might make deterrence worse and less robust than it currently is.

Senator Warren: That is a very interesting perspective on this. You know, I keep thinking about this, and I think about it in connection with the kind of commitment we are making on dollars. You know, the number I was citing earlier, it is just a baseline number, and we see the cost of nuclear weapons programs over and over, balloon from their initial estimates with little or no accountability from Congress. The Government Accountability Office report concluded that NNSA's, quote, nuclear security budget materials do not align with the agency's modernization plans, end quote.

In other words, NNSA's modernization schedule is just unrealistic and likely to cause more than anticipated, and now you are injecting into this, it not only may not make us safer, it may actually be more destabilizing.

So, let me stick on the spending end of this a bit, but let me ask you, Dr. Weiner, do you believe that it is reasonable to expect that the United States will end up spending significantly more on nuclear modernization than what has already been estimated?

Ms. Weiner: I think it would be unrealistic to assume that we have seen the top price tag for this, and for some very good reasons. First of all, we don't modernize our

nuclear weapons every day and it is not like we can call, pick the box store of your choice and say, oh, I would like to please have a solid rocket motor for my new GBSD. I mean, these are unique systems. It is hard to anticipate the cost of something that we haven't made in a very long time.

But one thing we can anticipate is that we have a bad track record of bringing in projects on schedule and under budget or on budget. And so, one of the things I did in preparation for this hearing was to pick one program and say, if I use the history of that agency's management of major projects, in this case, it is NNSA, if I pick one program, which we are told is vital for nuclear modernization and I inflate the cost of that program, according to the past history of that agency's major projects, what do I get?

And so, the program I picked was pit production. So, originally, pit production was estimated to cost between 3 and just under $8 billion. The current estimates, which I think came out just quite recently, are between 11 and $18 billion. So, already a lot of going up there.

But I looked back at some of the other major programs on par with this sort of thing that NNSA has to do. So, UPF, the uranium processing facility, if pit production goes up as much as UPF did, and keep in mind, UPF, eventually, I

think it was Congress said you have to stop spending more money on this, but if pit production goes up as much as UPF, instead of spending 11 to 18 billion, we will be spending potentially $49 billion on pit production, the current plans.

If we use CMRR as our lodestone, the chemistry and metallurgy research and replacement facility, then we are talking about spending, in terms of costing inflation, about $53 billion on pit production, not 11 to 18.

Or if you want to pick the poster child for things that cost more than we thought they would, that would be MOX, and, again, the very building where we are going to put in a pit production facility at the Savannah River site, yes. So, we never finished MOX, but it went up from 1.4 billion to $28 billion. To my knowledge, there has never been, I don't think Congress has ever even done an investigation of what went wrong with the MOX project and why it went up that much.

Yeah, we are going to use the same facility for our pit production facility. So, if pit production goes up as much as MOX did, instead of 11 to 18 billion, we could be spending 66 to $150 billion on pit production.

Senator Warren: Wow. Thank you very much. I see that I am way over my time, so I will stop now.

I have other questions that I will submit about the

wisdom of giving just one person the sole authority to launch nuclear weapons.

But thank you for your indulgence, Mr. Chairman. I appreciate it and I appreciate your having this hearing, and I appreciate our witnesses being here.

Senator King: Thank you, Senator.

Senator Kelly?

Senator Kelly: Thank you, Mr. Chairman.

I want to, first of all, thank all of the witnesses to being here today. It is great to see all of you.

So, Secretary Austin has stated that nuclear deterrence is the Department of Defense's highest priority and that the nuclear Triad is the bedrock of our national defense. In years past, the United States and Russia engaged in a high-stakes nuclear arms race and today, new nations, such as China and North Korea, have rapidly advancing nuclear capabilities and Iran is heading in that direction.

So, Ms. Creedon, I want to get your thoughts on countering the threat from Iran. A nuclear Iran is a threat to Israel and to regional security, including U.S. interests. We can't accept it, yet in recent years, Iran has made advancements in their nuclear program.

Ms. Creedon, what are the best options available to stop Iran from getting a nuclear weapon and how do we enhance regional and U.S. security?

Ms. Creedon: Thank you, Senator.

The JCPOA, which was negotiated during the Obama administration, although it was not enduring for the long-term, what it did was it attacked the most problematic aspect of what was then the Iranian program and that was the enrichment of uranium. The decision was made during that JWPOA that these most dangerous things would be gone after first and then in time, as relationship improved, there was the possibility for further actions.

I personally believe that withdrawal from the JCPOA was a significant mistake. It set us back in terms of the capabilities of Iran. They have slowly reversed various aspects of that JCPOA, and so I hope that this administration, as it has begun to have new discussions with Iran and trying to do something that looks like getting back into the JCPOA, whatever that means at this point in time, is successful. The only way we are going to make sure that Iran doesn't develop nuclear weapons is through these diplomatic processes.

Senator Kelly: You know, my understanding, I think it has been reported that the Iranians have begun some time ago now after the last administration got out of the JCPOA, that they have begun flowing uranium gas into their centrifuges. So, the progress they have made since the agreement has ended, assuming we get to a new agreement, would you agree

that we have to figure out a way to get back to the capability or pre-ending the JCPOA agreement, and then how would we do that?

Ms. Creedon: So, absolutely, Senator.

And the mechanism for doing that was established in the JCPOA and even though the U.S. pulled out, that mechanism is still in place and that mechanism is having the International Atomic Energy Agency do very intrusive inspections of the various facilities in Iran.

So, interestingly, Iran had not pushed back on the IAEA in terms of its inspection. Obviously, there are issues associated with some of the inspections, but that regime, which is the most intrusive regime that the IAEA has with any country, needs to go forward and also to be strengthened, if possible, in any future negotiations amongst the various countries that are now re-engaging.

Senator Kelly: Thank you. And, Ms. Creedon, one more question for you. In a 2018 interview with Australia's Perth USAsia Centre, you mentioned three areas of concern regarding nuclear weapons in the Indo-Pacific region. I don't know if you recall this interview 3 years ago, but you mentioned risk of theft for terrorist use as a risk, accidental use, mistaken use.

How do we work with other nuclear nations to ensure that none of those concerns that you raised come to pass,

not only with our allies, but do we also do that with our adversaries?

Ms. Creedon: Thank you, Senator.

We had a very large and extensive program with Russia. There is a, it was larger, now smaller, effort with China to really focus on materials, because the materials are what are the hardest to get and, yet, the key element of some terrorist or anybody else getting nuclear weapons or nuclear explosive devices. So, focusing on these materials, making sure that the materials are secure, that there aren't excess materials roaming around, if you will, understanding how adversaries are manufacturing these materials, particularly North Korea, what are they doing, are they materials-secured; these are all things that we really have to focus on.

One of my historic worries has been, we have talked a lot about counterterrorism and nuclear terrorism and not when, but -- or not if, but when this might happen, and it hasn't happened. So, that is good fortune. It is the result of a lot of good work.

But now I sometimes worry that this concern has maybe dropped off the radar screen. I think that is a mistake if we don't continue to support and fund these counter-proliferation, proliferation prevention, and counter -- the interdiction programs, all of these programs that are geared

to making sure that the materials are secure and not falling into the hands of those that we don't want them to fall into. Thanks.

Senator Kelly: Thank you.

Senator King: Dr. Kroeing, you sat very patiently and listened to some arguments about why we shouldn't, didn't have to modernize, it would be too expensive.

Would you like to respond to those comments?

Mr. Kroeing: Yes, thank you for the opportunity, Senator.

The numbers for U.S. nuclear modernization are, indeed, large, but I think spending comes down to priorities and what are our priorities. And the U.S. Department of Defense has said that the nuclear deterrence is the most important mission of the U.S. Department of Defense.

And if you put those numbers in the context of the overall Defense budget, they are modest, in my view. Five percent of the U.S. Defense budget is what has been estimated for U.S. nuclear modernization.

And so, reasonable people can disagree, but I think that is a value --

Senator King: Isn't one of the problems that we are modernizing all three legs of the Triad at the same time?

I liken it to a budgetary pig in the python of the budget. We have the submarines, the new bomber, and the

modernization of the missiles, all coming within about a 5-to-10-year period, which is going to eventually tail off after those capital investments are made.

Isn't that, from a budgetary, point of view, isn't that so?

Mr. Kroeing: Yes, we face the spa wave of nuclear modernization, that is right. And so, I think it would have been better if we had started some of these programs in the past, but now we are nearing a place where these platforms are really nearing the end of their service life, and as others have testified, I think it would be dangerous to extend the service lives of these capabilities further. There are only so many times a submarine can go down and come back up without endangering the lives of the sailors.

Senator King: Let me pursue with you one of the questions that I think Mr. Collina raised that I think at least bears discussion, and that is the sole authority issue.

Richard Nixon was notoriously unstable toward the end of his period in the White House, heavy drinking, and then there was even a time when I think Secretary Schlesinger said, don't do anything that the President tells you without checking with me.

We are talking about civilization. We are not talking about a strategic strike on an arms depot. We are talking

about the fate of civilization.

And it is unlikely, as I have seen the various scenarios, that it is a bolt from the blue, where it has to be a momentary decision. Why not a system that says the President, the Secretary, the Chief Justice of the Supreme Court, and Speaker of the House, or some, you know, I just made that up, but some group of people to make this tremendous decision.

Because in many cases, as I say, it is not a matter of minutes; it could be hours or days. And so, the entire fate of the civilization is not resting in one person's hands, whoever it is, the President of the United States is a human like the rest of us. Give me some thoughts.

Mr. Kroeing: The first thing I would say is I think it is not quite accurate to say that the President has the sole authority. There would be other people involved. The order would have to go through at least one other military officer and then it would have to go down to the launch officer.

Senator King: But the only stoppage, I have been through this, the only backstop is illegal order. But I am old enough to remember the Saturday Night Massacre, where President Nixon went through three layers until he got somebody who would carry out his order. He fired three people until he got to Robert Bork.

So, that doesn't satisfy me because I am sure that any

President could eventually get to some colonel who would say, yes, sir, Mr. President.

Mr. Kroeing: So, the second thing I would say is I think there are scenarios where prompt use of U.S. nuclear weapons would be important and could save many lives. So, for example, if North Korea used a nuclear weapon against Seoul and was getting ready to use a second or a third, I don't think we would want to have a committee meeting to decide whether we should use U.S. capabilities, possibly nuclear weapons, to stop that attack from taking place.

So, I do think that promptness can be important for saving U.S. and allied lives in certain plausible scenarios.

Senator King: And not to put words in your mouth, but on this issue of cost, it also has to be weighed against the cost of being wrong, isn't that correct, which would be immeasurable.

Mr. Kroeing: That is right. Possibly World War III, nuclear war. And so, I think 5 percent of the Defense budget is a good value.

Obama's Secretary of Defense, Ash Carter, said nuclear weapons don't actually cost that much. Secretary Mattis, Trump's Secretary of Defense, said we can't afford national survival. So, it is a large number, but I think it is a good investment.

Senator King: Senator Kelly, do you have further

questions?

Senator Kelly: Well, just to follow-up on the Chairman's questions.

Don't we often think about this in terms of the first-strike capability compared to a response, if we detect a launch and we can verify that that is an incoming strike from one of our adversaries, that the decision tree could be, is there a scenario where you see that the decision matrix and the number of individuals involved is different in one case compared to the other?

Mr. Kroeing: So, just to make sure I understand, Senator, so, there may be some scenarios in which we would have a committee make a decision on nuclear use and others where we would want to have the President to have sole authority.

Senator Kelly: Yeah, I am not necessarily, I don't think we should get into the committee scenario, but maybe different options to maybe interrupt a decision based on what the scenario is.

Have you thought through that process?

Mr. Kroeing: Well, to be honest, it is not an issue that I have given a lot of attention to. My initial thought is that that could weaken a deterrence. The United States has never had a no-first-use policy.

Senator Kelly: Uh-huh.

Mr. Kroeing: We want our adversaries, especially the Russians, the Chinese, the North Koreans, if they are thinking about aggression against us or our allies, even non-nuclear aggression, to have the possibility that U.S. nuclear weapons could be used in the back of their mind, and so I think steps we take to complicate that process could give them more reassurance that they do not have to worry about U.S. nuclear weapons, that the process is too cumbersome, that it would be unlikely that they would be used. But it is an issue that I should give more thought to because I see that it is of interest to the committee.

Senator Kelly: Well, thank you.

Thank you, Mr. Chairman.

Senator King: -- you use something similar. The argument that I have heard to counter that, us undertaking a no-first-use or declaring a no-first-use policy is that it would undermine the confidence of our allies. Japan has been mentioned to the point where they may say, well, we can't really count on the American umbrella, therefore, we will develop our own nuclear capability, or South Korea, or another ally.

What is a response to that argument?

Mr. Collina: Thank you, Senator.

Well, first, let me say that I think a no-first-use policy would be very much in the U.S. national security

interest because there is no realistic scenario where the U.S. would want to start a nuclear war. I mean, think about it, why would we want to start a nuclear war, which is what first-use is.

No President has used nuclear weapons in 75 years, because they have seen no need to and simply don't want to do that. So, I think we have a de facto no-first-use policy today, it is just we are not getting the benefits for it.

And in terms of the allies, I fully understand that the allies who depend upon U.S. extended deterrence will be made nervous by a U.S. no-first-use policy, but I think we can address their concerns by reassuring them, because extended deterrence does not depend on first-use. Extended deterrence depends on assured retaliation.

What we are saying is, if you, our allies are attacked, we will be there for you. That is a retaliation promise; it is not a first-use promise. So, I think we need to sit down, and I fully understood that this requires a heavy-lift diplomatic effort, and a lot of damage was done in the Trump administration on the alliances, so I completely get that.

But the Biden administration needs to sit down, and in the Biden administration, it is being conceived as a sole-purpose question. That is the term that is being used there. But the Biden --

Senator King: Let me follow-up on that for a minute.

Mr. Collina: Yeah.

Senator King: Doesn't that, then, let North Korea off at hook, with regard to chemical and biological weapons?

Deterrence is in the mind of the adversary. Don't we want them nervous about, gee, if we use chemical weapons in a massive way, we could face a nuclear strike? You want to put your adversary in a quandary.

Mr. Collina: Senator, I think that is a great question.

I would say that we only want to make threats if they are credible. If the United States makes threats that are not credible, that undermines all our other threats that we make.

I do not perceive it as credible that the United States would start nuclear war with North Korea over a chemical or a biological weapons issue, because that opens us up to nuclear retaliation from North Korea, particularly, when we have conventional weapons that can handle that threat.

So, I would only want the United States to make threats that are credible, and to me, the first-use of nuclear weapons, something that we haven't done in 75 years and that would open us up to nuclear retaliation is a bad idea and is simply not a credible threat.

Senator King: Thank you.

Senator Sullivan, welcome.

Senator Sullivan: Thank you, Mr. Chairman.

And I want to compliment the chair on your active tenure and aggressive posture on all these hearings. I think they are great. I really do. So, thank you. It is really, really informative for everybody, including myself.

Senator King: I think this is one of the toughest challenges, intellectual and --

Senator Sullivan: All of these are tough.

Senator King: Yeah.

Senator Sullivan: So, I am going to ask you guys a tougher one, no, not a tougher one; a tough one, as well.

Dr. Kroeing, I will start with you, but maybe the others can jump in. So, we had a hearing in this subcommittee last week on missile defense and as you know, our ground-based missile interceptor program is primarily designed for a ROGUE nation, North Korea, Iran, and, you know, there have been some arguments about, oh, maybe we get rid of that, too.

I think that is a really bad idea, because then you assume that Kim Jong-un and the Ayatollah are irrational actors, which, I think there is a lot of debate about that, whether they want to go down in a flame of glory and fire off weapons.

But there was a broader issue that General VanHerck mentioned at the end of the hearing. We just started to

unpack it. It is really how does missile defense contribute to flexibility in our strategic deterrence?

And I don't think enough people think about that, but it is this idea that if you don't have any kind of missile defense, so let's say North Korea launches a nuke and all of a sudden we don't have missile defense and it is coming our way and we are like, oh, geez, now what do we do? I guess we have to retaliate.

So, now we fire one off towards Pyongyang and the Russians and the Chinese are like, what the hell is this coming? And all of a sudden, you have World War III because you had no strategic flexibility.

If North Korea launches a nuke towards us, we shoot it down. We say we are really mad. Maybe we retaliate, maybe we don't.

So, can you talk a little bit more about that strategic deterrence and flexibility that our missile defense system, although, only focused on ROGUE nations, admittedly, provides much more strategic deterrence at the great power level that a lot of people miss that.

Mr. Kroeing: Thank you, Senator.

I think that is correct, that missile defense does contribute to U.S. deterrence. Deterrence theorists distinguish between deterrence by retaliation and deterrence by denial, and missile defense is essentially a deterrence

by denial.

If North Korea thinks that it might be able to conduct a limited nuclear attack against the United States or Russia and China, the fact that we have missile defense complicates that calculation for them. It takes cheap shots off the table.

Senator Sullivan: And what about this idea of flexibility in our own strategic deterrence; meaning, we don't have to immediately go to a mad, kind of scenario with them that could draw in other countries who have massive arsenals.

Mr. Kroeing: That is an important point.

As well, if we didn't have missile defense and an adversary conducted a nuclear attack against the United States, I think it is almost certain that a U.S. President would have to retaliate.

With missile defense, it does provide options, as you point out. If we shot a missile down, I think it would reduce the pressure the President felt to retaliate with nuclear weapons. That is a good point.

Senator Sullivan: Thank you.

Let me ask Mr. Collina, I think I missed it, but I think Senator Rounds said the idea of removal of the ICBMs from the Triad keeps him up at night. It keeps me up at night, too.

So, were you the one advocating for that, and give me your best shot on it. You know, I am always trying to learn here, but it is highly unlikely you are going to convince me. I find the argument and notion almost irrationally irresponsible but give it your best shot. I just want to hear it.

I agree with Senator Rounds, that would keep me up at night, as well, but you are an expert, so what is your argument on that?

Mr. Collina: Well, Senator, I want to appreciate your question and your openness to hearing arguments that you may not be fully open to, but I really appreciate --

Senator Sullivan: I am not that open.

Mr. Collina: I appreciate it.

Senator Sullivan: Listen, I am kind of curious.

Mr. Collina: I appreciate the spirit in which you ask it. And here is how I would answer your question.

You know, there are two ways that you would use an ICBM, right; you would use it first or you would use it second. And let's look at those in turn.

If you use an ICBM first, and presumably, you are doing that because you think there is an attack coming at us, right, that there is warning of attack, and you use the ICBM first before that attack gets here, that could be a false alarm. And if that is a false alarm and you used the ICBM

first, we have just started nuclear war. To me, that is the ultimate nightmare. I think we can all agree that we want to avoid that situation. So, using ICBMs first is simply a bad idea.

Okay. So, you can use them second. Well, if that is a real attack and those weapons land, the ICBMs are gone. They are all in their holes, in their silos; they are vulnerable. So, if it is a real attack, the attack lands, presumably aimed at the ICBMs, because they are the main targets to go after, we don't have them available for second use.

So, you can't use them first. You can't use them second. What are they for?

At the same time, because they are there, they create this "use them or lose them" situation, where a President would have to at least consider the option and may even be advised to use them in a situation where there is a warning of an attack coming in, and that increases the possibility of us starting nuclear war by mistake.

So, from that perspective, you can't use them first. You can't use them second. But it creates the danger of us starting a nuclear war by mistake.

Senator King: And, in fact, we had some close calls in that regard, did we not?

Mr. Collina: We have had close calls. And the person

who I wrote the book with, former Secretary of Defense Bill Perry, lived through two false alarms when he was in the Pentagon and there were two incidents in 1979 and 1980 where there were reports that there were hundreds of ICBMs coming in from Russia. In one case, the warning went all the way up to the national security advisor, who was almost ready to call the President of the United States, at that time, President Carter, to say, Mr. President, there is a Russian attack coming in, what should we do? And at the last minute, it was determined that that was a false alarm.

So, we have had way more false alarms than we have had real attacks. And I would just add the cybersecurity element to all this. We are all aware that cyber threats are increasing. They are also increasing to our nuclear systems, to our command and control systems, to the point, I would submit, that a President, when getting an alert that there may be an attack coming in, has to assume that that attack is false until proven otherwise, not just because of the false alarms that we have had in the past, but because cyberattacks make additional false alarms more likely.

And we can't address those threats through cyber defenses. We can only address them through policy, and in my opinion, the policy has to be, assume the attack is false, until proven otherwise. That means you cannot launch ICBMs first.

Senator King: Senator Kelly?

Senator Kelly: So I, like Senator Sullivan, I am convinced, as well, but it sounds like, though, you could be advocating possibly for a bigger investment in the United States Navy.

I served in the Navy for 25 years and we don't have that first-use, second-use issue with our nuclear submarine deterrent.

Mr. Collina: That is quite right.

The submarines are a great example of a force that they are invulnerable when deployed at sea. You don't have the "use it or lose it" crisis in the way that we do in ICBMs. If an attack is coming in, you can wait out the attack, as horrible as that sounds, and see if it is a real attack. And if you know it is a real attack, then you can retaliate.

You know, people think that if there is a warning of an attack coming in, that we have to respond right away. In fact, an immediate response of ours does not stop the attack from coming in, right. If that is a real attack, it is going to land either way.

So, better to wait it out, see if it is real. If it is not real, your self-control has just saved the world. And if it is real, you still have the subs out in the oceans that can retaliate.

So, from my perspective, you know, it is a no-brainer.

You don't launch nuclear weapons on warning of attack.

Senator Sullivan: Who wants to rebut that argument?

Senator King: Go ahead, Dr. Kroeing.

Mr. Kroeing: Well, I disagree with my colleague. I think that there are situations when the United States might want to use ICBMs first and that it could also use ICBMs second.

So, the scenario that was painted was, we get, our sensors pick up evidence of an attack and then the President is trying to decide whether to respond. But I think this bolt out of the blue, Cold War scenario is unlikely, as many people have said today.

Rather, I think the greatest risk of nuclear war is major conflict, regionally, that escalates, and I think there are scenarios where Russia invades NATO allies, China invades or attacks allies in the region, maybe these use other unconventional weapons, where the United States would want to consider nuclear first-use. We do not have a no-first-use policy.

In addition, I think the United States might want to use nuclear weapons second and it could use ICBMs second. It is a robust force, 450 ICBM silos. To destroy all of those, Russia would have to use 900 nuclear weapons. There is no guarantee that they would succeed, so I think that ICBMs are survivable. It is not some easy target for an

adversary to take out. Only Russia could contemplate that. China and North Korea couldn't even, doesn't even have the capability to conduct that kind of attack.

And the idea that there is this "use it or lose it" problem, I think rests on a false dilemna, you know, a common, illogical fallacy. In the real world, there are a lot of choices, other than use and lose. You can negotiate, use conventional forces and other things.

So, I do think that, as I said earlier, that ICBMs are an important part of the U.S. nuclear arsenal. There has been a bipartisan consensus on that since the 1960s and they advance all four of the major goals of the U.S. nuclear policy outlined in the 2018 Nuclear Posture Review.

Senator King: Dr. Weiner, you had a thought?

Ms. Weiner: I just wanted to comment on the "use it or lose it" dilemna and the notion that in the middle of a crisis, a President would sit back and say, you know, there are other options than the one that I am being presented with. So, I have a research project that actually uses a virtual reality experience to duplicate just exactly this crisis, right. And so, you get to play the role of President. People are giving you all the advice you want and you have --

Senator King: That would really cause Sullivan to lose sleep.

[Laughter.]

Ms. Weiner: Come participate.

So, you know, you get all the information you want. You can ask anybody any question that you want. But the fact of the matter is there is someone reminding you that you have 15 minutes or less to make a choice; otherwise, those ICBMs could be gone. They are a valuable military asset, and so you have to consider that.

There is also someone reminding you that you probably really want to leave the White House pretty quickly, because we don't know what else is out there, so you may have to leave.

There is also the fact that, based upon my research, only one President of the United States ever actually participated in these drills when they were asked to. Everybody else sent a delegate, somebody else. And so, you may have the President of the United States in this crisis, the clock is ticking, trying to figure out what to do. Keep in mind, there is a huge amount of uncertainty, right; you don't have perfect intel at that point.

And so, the President is trying to make a decision about what to do and they may never have practiced what it is like to be involved in a nuclear crisis, adding the fact that deterrence on the one hand assumes you are the rational decision-maker. You can sit back, you can say, okay, this

is what uncertainty tells me. I am weighing the pros and the cons. Here is the rational choice.

And then there is a huge literature from every foreign policy crisis that we have examined from behavioral economics or behavioral psychology, all of which agree, you are not going to be rational. The disagreement is about which particular irrational bias, which all people have in terms of decision-making, the disagreement is about which irrational bias is going to govern your behavior in that crisis, not that you are going to be rational.

Senator King: I find it shocking that only one President in the nuclear age has physically participated in one of these exercises.

I participated in one in the [inaudible] 4 or 5 years ago and it was a stunning experience and I just, I think you would want some experience in what that situation would be like. So, I do find that shocking.

I want to thank all of you. This has been a very stimulating discussion.

I mentioned in my opening statement about my thesis. When I mentioned it to General Richards of STRATCOM, he said he was going to put CIA on the case to find it. As far as I know, it hasn't been found. I hope it is never found.

But the other thing I want to do, this has been a very good hearing. I am sure all of you had places where you

wanted to jump in.

File some supplemental testimony, if you would, if you feel so moved, to amplify some of the points that you made or to rebut some of the points that you heard.

We are wrestling with enormously important issues here, trying to find our way toward what the best policy for this country is and I, again, appreciate your participation.

Thank you to our senators and those who joined us by Webex.

Senator Sullivan, you are prepared? Senator Kelly?

Thank you. The hearing is adjourned.

[Whereupon, at 6:09 p.m., the hearing was adjourned.]