DOE MODERNIZATION: LEGISLATION ADDRESSING DEVELOPMENT, REGULATION, AND COMPETITIVENESS OF ADVANCED NUCLEAR ENERGY TECHNOLOGIES

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY

OF THE

COMMITTEE ON ENERGY AND COMMERCE

HOUSE OF REPRESENTATIVES

ONE HUNDRED FIFTEENTH CONGRESS

SECOND SESSION

MAY 22, 2018

Serial No. 115–132

Printed for the use of the Committee on Energy and Commerce
energycommerce.house.gov

U.S. GOVERNMENT PUBLISHING OFFICE
33–420 PDF WASHINGTON : 2019

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C O N T E N T S

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TUESDAY, MAY 22, 2018

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:04 a.m., in room 2123, Rayburn House Office Building, Hon. Fred Upton (chairman of the subcommittee) presiding.

Members present: Representatives Upton, Barton, Shimkus, Latta, Harper, McKinley, Kinzinger, Griffith, Johnson, Long, Bucshon, Flores, Mullin, Hudson, Walberg, Duncan, Walden (ex officio), Rush, McNerney, Peters, Green, Doyle, Castor, Welch, Tonko, Loebsack, Schrader, Kennedy, and Pallone (ex officio).

Staff present: Mike Bloomquist, Staff Director; Samantha Bopp, Staff Assistant; Daniel Butler, Staff Assistant; Kelly Collins, Legislative Clerk, Energy/Environment; Margaret Tucker Fogarty, Staff Assistant; Adam Fromm, Director of Outreach and Coalitions; Jordan Haverly, Policy Coordinator, Environment; Milly Lothian, Press Assistant and Digital Coordinator; Mary Martin, Chief Counsel, Energy/Environment; Drew McDowell, Executive Assistant; Brandon Mooney, Deputy Chief Counsel, Energy; Mark Ratner, Policy Coordinator; Peter Spencer, Senior Professional Staff Member, Energy; Austin Stonebraker, Press Assistant; Hamlin Wade, Special Advisor for External Affairs; Everett Winnick, Director of Information Technology; Andy Zach, Senior Professional Staff Member, Environment; Priscilla Barbour, Minority Energy Fellow; Jeff Carroll, Minority Staff Director; Rick Kessler, Minority Senior Advisor and Staff Director, Energy and Environment; John Marshall, Minority Policy Coordinator; Alexander Ratner, Minority Policy Analyst; Andrew Souvall, Minority Director of Communications, Member Services, and Outreach; Tuley Wright, Minority Energy and Environment Policy Advisor; and C.J. Young, Minority Press Secretary.

OPENING STATEMENT OF HON. FRED UPTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. UPTON. Good morning, everybody. Sorry I am a few minutes late. Good morning. And welcome to our hearing to discuss four

very important legislative proposals to address and advance our Nation's nuclear energy policy.

You know, as we have heard throughout Congress, our Nation's international nuclear leadership is eroding. Last week, a report by Bloomberg New Energy Finance found that nearly a quarter of our Nation's fleet of nuclear power reactors are at risk of early closure in the next couple of years.

These 24 at-risk reactors total over 6 percent of the total electricity generated in the U.S., about how much electricity is consumed in Michigan and Illinois combined. And if we are going to get serious about an all-of-the-above energy strategy and the value of a diverse, clean energy portfolio, the implications of this threat cannot be ignored.

The decision to close a nuclear power plant is irreversible. We know that. Reactors cannot be re-licensed to produce power once they cease operation. And if the projected retirement of nuclear energy is realized, the fleet's significant loss will lead to a ripple effect throughout the nuclear supply chain.

Fuel cycle facilities that underpin both commercial and national security needs lose critical capacity. And technology services that provide world-class simulation to modernize and maximize nuclear safety will look to other global markets that have growth potential. The next generation of nuclear engineering and scientists would dry up as educational institutions can no longer continue to support the necessary facilities and programs. International leaders in the nuclear field made clear, made clear to this subcommittee a couple months ago that these cumulative repercussions will weaken our national security standing and, if it continues, would require a generation of sustained Federal commitment to rebuild.

I don't cede that the outcome is inevitable. The thoughtful proposals that we are going to examine today provide directed solutions to address these multifaceted challenges.

H.R. 1320, sponsored by Representatives Kinzinger and Doyle, brings budgetary discipline to the NRC and improves transparency and predictability for civilian nuclear companies. Under current statutory requirements, the NRC recovers about 90 percent of its total budget from NRC licensees. As a result, my Southwest Michigan ratepayers help fund the NRC to regulate, license, and oversee the commercial nuclear industry. The Kinzinger-Doyle bill also lays out basic expectations that align with the NRC's established tradition of adhering to the organization's Principles of Good Regulation.

Congressman Johnson's discussion draft discusses the global competitive challenges for the nuclear supplier community. When provided a level playing field, I am confident American know-how and technological leadership is the best in the world. However, nuclear companies backed by foreign governments, which don't necessarily share our values, artificially subsidize our competition. The motivation behind these actions is clear. Mr. Johnson's bill will improve the ability of our companies to compete, and win, in international markets.

Imagine designing a new car that is cheaper, safer, and gets triple the fuel mileage from anything that we see on the road today, but when the vehicle is ready to hit the road, there is just no gas to fill up the tank. Nuclear innovators face just that challenge.

Advanced nuclear technologies offer a wealth of promising benefits. However, for these designs to become reality, a certain amount of advanced nuclear fuel must be available for the first movers. Congressman Flores' legislation helps address this obstacle by directing DOE to undertake specific actions to provide what is known as high-assay low-enriched uranium. The time to begin addressing this problem is now in order to have the advanced fuel available when it is needed.

The fourth bill, bipartisan legislation from Congressmen Hudson, Peters, Wilson, and Norcross, directs the Secretary of Energy to identify the key components for a pilot program that could capture the energy security benefits of future nuclear technologies to support critical national security infrastructure.

This morning we are going to hear from the Department Energy on the first panel, including the Office of Nuclear Energy and NNSA. We are also going to hear several expert perspectives on the second panel.

I look forward to that discussion, and at this point would yield to the ranking member of the subcommittee, Mr. Rush from Illinois.

[The proposed legislation appears at the conclusion of the hearing.]

[The prepared statement of Mr. Upton follows:]

PREPARED STATEMENT OF HON. FRED UPTON

Good morning and welcome to our hearing to discuss four important legislative proposals to address and advance our Nation's nuclear energy policy.

As we have heard throughout Congress, our Nation's international nuclear leadership is eroding. Just last week, a report by Bloomberg New Energy Finance found that nearly a quarter of our Nation's fleet of nuclear power reactors are at risk of early closure in the next few years.

These 24 at-risk reactors total over 6 percent of the total electricity generated in the United States, about how much electricity is consumed in Michigan and Illinois combined. If we are serious about an all-of-the-above energy strategy and the value of a diverse, clean energy portfolio, the implications of this threat cannot be ignored.

The decision to close a nuclear power plant is irreversible. Reactors cannot be relicensed to produce power once they cease operation. If the projected retirement of nuclear energy is realized, the fleet's significant loss will lead to a ripple effect throughout the nuclear supply chain.

Fuel cycle facilities, that underpin both commercial and national security needs, lose critical capacity. Technology services that provide world-class simulation to maximize nuclear safety will look to other global markets that have growth potential. The next generation of nuclear engineering and scientists would dry up as educational institutions can no longer continue to support the necessary facilities and programs. International leaders in the nuclear field made clear to this subcommittee in February, these cumulative repercussions will weaken our national security standing and, if it continues, would require a generation of sustained Federal commitment to rebuild.

But I do not yet cede that outcome as inevitable. The thoughtful proposals we will examine today provide directed solutions to address these multifaceted challenges.

H.R. 1320, sponsored by Representatives Kinzinger and Doyle, brings budgetary discipline to the Nuclear Regulatory Commission (NRC) and improves transparency and predictability for civilian nuclear companies. Under current statutory requirements, the NRC recovers about 90 percent of its total budget from NRC licensees. As a result, my Southwestern Michigan ratepayers help fund NRC to regulate, license, and oversee the commercial nuclear industry. The Kinzinger-Doyle bill also lays out basic expectations that align with NRC's established tradition of adhering to the organization's Principles of Good Regulation.

Congressman Johnson's discussion draft addresses the global competitive challenges for the nuclear supplier community. When provided a level playing field, I am confident American know-how and technological leadership is the best in the

world. However, nuclear companies backed by foreign governments, which don't necessarily share our American values, artificially subsidize our competition. The motivation behind these actions is clear. Our adversaries seek to establish 50-year, or longer, geostrategic relationships. Mr. Johnson's bill will improve the ability of our companies to compete, and win, in international markets.

Imagine designing a new car that is cheaper, safer, and gets triple the fuel mileage from anything we see on the road today. But when the vehicle is ready to hit the road, there is no gas to fill up the tank. Nuclear innovators face just that challenge.

Advanced nuclear technologies offer a wealth of promising benefits. However, for these designs to become reality, a certain amount of advanced nuclear fuel must be available for the first movers. Congressman Flores' legislation helps address this obstacle by directing DOE to undertake specific actions to provide what is known as high-assay low-enriched uranium. The time to begin addressing this problem is now in order to have the advanced fuel available when needed.

The fourth bill, the bipartisan legislation from Congressmen Hudson, Peters, Wilson, and Norcross, directs the Secretary of Energy to identify the key components for a pilot program that could capture the energy security benefits of future nuclear technologies to support critical national security infrastructure.

This morning we will here from the Department of Energy on the first panel, including from the office of Nuclear Energy and the NNSA. We will also hear several expert perspectives on the second panel. I look forward to the discussion and working with my colleagues on both sides of the aisle to advance these important bipartisan bills.

I look forward to the feedback the two panels of expert witnesses will provide this morning, as well as working with my colleagues on both sides of the aisle to advance these important bipartisan bills.

OPENING STATEMENT OF HON. BOBBY L. RUSH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Mr. RUSH. Well, thank you, Mr. Chairman. Mr. Chairman, thank you so much for holding this important hearing today on legislation addressing the development, regulation, and competitiveness of advanced nuclear technologies.

As I have said many times before, Mr. Chairman, I subscribe to an all-of-the-above energy portfolio, even as we move towards a low carbon energy economy. I have also stated on many occasions that I believe nuclear energy must play a vital role as a source of safe, reliable, low carbon power that can help us meet the energy and environmental needs of the 21st Century.

I look forward to working with the majority as we proceed through regular order. And I believe that we may be able to come to a strong, bipartisan agreement on most, if not all of these bills.

Today, Mr. Chairman, I support the discussion draft offered by Mr. Flores of Texas which would simply direct the Secretary of Energy to establish a program to support the availability of high-assay low-enriched uranium, or HA–LEU, for commercial use. We have learned that there are several companies looking to design and license advanced nuclear reactor technologies utilizing uranium-235 isotopes enriched at levels greater than 5 percent and less than 20 percent. Some of these companies identified significant challenges associated with assessing HA–LEU.

And I believe Mr. Flores' discussion draft will address some of these concerns and make HA–LEU more accessible with the right safeguards. Also, I support, Mr. Chairman, that the discussion draft offered by a group of bipartisan Members, including two from this subcommittee, Mr. Hudson of North Carolina, and Mr. Peters of California. This bill would require the Secretary of Energy to de-

velop a report on a pilot program to site, construct, and operate microreactors at critical national security locations.

Mr. Chairman, I am also inclined to support some of the objectives of H.R. 1320, which will amend the NRC fee recovery process associated with the advanced reactor regulatory framework, while also limiting internal funds available for corporate support costs and capping fees on operating reactors.

However, Mr. Chairman, I do have some concerns regarding the bill's provisions essentially repealing licensing assistance to foreign governments. Also want to better understand verification of repealing requirements for mandatory hearing while also implementing specific time lines to review environmental impact statements and how these changes might impact public input.

Finally, Mr. Chairman, I also look forward to engaging today's witnesses on the discussion draft sponsored by Mr. Johnson of Ohio. This bill would, among other things, revise DOE's review of Part 810 process by expediting procedures for transferring civilian nuclear technology, including to foreign powers. Mr. Chairman, this proposal comes against the background of the current administration's decision to renege on the U.S. commitment in the Iran deal while also moving forward on potential talks with North Korea's volatile dictator on denuclearization issues.

So I look forward to hearing today's distinguished panel on both the timing and the necessity of this legislation, as well as identifying possible unintended consequences.

I want to thank you, Mr. Chairman, and I yield back the balance of my time.

[The prepared statement of Mr. Rush follows:]

PREPARED STATEMENT OF HON. BOBBY L. RUSH

I want to thank you, Mr. Chairman, for holding this important hearing today on legislation addressing the development, regulation, and competitiveness of advanced nuclear technologies.

Mr. Chairman, as I have stated many times before, I subscribe to an all-of-the-above energy portfolio, even as we move towards a low-carbon energy economy.

I have also stated on many occasions that I believe nuclear energy must play a vital role as a source of safe, reliable, low-carbon power that can help us meet both the energy and environmental needs of the 21st Century.

Mr. Chairman, I look forward to working with the majority as we proceed through regular order and I believe we may be able to come to a strong bipartisan agreement on most, if not all of those bills.

Today, I support the discussion draft, authored by Rep. Flores of Texas, which would simply direct the Secretary of Energy to establish a program to support the availability of high-assay low-enriched uranium, or HA–LEU, for commercial use.

We have learned that there are several companies looking to design and license advanced nuclear reactor technologies utilizing uranium-235 isotopes enriched at levels greater than 5 percent and less than 20 percent.

Some of these companies identified significant challenges associated with accessing HA–LEU and I believe Mr. Flores' discussion draft would address some of these concerns and make HA–LEU more accessible with the right safeguards.

I also support the discussion draft authored by a group of bipartisan Members, including two from this subcommittee, Mr. Hudson of North Carolina and Mr. Peters of California.

This bill would require the Secretary of Energy to develop a report on a pilot program to site, construct, and operate microreactors at critical national security locations.

Mr. Chairman, I am also inclined to support some of the objectives of HR 1320, which would amend the NRC's fee recovery process associated with the advanced

reactor regulatory framework, while also limiting the total funds available for corporate support costs, and capping fees on operating reactors.

However, I have some concerns regarding the bills' provision potentially repealing licensing restrictions to foreign governments.

I also want to better understand the implications of repealing requirements for mandatory hearings, while also implementing specific timelines to review final environmental impact statements and how that might impact public input.

Finally, Mr. Chairman, I also look forward to engaging today's witnesses on the discussion draft sponsored by Mr. Johnson of Ohio.

This bill would, among other things, revise DOE's review of the Part 810 process by expediting procedures for transferring civilian nuclear technology, including to foreign powers.

Mr. Chairman, this proposal comes against the backdrop of the current administration's decision to renege on the U.S. commitment in the Iran Deal, while also moving forward on potential talks with North Korea's volatile dictator on denuclearization issues.

So, I look forward to engaging today's distinguished panelists on both the timing and necessity of this legislation, as well as identifying possible unintended consequences.

Thank you, Mr. Chairman, and with that I yield back the balance of my time.

Mr. UPTON. The Chair recognizes for an opening statement the chair of the full committee, the gentleman from Oregon.

OPENING STATEMENT OF HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Mr. WALDEN. Good morning, Mr. Chairman. Thanks for holding this hearing. This really represents an important component of our Department of Energy effort at modernization.

The bills we will examine today provide key ingredients to enhance a core national security and energy security mission for the Department, and of the Nation: promoting the safe and peaceful use of nuclear technology. It is really important.

Congress first authorized the commercial application of atomic energy in 1954, when it declared the, and I quote, "development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise." That policy remains as relevant today and as important as ever.

By any measure, atomic energy has already brought tremendous benefits to the Nation; it has provided a baseload, emissions-free source of electricity that has powered homes and industry over the last half a century. It has provided an infrastructure for our national and international security, from the technologies and fuels for our nuclear navy to the safety and security for civilian nuclear power the world over.

However, as everyone on this panel knows well, a confluence of factors—abundant natural gas, power market designs, economic and regulatory burdens—have inhibited the Nation's nuclear energy over the past decade. The challenge confronting policymakers is how to preserve the beneficial use of atomic energy for future generations. Thoughtful, targeted legislative proposals today I think are a really good start.

The bipartisan bill from Representatives Kinzinger and Doyle establishes reasonable and predictable time frames for regulatory decisions so companies like Oregon-based Nuscale Power can develop business plans to commercialize new nuclear technologies, while also protecting future consumers from high regulatory costs.

The many regulatory requirements imposed by the Federal Government on special nuclear material are understandable due to the risk associated with unsecured radioactive sources, but this presents barriers to new market entrants, too. Congressman Flores' discussion draft will spur innovation by providing a solution to advanced nuclear fuel needs.

And the bipartisan discussion draft from E&C members Hudson and Peters and two members of the Armed Services Committee, Congressmen Wilson and Norcross, will help identify specific national security applications to capture the benefits of transformational nuclear reactor designs. For example, Idaho National Laboratory's remote location and critical defense programs may be an ideal location to construct and operate a resilient nuclear reactor.

And lastly, Congressman Johnson's discussion draft will help reduce barriers to competition facing our domestic manufacturing, vendors, and nuclear service companies. This is a critical conversation for this subcommittee and one we must not shy away from.

This morning's witnesses bring both extensive experience in public service and business acumen. And we thank you both for being here.

I want to welcome Dr. Brent Park, the recently confirmed Deputy Administrator for Defense Nonproliferation at the National Nuclear Security Administration. Dr. Park is responsible for critical national security programs that keep America safe. Dr. Park is joined on the first panel by Ed McGinnis from DOE's Office of Nuclear Energy. So we appreciate your being here.

And the second panel this morning includes Melissa Mann, the president of URENCO, USA. URENCO is the only domestically located, NRC-licensed facility to enrich uranium for commercial use. Ms. Mann brings a wealth of insight to this discussion on behalf of the U.S. nuclear supply chain industry.

And Southern Nuclear has assumed the leadership mantle on behalf of utilities to assess and develop advanced nuclear reactor designs. Nick Irvin leads those efforts for Southern Company and offers a hands-on testimonial of the rigorous process underway across the country to seek regulatory approval for promising first-of-its-kind technologies.

I also want to welcome back Jeff Merrifield, who has testified in this room many times, going back to his tenure as an NRC Commissioner. He is now practicing law with a focus on advanced nuclear reactors and strategic counsel to energy companies. Jeff provides an abundance of experience to inform today's discussions.

There remains tremendous promise for America's nuclear technology. And we can ensure that promise through legislative reforms reflective of our committee priorities to put consumers first, advance innovation, protect national security, and spur competition. I believe the four bills today align with those priorities.

So I look forward to and thank our Members on both sides of the aisle for coming together for these initiatives. And I would be remiss if I didn't also thank the committee, and especially Mr. Shimkus, for the effort to get a permanent and interim nuclear waste storage facility up and running. He and I won the pool on the vote count in the House. We both independently predicted 340 votes

would be achieved, and that was the number. Now we just need, you know, 100 in the Senate. Maybe 98 would do.

So, with that, Mr. Chairman, we remain committed to moving forward on this energy front. And I return the balance of my time.

[The prepared statement of Mr. Walden follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

Today's Energy Subcommittee legislative hearing represents an important component of our DOE modernization efforts.

The bills we will examine provide key ingredients to enhance a core national security and energy security mission of the Department, and of the Nation: promoting the safe and peaceful use of nuclear technology.

When Congress first authorized the commercial application of atomic energy in 1954, it declared: the "development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise."

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The challenge confronting policymakers is how to preserve the beneficial use of atomic energy for future generations. Today's thoughtful, targeted legislative proposals are a good start.

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There remains tremendous promise for American nuclear technology; and we can ensure that promise through legislative reforms, reflective of our committee priorities to put consumers first, advance innovation, protect national security, and spur competition. The four bills today align with those priorities.

I appreciate the bipartisan leadership from Members on this topic and look forward to moving these important bills forward.

Mr. UPTON. The Chair would recognize the ranking member of the full committee, Mr. Pallone, for an opening statement.

OPENING STATEMENT OF HON. FRANK PALLONE, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. PALLONE. Thank you, Mr. Chairman.

Today's hearing will examine four bills addressing a range of topics relating to advanced nuclear energy technology. H.R. 1320, the Nuclear Utilization of Keynote Energy Act, introduced by Representatives Kinzinger and Doyle, builds upon a discussion draft that this subcommittee reviewed in 2016.

H.R. 1320 makes several major changes to the Nuclear Regulatory Commission's budgeting process and fee structure. The bill caps corporate support costs at the Commission and puts a ceiling on the fee charged to each nuclear reactor. I appreciate the financial strain the nuclear industry is facing and the carbon free energy it provides, however, I am concerned that these budgetary changes could arbitrarily limit the resources the NRC needs and adversely affect its ability to do its job.

I also have questions about Section 7 of the bill which sets up an expedited time line for review of nuclear reactors at the NRC. The bill provides 24 months to complete a draft environmental impact statement and 42 months to complete the technical review process. Inflexible deadlines could jeopardize the environmental and safety review process for more complex applications.

And I am also concerned with the provision in the section that requires NRC issue a construction permit to a nuclear facility even if an entity has filed a formal request for a hearing objecting to the project. Stakeholders should have the chance to voice their concerns publicly before a project permit is issued.

But despite my issues with those sections of the bill, I am supportive of setting a deadline for the NRC to finish its decommissioning rulemaking and removing advanced nuclear reactor work at NRC from the fee recovery requirement. I look forward to work with my colleagues on this bill as we move forward in the process.

The committee will also review a discussion draft from Representative Johnson that makes changes to the process by which the Secretary of Energy authorizes the transfer of unclassified nuclear energy technology and assistance to foreign countries. This is known as the Part 810 process. I appreciate that this process must function well for the U.S. to remain competitive in the commercial nuclear space, but the bill establishes a 30-day time frame for the Secretary to approve the transfer of certain low proliferation risk

nuclear technologies to countries that are not nuclear weapon states.

Unfortunately, President Trump has put us on the path to upend the current dynamic of nuclear weapons proliferation across the globe. The President has walked away from the Iran deal. And now Saudi Arabia has said that if Iran restarts its nuclear program Saudi Arabia will itself pursue building nuclear weapons. And I am uncomfortable with expediting the review process of Part 810 at a time when there is so much global uncertainty on nuclear proliferation. This is not the right time to address this issue.

Next, the committee will consider a discussion draft from Representative Flores to accelerate the availability of high-assay low-enriched uranium. This is the fuel needed for most advanced nuclear reactor designs. It is not commercially available today. In order to ensure the fuel is available for advanced reactors once they are licensed and ready to begin producing electricity, the Federal Government will need to coordinate efforts within agencies and with the commercial nuclear sector. This is a worthy effort, and I look forward to working with the majority on this proposal.

And last, we have a discussion draft that directs the Departments of Energy and Defense to develop a report evaluating the resiliency benefits of siting microreactors at critical DOE and DoD infrastructure sites. I believe this report will provide the committee with valuable information, and commend Representatives Peters and Hudson, as well as my New Jersey colleague, Representative Norcross, for taking up this important issue.

But finally, I want to thank, I do want to thank Priscilla Barbour, who has provided invaluable support over the last year as an energy fellow on the minority committee staff. Priscilla is finishing her fellowship tomorrow, and I wish her well on her future endeavors.

[The prepared statement of Mr. Pallone follows:]

PREPARED STATEMENT OF HON. FRANK PALLONE, JR.

Today's hearing will examine four bills addressing a range of topics relating to advanced nuclear energy technologies.

H.R. 1320, the Nuclear Utilization of Keynote Energy Act, introduced by Representatives Kinzinger and Doyle, builds upon a discussion draft that this subcommittee reviewed in 2016. H.R. 1320 makes several major changes to the Nuclear Regulatory Commission's (NRC) budgeting process and fee structure. The bill caps corporate support costs at the Commission and puts a ceiling on the fee charged to each nuclear reactor. I appreciate the financial strain the nuclear industry is facing and the carbon-free energy it provides. However, I am concerned that these budgetary changes could arbitrarily limit the resources the NRC needs and adversely affect its ability to do its job.

I also have questions about section 7 of the bill, which sets up an expedited timeline for review of nuclear reactors at the NRC. The bill provides 24 months to complete a draft environmental impact statement and 42 months to complete the technical review process. Inflexible deadlines could jeopardize the environmental and safety review process for more complex applications. I am also concerned with a provision in this section that requires NRC to issue a construction permit for a nuclear facility even if an entity has filed a formal request for a hearing objecting to the project. Stakeholders should have the chance to voice their concerns publicly before a project permit is issued.

Despite my issues with those sections of the bill, I am supportive of setting a deadline for the NRC to finish its decommissioning rulemaking and removing advanced nuclear reactor work at NRC from the fee recovery requirement. I look forward to working with my colleagues on this bill as we move forward in the process.

The committee will also review a discussion draft from Rep. Johnson that makes changes to the process by which the Secretary of Energy authorizes the transfer of unclassified nuclear energy technology and assistance to foreign countries. This is known as the Part 810 process. I appreciate that this process must function well for the U.S. to remain competitive in the commercial nuclear space. But, the bill establishes a 30-day time frame for the Secretary to approve the transfer of certain "low proliferation risk" nuclear technologies to countries that are not nuclear weapons states.

Unfortunately, President Trump has put us on the path to upend the current dynamic of nuclear weapons proliferation across the globe. The President has walked away from the Iran deal, and now Saudi Arabia has said that if Iran restarts its nuclear program, Saudi Arabia will itself pursue building nuclear weapons. I am uncomfortable with expediting the review process for Part 810 at a time when there is so much global uncertainty on nuclear proliferation. This is not the right time to address this issue.

Next, the committee will consider a discussion draft from Rep. Flores to accelerate the availability of high-assay low-enriched uranium. This is the fuel needed for most advanced nuclear reactor designs. It is not commercially available today. In order to ensure the fuel is available for advanced reactors once they are licensed and ready to begin producing electricity, the Federal Government will need to coordinate efforts within agencies, and with the commercial nuclear sector. This is a worthy effort, and I look forward to working with the majority on this proposal.

Last, we have a discussion draft that directs the Departments of Energy and Defense to develop a report evaluating the resiliency benefits of siting microreactors at critical DOE and DOD infrastructure sites. I believe this report will provide the committee with valuable information, and commend Representatives Peters and Hudson, as well as my New Jersey colleague, Rep. Norcross for taking up this important issue.

Finally, I want to thank Priscilla Barbour, who has provided invaluable support over the last year as an energy fellow on the minority committee staff. Priscilla is finishing her fellowship tomorrow.

Mr. PALLONE. And then I would like to yield my minute to Mr. Doyle.

Mr. DOYLE. Thank you, Mr. Pallone. And thank you, Mr. Chairman, for holding this hearing today. I appreciate the opportunity to discuss nuclear energy, which is a critical component of our Nation's energy portfolio.

Nuclear energy provides nearly 40 percent of Pennsylvania's electricity, and employs thousands of skilled workers in Pennsylvania. This carbon-free, reliable baseload power is also an important factor in meeting our climate goals, which is why it is necessary to work collaboratively to address the issues confronting the nuclear industry.

I want to thank my colleague, Congressman Adam Kinzinger, for his leadership introducing H.R. 1320, the NUKE Act. This bipartisan legislation would take important steps to modernize the NRC's fee structure, study new opportunities for additional regulatory certainty, and look to future reforms that will ensure the NRC can continue to effectively protect public health and safety.

I would note that this legislation was originally entitled the NUKEPA Act, so I appreciate that the name has evolved so that it no longer poses a threat to the State of Pennsylvania.

Mr. Chairman, with that, I thank you and yield back.

Mr. UPTON. The gentleman's time has expired. We are now ready to start our distinguished panel's testimony. We welcome Brent Park, the Deputy Administrator for Defense Nuclear Nonproliferation at the NNSA; and Ed McGinnis, Principal Deputy Assistant Secretary for the Office of Nuclear Energy at DOE.

So, welcome to both. And each, thank you for submitting your testimony in advance. It will be made part of the record in its entirety. And we would like you to spend 5 minutes each, no longer than that, to discuss the summary, at which point we will go to questions.

Dr. Park, we will welcome you first.

STATEMENTS OF BRENT PARK, PH.D., DEPUTY ADMINISTRATOR FOR DEFENSE NUCLEAR PROLIFERATION, NATIONAL NUCLEAR SECURITY ADMINISTRATION, DEPARTMENT OF ENERGY, AND EDWARD G. MCGINNIS, PRINCIPAL DEPUTY ASSISTANT SECRETARY FOR NUCLEAR ENERGY, DEPARTMENT OF ENERGY

STATEMENT OF BRENT PARK

Dr. PARK. Good morning, Chairman Upton, Ranking Member Rush, members of the subcommittee. Thank you for the opportunity to provide views on behalf of the Department of Energy's National Nuclear Security Administration on the proposed pieces of legislation. I appreciate the ongoing bipartisan efforts to address our Nation's energy challenges.

First I would like to discuss the potential for DOE to establish a program to support the availability of high-assay low-enriched uranium, so-called HA–LEU. NNSA fully agrees with the committee that availability of HA–LEU is important, and recognizes the need that industry has expressed for researching and developing HA–LEU fuels.

Enriched uranium is required at various levels of enrichment and forms for national security and nonproliferation missions, as well as an equalizer for production. Since the United States no longer has a uranium enrichment capability for these missions, the Nation relies on inventory of highly enriched uranium material that is unblended to meet the enriched uranium requirements identified above. However, our supply is finite, and at present irreplaceable. Moreover, our current stores of HA–LEU will run out in the early 2040s.

To meet industry needs, NNSA will evaluate any specific requests from industry for this material alongside NNSA's ongoing needs for enriched uranium for defense and nondefense purposes.

NNSA supports the language in the bill regarding the development of a transportation package for HA–LEU, and exploring options to establish a domestic HA–LEU enrichment and production capability. NNSA strongly supports such an enrichment capability which we believe is essential in assuring a long-term supply of HA–LEU to meet the needs of the commercial industry, research reactors, and medical isotope products.

A second bill with NNSA components for discussion today pertains to DOE's authority under 10 C.F.R. Part 810 to regulate exports of U.S. civil nuclear technology and assistance for peaceful purposes. Overall, this draft legislation will deliver useful and practical improvements of the regulatory process that is important to the Nation's security and economic prosperity.

We appreciate the opportunity to come before you today as well as continue the discussion with your staff on any issues that may

arise. The Department seeks to ensure the highest nonproliferation standards are applied globally in such a way as to facilitate U.S. exports. The burgeoning international nuclear energy market provides a significant commercial opportunity for the U.S. nuclear industry, and the export of U.S. nuclear technology plays a large part in making sure U.S. industry remains an active player in this market.

In response to feedback from the U.S. industry and other stakeholders, we have taken a number of steps to simplify and update the Part 810 regulation, and have implemented significant improvements in the process for reviewing export applications. In addition to the Department's recent implementation of the e810 electronic application system, the committee's legislation will further streamline the review process in general, while maintaining strong nonproliferation controls on U.S. nuclear technology.

We agree that this legislation will empower the Secretary of Energy to authorize technology and systems exports in a more expeditious manner. I look forward to additional discussion with the committee.

In our view, this legislation will reduce processing times for applications involving certain reactor technologies and destinations that present a low risk of nuclear proliferation, and will provide the Department with flexibility to recommend the Secretary to delegate some application approvals to a lower level.

Another advantage the bill provides is the requirement for DOE offices to review Part 810 applications at the same time that they are being reviewed by the interagency whether they are performing these reviews expressly. We are happy to report that the Department has already begun this process, and we are confident this is yet another step in the right direction.

NNSA recognizes that the effective implementation of our mission is to strengthen our strong partnerships with industry. NNSA needs these strong energy partners to resolve the critical national security issues that we face.

Thank you for the opportunity to testify before you today. And I, with my staff, look forward to future discussions of this draft bill. I stand ready to answer any questions you may have.

[The prepared statement of Dr. Park follows:]

Statement of Dr. Brent Park
Deputy Administrator for Defense Nuclear Nonproliferation
National Nuclear Security Administration
U.S. Department of Energy
Before the
Subcommittee on Energy
U.S. House Committee on Energy and Commerce

May 22, 2018

Chairman Upton, Ranking Member Rush, and Members of the Subcommittee, it is an honor to appear before you on behalf of the Department of Energy's (DOE) National Nuclear Security Administration (NNSA). Today, I will provide general and technical comments on two bills. The first pertains to the potential for DOE to establish and carry out a program to support the availability of high assay low-enriched uranium (HA-LEU) for commercial use and other purposes. The second pertains to DOE's authority under 10 CFR Part 810 to authorize civil nuclear trade, helping to ensure that nuclear technologies and assistance exported from the United States will be used only for peaceful purposes. Although the Administration has not taken an official position on the bills, the Department appreciates the Committee's interest in these topics.

NNSA's Role in Uranium Management

Uranium Management for Defense and Non-Defense Uses

The Department is preparing an Excess Uranium Management Plan addressing management of its uranium inventory that is excess and not dedicated to national security missions. This Department-wide effort is being coordinated by DOE's Office of Nuclear Energy and is expected to be released in the coming months. In addition, NNSA produces a biannual report to Congress, the Unencumbered Enriched Uranium Management Plan Through 2065, that includes plans for managing tritium and enriched uranium resources to meet national security and defense requirements.

Uranium Requirements

As stated in the 2018 Nuclear Posture Review, we live in an evolving international security environment that is more complex and demanding than any since the end of the Cold War, necessitating a national commitment to maintain modern and effective nuclear forces and infrastructure. To remain effective, recapitalizing our Cold War legacy nuclear forces is critical.

NNSA's enduring missions remain vital to the national security of the United States: maintaining the safety, security, reliability, and effectiveness of the nuclear weapons stockpile; reducing the threat of nuclear proliferation and nuclear terrorism around the world; and providing nuclear propulsion for the U.S. Navy's fleet of aircraft carriers and submarines. NNSA requires a reliable supply of strategic materials, including enriched uranium, to accomplish its missions.

For NNSA, enriched uranium is required at various levels of enrichment and forms for national security and nonproliferation missions, as well as medical isotope production. Today, the United States no longer has a uranium enrichment capability for these missions. The Nation relies on an inventory of highly enriched uranium (HEU) material that is downblended to meet the enriched uranium requirements listed above; however, that supply is finite and, at present, irreplaceable. Additionally, the United States requires enriched uranium for defense missions to be free from domestic peaceful use restrictions and from foreign peaceful use obligations.

To support NNSA's nonproliferation mission of minimizing or eliminating the use of HEU in civilian application, NNSA provides HA-LEU for use in research reactors and medical isotope production, internationally and domestically. The HA-LEU we provide is used in the production of molybdenum-99 (Mo-99), a life-saving medical isotope used in thousands of patient procedures daily in the United States.

NNSA continues to refine its projections on the finite supply of HEU to ensure adequate supply for Defense Programs, Defense Nuclear Nonproliferation, and Naval Reactors. NNSA has sufficient inventory to support tritium production through 2038, research reactors and isotope production through the early 2040s, and naval reactors through the 2050s.

NNSA's Office of Defense Programs is working to reestablish a Domestic Uranium Enrichment (DUE) capability in time to supply LEU for tritium production. In December of 2016, NNSA approved the mission need for this capability and an analysis of alternatives is currently underway. NNSA is considering options to include a HA-LEU capability as it works to reestablish its DUE capability.

The Department agrees with the Committee's concern regarding the availability of HA-LEU fuels and recognizes industry's need for HA-LEU fuels in support of advanced nuclear technologies. The Department will evaluate any specific requests from industry for this material alongside its ongoing needs for enriched uranium for research reactor fuel and medical isotope production and its national defense needs for tritium production and naval propulsion.

Draft Discussion Legislation on Establishing a Program to Support Availability of HA-LEU for Commercial Use

This draft legislation would require the Secretary of Energy to establish and carry out a program to support the availability of HA-LEU for commercial use. The Department would be required to work with industry to design and have transportation packages certified by the Nuclear Regulatory Commission by January 1, 2023.

It would require the Department to report on the uranium inventory that could be used for commercial purposes, conduct a biannual survey of stakeholders to estimate the quantity of HA-LEU necessary for commercial use, and conduct an analysis to determine options available to the Secretary to procure HA-LEU.

The legislation as written may be redundant to existing requirements and efforts underway. Allowing a Consortium that includes industry members to determine who can purchase HA-LEU

from the Department may present conflicts of interest or an unfair advantage to certain players in an emerging market. In the near term, NNSA will continue to review existing programmatic needs and will make every reasonable effort to accommodate industry requests for material when they are submitted.

NNSA recognizes the commercial need for HA-LEU; however, additional draws on the limited supply of HEU from the Department's inventory would have unintended national defense, economic, and medical consequences.

In addition, a shortage of material to supply research reactors and medical isotope production may deter reactors from converting to HA-LEU fuel from HEU fuel in the future. There also may be a shortage of life-saving medical isotopes.

Additional HEU for down-blending would have to be identified from the existing inventory of weapons and weapon components, many of which are held for potential reuse in future weapons designs. If additional materials are earmarked for HA-LEU, the Department may be forced to make premature decisions on future nuclear weapon stockpile makeup and design. Although NNSA does not currently anticipate needing to down-blend additional HEU to LEU for tritium production, this issue could be exacerbated if NNSA needed to bridge a gap to a full scale enrichment capability.

DOE's Civil Nuclear Technology Export Authority

The U.S. Energy Information Administration projects that installed nuclear generating capacity outside the United States will increase by nearly 80% from 2015 to 2050. The growing international market presents a critical commercial opportunity for the U.S. nuclear industry, and the exports of U.S. nuclear technology need to be carefully managed. Under the Atomic Energy Act of 1954, as amended (AEA), the Secretary of Energy has the authority to authorize proposed exports of unclassified U.S. nuclear technology and assistance with the concurrence of the Department of State (DOS) and after consultation with the Departments of Defense and Commerce, and the Nuclear Regulatory Commission. This authority is implemented in the 10 CFR Part 810 regulation (Part 810), which DOE/NNSA is responsible for administering.

As the Secretary stated in his December 22, 2017 letter to this Subcommittee, the Department is committed to reducing processing times for applications under Part 810 while maintaining strong nonproliferation controls on U.S. nuclear technology. DOE/NNSA and other pertinent U.S. Government agencies have made significant progress in improving the efficiency and transparency of the Part 810 regulatory regime, including through implementation of DOE/NNSA's Part 810 Process Improvement Plan. Key accomplishments to date include the following:

- The Department published a revision to the Part 810 regulation that, among other benefits, establishes fast track approval processes for a number of activities that previously would have required specific authorization.

- The Department established an electronic submissions portal ("e810") that is operational and available for industry use. This website was a long-standing request from industry groups and has been available to exporters since January 2017. The e810 system reduces the paperwork burden for industry and increases transparency by allowing the applicant to view where their request is in the reviewing process.

- DOE established a single point of contact for all exporters, standardized internal documents, and clarified internal review processes.

- DOE/NNSA has begun an effort to clarify the Part 810 compliance policy to encourage exporters to self-identify issues and violations.

- DOE/NNSA worked with the DOS to provide an earlier contingent concurrence on applications, enabling most reviews to be completed concurrently while DOS works to obtain the required government-to-government nonproliferation assurances from the country that would receive the assurances. Previously, DOS did not concur until they had received the required assurances, and DOE's final review did not start until receiving DOS's concurrence.

- DOE/NNSA coordinated across the Department to establish timely and realistic deadlines for internal reviews of Part 810 applications to reduce processing times and improve the predictability of the application process for applicants.

- DOE/NNSA expanded industry outreach and assistance, including with regional events at nuclear industry hubs, and began issuing an annual public report summarizing Part 810 review activities.

Because of these and other changes, the average processing time for specific authorization, renewal, and amendment requests under Part 810 has dropped from a high of more than 18 months to approximately 12 months. In addition to these recent accomplishments, future planned improvements include establishing user groups and training sessions for e810, developing a risk-based procedure for the analysis of reports submitted under Part 810, expanding the system's functionality to include electronic reviews of documents by DOE and the interagency, and creating a publicly available online archive of Part 810 authorizations and determinations. NNSA is working to ensure these improvements are implemented in a timely manner.

Despite continuous improvements in the Part 810 process, the lengthiest part of the specific authorization process remains the time it takes partner countries to provide the required governmental nonproliferation assurances which can result in processing delays of six months to well over a year.

Efforts to expedite the Part 810 process must also accommodate the requirements of the Fiscal Year 2016 National Defense Authorization Act, which added a heightened level of review for proposed technology exports to China and Russia.

Draft Discussion Legislation on Improvements to the 10 CFR Part 810 Process

Through amendments to Section 161 of the AEA, this bill would remove language prohibiting the Secretary from delegating his authority under section 57b. of the AEA to approve exports of nuclear technology and assistance.

The bill also amends Section 57 of the AEA to direct the Secretary to establish expedited procedures to process Part 810 applications involving the transfer of "low proliferation reactor technologies" to certain countries, as designated by the Secretary, and with the caveat that China and Russia are ineligible.

Once implemented in regulation, these expedited procedures would work similarly to the "fast track approval" process for requests to provide operational safety assistance that was introduced in the 2015 revision to the Part 810 regulation.

The transfer of all nuclear power reactor technologies (other than technology for reactors especially designed for the production of plutonium or uranium-233) is already generally authorized to all countries that have Agreements for Peaceful Nuclear Cooperation (123 Agreements) with the United States, other than China, India, and Russia.

As such, the impact of the expedited procedures will be limited to certain special cases. For example, the expedited procedure could be used to quickly approve deemed export applications for nationals of non-sensitive countries, as well as applications from U.S. nuclear companies to outsource information technology services to non-sensitive countries that have established non-proliferation commitments, but generally authorized destinations under Part 810.

The Department supports reforms to streamline the Part 810 review process and appreciates the language recognizing the Department's own progress in implementing its Part 810 Process Improvement Plan. DOE looks forward to working with the Committee on this legislation and to continuing to improve the Part 810 process.

Conclusion

DOE appreciates the ongoing bipartisan support of this Committee, and looks forward to working with the Committee on the legislation on today's agenda and any future legislation.

Mr. UPTON. Thank you so much.
Mr. McGinnis.

STATEMENT OF EDWARD G. MCGINNIS

Mr. MCGINNIS. Thank you very much, Chairman Upton, Ranking Member Rush, and other members of the subcommittee. I am very pleased to appear before you today to discuss legislation addressing advanced nuclear energy technologies, including high-assay low-enriched uranium, which I will refer to in shorthand during my testimony as high-assay LEU.

Although the administration is still evaluating your bills and has not taken an official position at this time, the Department greatly appreciates the committee's interest in these topics and recognizes the potentially very important role high-assay LEU may well play in meeting our Nation's energy and national security needs.

Over the last seven decades, the nuclear energy capabilities pioneered by the United States have served and supported our Nation's energy security and, in turn, national security. In recognition of this vital role, the White House-led review of U.S. nuclear energy policy is underway, and we are already beginning to take steps to revitalize and expand our civil nuclear energy sector. The outcomes of the civil nuclear review will inform our approach to revitalizing this critical sector.

While our Nation's nuclear infrastructure, supply chain, and manufacturing base have been significantly degraded, the United States still leads the world in other key areas of nuclear energy. In fact, we believe the most mature advanced U.S. designs could potentially be deployed as early as the mid to late 2020s by the private industry. This is where the need for high-assay LEU arises.

Nearly all U.S. advanced nonlight-water reactors under development will require high-assay LEU, including advanced microreactors. The advanced reactor community has stressed the near-term need and importance of high-assay LEU for advanced nuclear fuel, qualification testing, and for potential demonstration reactors.

No commercial enricher currently provides high-assay LEU. While current enrichment plants could be modified to produce high-assay LEU, it is unlikely that a commercial capability would be pursued without further indication of progress towards deployment by advanced reactor vendors. The Department recognizes the industry's concerns regarding high-assay LEU fuel, and we are taking a number of actions to support the development of high-assay LEU in the near and longer term.

First, the Department is working with industry to refine its near-term R&D needs for fuel development and qualification, particularly how much material is needed, when, and in what form, and also to understand more about projections for longer-term needs.

Second, we are leveraging our expertise in support of the technical aspects of commercial high-assay LEU infrastructure. The Department is aware that high-assay LEU may be needed in various fuel forms by different vendors. On the transportation side there are no large scale shipments of uranium enriched above 5 percent. And the transportation packages currently used for these smaller shipments may not support commercial-scale operations.

Third, the Department is reviewing materials across the DOE complex with an eye toward materials and processing options that may support some near-term industry R&D needs. Once industry needs in terms of quantities, forms, tolerances for impurities, and timing are known, the Department can then evaluate specific requests from industry for material, alongside our ongoing needs for research, reactor fuel, and medical isotope production. Current Department mission needs are supplied from our finite and diminishing supply of high-enriched uranium.

In conclusion, the Department is working closely with U.S. nuclear innovators to define the challenges to bringing the next generation of advanced nuclear reactors and power into the marketplace, and are embarking on a number of actions to support the development of a commercial fuel cycle for high-assay LEU.

We look forward to working with Congress, including in particular the subcommittee here, industry, and our partners across the Department on defining and exploring high-assay LEU issues now and in the future.

And, finally, I would just like to say that we greatly appreciate the work and focus of this subcommittee on such important matters to our Nation's energy and national security. Thank you very much.

[The prepared statement of Mr. McGinnis follows:]

Testimony of Edward G. McGinnis
Principal Deputy Assistant Secretary for Nuclear Energy
U.S. Department of Energy
Before the
U.S. House Committee on Energy and Commerce
Subcommittee on Energy

May 22, 2018

Chairman Upton, Ranking Member Rush, and Members of the Subcommittee, I am very pleased to appear before you today to discuss high-assay low-enriched uranium (HALEU), that is, uranium that has greater than 5% of the fissile U-235 isotope, but still less than 20%, the cutoff for highly enriched uranium (HEU), and the role it may play in meeting our Nation's energy and national security needs. Although the Administration is still evaluating the bills and has not taken an official position at this time, the Department appreciates the Committee's interest in these topics.

Over the last seven decades, the nuclear energy capabilities pioneered by the United States have served and supported our Nation's energy security, and in turn, national security. Nuclear energy is the largest source of clean energy in the United States, providing over 56 percent of our Nation's emission-free electricity in 2017. Nuclear power plants have served as bedrocks to communities across the country, providing high-paying, skilled jobs to hundreds of thousands of Americans.

Beyond the vital role that nuclear energy plays in support of our economy and environment, and as part of the foundation for reliability and resiliency of our electric grid, nuclear energy is essential for achieving important national security missions. U.S. nuclear energy capabilities strongly support our global nuclear nonproliferation objectives, enhance our country's role as a world leader, and provide a unique and strategically important source of fuel supply for our nuclear Navy.

In recognition of the vital role nuclear energy serves for our Nation, and the current need for our Nation's nuclear energy sector, a White House-led review of U.S. nuclear energy policy is underway, and we are beginning to take steps to revitalize and expand our civil nuclear energy sector. The outcomes of the Civil Nuclear Review will inform our approach to revitalization of this critical sector.

While our Nation's nuclear infrastructure, supply chain, and manufacturing base have been significantly degraded, the United States still leads the world in other key areas of nuclear energy, including reactor operation efficiency, reactor safety operations, advanced reactor designs, and other new innovative approaches, such as accident tolerant fuel and additive manufacturing.

Strong bipartisan support is critical to our collective efforts to revitalize and expand our Nation's nuclear energy sector. The Department of Energy (DOE) is committed to working closely with this Subcommittee to build our nuclear energy revitalization, and we are working hard to fully

leverage DOE's world class national laboratories in strong partnership with U.S. universities and industry.

Some of the most exciting innovation is coming from the U.S. advanced nuclear reactor design sector, with approximately 50 innovative reactor designers working to develop and deploy advanced reactor concepts in North America. These designs, such as advanced small modular reactors, offer the potential for step-change safety enhancements including walk-away safe reactor designs; unprecedented versatility including load-following capability, non-electric applications, and distributed power; dramatically improved financing; and the ability to consume waste as an energy resource. These design features, if proven and commercialized, could be truly transformational and game changing.

To support the nuclear sector revitalization, the Department's investments are focused on early stage research and development of new technologies. With limited U.S. Government research and development investment, we believe that the most mature, advanced U.S. designs could potentially be deployed as early as the mid-to-late 2020s by private industry, demonstrating U.S. leadership in this burgeoning area, as well as enhancing U.S. competitiveness in an emerging global market while supporting U.S. nonproliferation objectives. This is where the need for HALEU arises. Nearly all U.S. advanced reactors under development will require HALEU, including advanced micro reactors. The advanced reactor community has stressed the near-term need and importance of HALEU for advanced reactor fuel qualification testing and for potential demonstration reactors.

HALEU is also important to national security needs. The Department currently provides HALEU to research reactors globally, many of which have been converted from HEU fuel as part of our Material Management and Minimization program to help meet nonproliferation objectives. Successful conversion of these reactor facilities to HALEU essentially eliminates the risk of diversion and potential misuse of HEU while allowing for continued operation to conduct various research activities and produce vital medical isotopes, such as molybdenum-99 (Mo-99), critical for diagnostic medical imaging.

No commercial enricher currently provides HALEU. While current enrichment plants could be modified to produce HALEU, it is unlikely that a commercial HALEU capability would be pursued without further indication of progress toward deployment by advanced reactor vendors. Further efforts toward deployment of advanced reactors require the development and qualification of HALEU fuels. In addition, significant efforts are needed to ensure the development of a fuel cycle infrastructure that supports the use of HALEU. This includes transportation and packaging, conversion of the HALEU to various fuel forms, and fuel fabrication capabilities.

The Department recognizes the industry's concerns regarding HALEU fuel qualification and testing as well as the development of a robust HALEU fuel cycle infrastructure for testing and ultimate deployment of U.S. advanced reactor concepts. We are taking a number of actions intended to support the development of HALEU in the near and longer term.

First, the Department is working with industry to refine its near-term R&D needs for fuel development and qualification, particularly how much material is needed, when, and in what form, and also to understand more about projections for longer-term needs. We are also refining our own needs for HALEU, including for research reactors, Mo-99 production, and other nonproliferation requirements. Understanding these requirements will better inform our efforts in support of infrastructure development, as well as our development of options to meet those needs.

Second, we are leveraging our technical expertise in support of the technical aspects of a commercial HALEU infrastructure development. The Department is aware that HALEU may be needed in various fuel forms (e.g., metallic, oxide, liquid) by different vendors, each of which may result in slightly different infrastructure needs. On the transportation side, there are no large scale shipments of uranium enriched above 5% U-235, and the transportation packages currently used for these smaller shipments may not support commercial-scale operations. The development and certification of shipping packages appropriate for HALEU is an identified gap in the HALEU fuel cycle infrastructure.

Third, the Department is reviewing materials across the DOE complex with an eye toward materials and processing options that may support some near-term industry R&D needs. These options may include material recovery and down blending of certain inventories of fuel from former Department reactor programs. Many of the options under consideration involve fuel that has been irradiated, so the utility of the material for research and proof-of-concept activities will depend upon the tolerance of the advanced reactor designs for certain impurities. Once industry needs in terms of quantities, forms, tolerances for impurities, and timing are known, the Department can evaluate any specific requests from industry for material, alongside our own ongoing needs for research reactor fuel and medical isotope production. Current Department mission needs are supplied from our finite and diminishing supply of HEU.

The National Nuclear Security Administration's (NNSA) Domestic Uranium Enrichment program seeks to create a domestic source of enriched uranium to support tritium production for the nuclear weapons stockpile. NNSA is currently evaluating options, including the status quo and potential commercial and government alternatives, while considering cost, schedule, risk, and effectiveness.

This work has synergies with efforts for a HALEU enrichment capability in the longer run. For example, NNSA's 2017 Request for Information (RFI) for the Supply of Enriched Uranium sought information from industry about their interest and capabilities for producing LEU, HEU, and HALEU for research and test reactors as well as for emerging commercial needs for advanced power reactors. The RFI and subsequent discussions have been coordinated with the Office of Nuclear Energy and we intend to continue our productive collaborations on HALEU in the future.

Conclusion

The Department is working closely with U.S. nuclear innovators to define the challenges to bringing the next generation of advanced nuclear power into the marketplace. As noted earlier,

we recognize the importance of HALEU fuel development and qualification, as well as the development of a robust HALEU fuel cycle infrastructure, for testing and ultimate deployment of these U.S. advanced reactor concepts. We are embarking on a number of actions intended to support the development of a commercial fuel cycle for HALEU in the near and longer term.

We look forward to working with Congress, including this Subcommittee, industry and our partners across the Department on defining and exploring HALEU issues now and in the future.

Mr. UPTON. Well, thank you both. And appreciate your kind words. And we do work, try to work in a bipartisan way in potentially all the things that we move through this subcommittee. And we look forward to working with you.

I would say as we talk about these bills, and the sponsors are here, we intend to move these bills. And there is a legislative process. We want your input. I know that you have not taken a formal stand with staff on any of these, but we would like your technical assistance, but also your continued input as these bills begin to move through the process. So if you can take that back to your department heads, that would be great.

Quick, couple of quick questions from my vantage point. You know, we know that, according to the EIA and World Nuclear Association data, there are presently about 50 nuclear reactors under construction around the world, mostly in Asia. There are about 150 to 160 reactors on order or planned, and upwards of 300 that have been proposed. Almost all of that growth is in Asia, the Middle East, with a little bit in Russia.

Not a lot here in the U.S., I think primarily because of the cheap natural gas. We're seeing big advancements there in terms of new permitting. I've got a facility in my district that looks to break ground a little bit later this fall. And I have got a nuclear plant, it is like a plant that is looking to phase out now over the next couple years, the Palisades plant. And more power will have to be generated by other sources, whether it be renewable, gas, that type of thing.

So as the U.S. companies are competing primarily with China, Russia, France, South Korea, if we are unable to successfully compete and are excluded from those emerging markets, including the Middle East, will the dominance of China, Russia in these markets be beneficial to international nuclear security, nonproliferation, and nuclear safety? How will that all fit as we lose probably our leading role as we see the number of domestic facilities here in the U.S. actually be reduced without any real plans to finish construction.

The new plants won't make up for the ones that are being taken offline. How does that work with what is happening internationally?

Dr. PARK. Thank you. First of all, I agree with your assessment that the U.S. needs to reclaim the leadership clearly. There is no question in your statement. And how we go about doing that is what is on the table for us to discuss.

I think we are taking your leadership and guidance from this committee to make sure we streamline many of these approval processes and so on. But we need to do better. I acknowledge that. And in terms of actually not playing in the theaters that you just talked about, many dozens of nuclear reactors being built and being designed and so on, we need to get into that world as quickly as possible and work closely with any other sectors to make sure we have a competitive edge.

Again, our—as a nuclear physicist I am happy to share with you we actually have the edge on the nuclear technologies on the science and technology side, we just need to better transfer these

proven technologies in a safe, secure—in a safeguarded format. We are doing our very best at the moment.

Mr. UPTON. Mr. McGinnis, do you have anything?

Mr. MCGINNIS. Thank you very much. I would say that the implications to the United States trending out of its nuclear leadership role, which most of the DNA still today around the world in nuclear technologies is from the United States and some great innovators, if we continue with this trend and if we don't find a way to re-vector into a sustainable growth potential, it goes far beyond electricity. Resiliency is really important. But when it comes to the global, competitive, strategic state of play in nuclear with Russia and China, the implications go directly into our national security interests and not just our energy security interests.

So it is vital that we begin building again. We have had an extraordinary run of our fleet, which is by far the most efficiently run in the world. And we still lead as the greatest innovators. We know how to disrupt and innovate like other industries we are witnessing in aerospace and others in the United States. Frankly, our competitors are hoping that we don't find and tap that innovation in this moment for nuclear.

I strongly believe we are at that point where we are in the process of disrupting the market, innovating right now. And so we have a great opportunity, and I want to say in large part because of the really unprecedented, I would say in my career, bipartisan support from Congress, including such as is reflected in this subcommittee. So thank you.

Mr. UPTON. And before I yield there to my friend Mr. Rush, I want to insert into the record a report from the Atlantic Council titled "U.S. Nuclear-Power Leadership and the Chinese and Russian Challenge." And without objection, so ordered.

[The information appears at the conclusion of the hearing.]

Mr. UPTON. I yield to my friend, the gentleman from Illinois, for 5 minutes.

Mr. RUSH. I want to thank you, Mr. Chairman.

Dr. Park, you noted Secretary Perry's December 2017 letter to this subcommittee detailing the agency's commitment to reducing processing time for application on the Part 810. You stated that DOE and NNSA have already made significant progress in improving efficiency and transparency on the Part 810 regulatory regime by implementing the Part 810 process improvement plan.

These improvements help to reduce the average processing time for a request under Part 810 from a high of more than 18 months to approximately 12 months. In light of this process improvement plan do you see a need for legislation such as the discussion draft that is before us today that will amend the Atomic Energy Act to improve the process for authorizing the transfer of civilian nuclear commerce, technology, and assistance. And does this bill overlap with aspects of the improvement plan?

Dr. PARK. First of all, I did a really detailed analysis of the committee's help and guidance, by the way. That is in concert with this committee that we have been developing PIP, performance improvement plan. We actually had implemented many of your guidance in our planning, by the way.

For example, as we are developing e810 for example, your example, we actually, I think we shared with your staff that the internal processing—this is only an example by the way—instead of waiting for State Department to do—to wait for official assurance on operation requirements we actually do a parallel process, number one.

Number two, as it turns out that many of the things that we used to do in paper form, the industry partners did not know what kind of progress they were making with us, through e810, for example. If they are able to have a transparency into where are their packages and, you know, ask us how to speed things along and so on, there are a lot of improvements that we have made. We still need to do more.

But, again, there are enough of positive signs. Yesterday I asked my staff to give me statistics on what kind of uses we have for e810. I am happy to report to the committee that the improvement of the usage has gone up substantially from last year to this year on month-by-month rollout. Compared to 2017, 2018 usage of e810 is 50 percent higher. It is too early to tell whether this will really seal the deal in terms of expediting the approval process and so on and so forth.

But so far, indicators are that we are making a positive difference and we are training the interested partners so they know how to work with us. So this is all being realized.

Mr. RUSH. Right. So on the proposed legislation, will that enhance your ability or will that retract from your ability?

Dr. PARK. So, I don't think I could comment on whether that would help or whatever. But I appreciate the fact that there are many, many useful guidelines out of this committee. So we will look for ways to work with the committee.

Mr. RUSH. Thank you. I am going to ask you another question.

In your written statement, you say that the Avanced Nuclear Fuel Availability Act, as written, may be redundant to existing requirements and initiatives currently being conducted at the agency. You also note that "allowing a consortium that includes industry members to determine who can purchase HA–LEU from the Department may present conflicts of interest or an unfair advantage to certain players in the emerging market." Can you briefly discuss both the redundancies that are found in this bill with regards to your current practice?

Also, what recommendation will you suggest to help avoid the occurrence of conflict of interest or unfair advantage for industry members helping to decide who can purchase HA–LEU?

Dr. PARK. So, appreciate your thoughtful question.

As it turns out, I would not look at the word "redundancy" as a negative word. The fact that we actually have been working with your staff of this committee for quite some time we then implemented the redundancy of the word would come in the form of, we heard you already. If the bill actually incorporates these guidelines, we are happy to absorb, follow the guidelines. But we have been doing quite a bit already in the form of, we are actually working with any and other parts within DOE to collectively promise from industry partners.

We have some rough numbers that we got. But, again, we are actually incorporating that into our projections, as I shared with

you in my oral testimony. Our supply would run out in early 2040s, so we are required to update our projections as we collect information from industry partners or other players. So, to that extent, "redundancy" is not a bad word, number one, if that helps you.

Mr. RUSH. I get your point.

Mr. UPTON. The gentleman's time has expired.

Mr. Barton.

Mr. BARTON. Thank you, Mr. Chairman. I don't have too many questions.

My primary question is about the discussion draft by Congressmen Hudson, Wilson, Norcross, and Peters about these microreactors at Department of Energy—I mean Department of Defense facilities. I'm not real sure what a microreactor is. So I want a definition. And I also want to know who would have jurisdiction. Would it be the Defense Department or would it be the Energy Department?

Mr. MCGINNIS. Thank you very much for that question. Microreactors, depending on who you talk to, define it by the power level. And one conventional range is 1 to up to 10 megawatts electric. Some companies are defining it 1 to 30, even in the kilowatt range.

But it is smaller, lower level than what is a conventional small modular reactor, number one.

Number two, this is a very interesting emerging technical sector that I am witnessing, we are witnessing right now in the United States with regards to microreactors. There are a number of exciting designs and companies in different parts of the United States, some of which we are working with at the Department of Energy on supporting an appropriate technical role early stage on supporting the proving out of these microreactors.

In fact, we have an MOU with one such microreactor where they are targeting 2021 to have the first demonstration built at Idaho National Lab, just to give you a sense of how fast this is moving. These microreactors, the key—I know about this from the fuel supply—is they all, virtually all, require high-assay LEU, maybe smaller amounts, but if they prove out the business line they are going to, they will be selling many of them.

Now, on the question of the Department of Defense and Department of Energy, what I can say is that we are certainly working with the Department of Defense. We are in communications with them. We are sharing our information and know-how on microreactors with the Department of Defense, more than one part of the Department of Defense. We are sharing information with them from the infrastructure side, the Assistant Secretary as well as from Army. And we see, frankly, great potential, significant potential with regards to the role and value of microreactors.

And I think, frankly, this could be one of those surprise disruptive, very positively disruptive sectors that may, may catch a lot of us by surprise in a very good way. And I am excited about it.

Mr. BARTON. I yield back.

Mr. UPTON. Mr. Peters.

Mr. PETERS. Thank you, Mr. Chairman. I appreciate having this hearing today.

Nuclear energy technology is an important part of increasing our zero mission energy sources. We need this energy generation and the clean air standards it can help us achieve. And for these reasons, and many more, I supported research and development in next generation energy technologies, particularly advanced nuclear development in small modular reactors.

And I am one of the, with Mr. Hudson, one of the lead sponsors of the draft bill before us today. And I appreciate his work on that.

My bill would—our bill would—direct the Department of Defense and Department of Energy to work together in analyzing how microreactors can bolster energy resiliency for national security.

In my home district in San Diego and in the nearby region, we have piloted microgrids at Marine Corps Air Station Miramar. We have tested battery generation rucksacks at Camp Pendleton, and performed other energy development project partnerships between the Navy and the University of California at San Diego. DoD has been a willing and helpful partner in testing clean and innovative energy sources. It is not because they are tree huggers or doctrinaire environmentalists, but from their perspective energy resilience is a life and death question.

For instance, the fewer batteries that Marines have to carry, the more ammunition they can take in their pack; and that could be what saves their life in a firefight in a faraway country. It is a stark reminder of how energy resilience is critical. I think the partnership in this bill makes sense and I hope to see it advance quickly.

To Mr. McGinnis, I had a question about research funding. I am an advocate for early stage innovation and research support from the Federal Government. I wanted to just give you an opportunity to say if you think we are missing any areas of nuclear research and innovation, where we need to bolster that investment.

Mr. MCGINNIS. Thank you very much.

There, as indicated, we are in the process of revitalizing our nuclear energy sector. We made it clear that we have experienced great degradation, frankly, including in our test capabilities, whether it is not having fast neutrons for a fast spectrum reactor to be able to test those key components for the next class of reactors coming in, or advanced fuels, or whether it is other technical capabilities that we need as a key element of our nuclear sector.

So I can say, first of all, that the authorization language that we have seen today, and also the appropriations has been very important to support our efforts to revitalize. We don't just rely on Idaho National Lab, although Idaho National Lab is a flagship lab for nuclear energy, we are relying on Oak Ridge, we are relying on many of the others, and Lawrence Livermore and other labs. But if we are going to get back in the game we have got to get our fuel cycle R&D test capabilities back to where it belongs, back in a robust area.

We are on a good trajectory now. And all I can say is strong support is greatly appreciated as we work with a private/public posture where we are finding that sweet spot to support and dispatch the technical challenges that with our labs and our capabilities that our U.S. industry can most benefit from.

So, thank you very much for the support. And we stand ready to follow additional laws that may come in that you are moving through.

Mr. PETERS. Maybe I will just explore a bit more kind of what, what areas you might see us investing in, what particular areas in nuclear that you think offer promise?

Mr. MCGINNIS. One is, of course, the fast test capability is very important, having testing capabilities for the new class of reactors. We are experience—we are seeing a lot through our new industry funding opportunity mechanisms where it also becomes an opportunity to hear from industry where they most need us. Whether it is testing, whether it is benchmarking data, simulation modeling and simulation, even supporting the NRC with our modeling and simulation and supporting their development of advanced guidelines, frankly, industry needs us to support them in the data and benchmarking as they go through certification. That is one of the biggest challenges for our new innovators.

But also, having the testing capabilities, just continuing to support our reinvestment in establishing our test capability for both the front and back end and for reactors, fuels. And also, very important, if not most important, is our efforts to support the continued life and longevity of the fleet of reactors operating in this country now.

Mr. PETERS. Thank you very much. And thank you, Mr. Chairman. I yield back.

Mr. UPTON. Mr. Shimkus.

Mr. SHIMKUS. Thank you, Mr. Chairman.

Mr. McGinnis, I have a lot to go through so let's be efficient with our time if we can. Are you aware of an enrichment facility located in Eunice, New Mexico?

Mr. MCGINNIS. Yes, indeed.

Mr. SHIMKUS. Is that enrichment facility licensed by the Nuclear Regulatory Commission?

Mr. MCGINNIS. Yes, indeed.

Mr. SHIMKUS. In order to meet future demand for high-assay low-enrichment uranium, is that facility capable of making the material for commercial use? If the facility secures the appropriate modification to its NRC licensing basis?

Mr. MCGINNIS. I believe yes.

Mr. SHIMKUS. Are you aware of a recent GAO report that found DOE's cost estimate to develop new enrichment options lacked credibility because it was not well documented or accurate?

Mr. MCGINNIS. I am aware of the GAO report in general.

Mr. SHIMKUS. And have made no judgment on being aware of the GAO report as far as accuracy?

Mr. MCGINNIS. I would have to get back with you on the specifics on my view on that.

Mr. SHIMKUS. It is just important because as you go forward if GAO's analysis is not accurate then we don't want to do our basis of decision making on that fact.

Based on the availability of U.S. enrichment capabilities for commercial use would you agree that the U.S. Government does not need to spend billions of dollars of nondefense money to subsidize Government-backed competition to an existing operational facility?

Mr. MCGINNIS. I certainly don't support subsidies. But I think it is premature to say whether there would be a need for a second supply for enrichment. I can tell you that some companies have come to me strongly encouraging the support of at least two suppliers to have good, robust competition and pricing. Notwithstanding, though, we are very fortunate and very thankful for having that top world class facility in New Mexico in the form of LES.

But the question is whether—and I am just basing it on what we are hearing from certain industry—whether that is the final end state if they end up establishing a cascade for high-assay LEU, or do you want to get to the point where you have a couple of suppliers, such as in the fuel fabrication business where you have pretty strong competition because—and pretty good pricing because of that competition.

Mr. SHIMKUS. Well, you know, other pricing debates that we have in the other realm of fuel. So, also we want, we really want to be cautious about in this time of fiscal constraints. I do believe in competition. I do believe that that drives that through. But we have dealt with Government subsidization of helping infrastructure to move to markets that weren't existing. Not saying that they needed competition, but there was no business plan or model for that.

So, again, I am just raising some concerns.

Dr. Park, if the United States funds a Government-sponsored facility to support both defense and nondefense purposes would you be concerned that this could send conflicting messages to the international community about developing dual-purpose fuel cycle facilities?

Dr. PARK. So U.S. segment has made a commitment to international partners. For example, when they downgrade from HA–LEU to lower level LEU, we would provide the fuels because, actually, it's going to be the right thing for us to do to minimize the risks of HA–LEU falling into the wrong hands. So we need to follow through on those commitments. And we also follow through on the medical isotope production efforts and so on.

The first example that I used is high performance reactors that require the use of HA–LEU and so on. So there are different examples. But to answer your question, it actually depends on case by case. We need to actually analyze the benefits and risks and then make appropriate recommendations. So I don't think that we could provide some general, overall, you know, response that this is what we are going to do. It really depends on who the players are, who are partners are, and so on, and other considerations that we need to fold in.

Mr. SHIMKUS. Yes, and I was listening carefully to my colleague Scott Peters from California. And when he was asking really Mr. McGinnis what other things, you know, he was trying to reach what other things should we be looking at? My point would be we need to look at the front end here to address the international concerns and the commitments, but also the Government being involved in an area where we may not need to be involved, and how much of those nondefense dollars which are always, we are scrambling for, goes to that when there is an available, looks like there will be an available commercial production facility already in place.

So those are my concerns. We have aired them out now publicly. And with that, Mr. Chairman, thank you. I yield back my time.

Mr. UPTON. The gentleman yields back. The Chair would recognize the gentleman from California, Mr. McNerney.

Mr. MCNERNEY. Thank you, Mr. Chairman.

Just last week Mr. Flores approached me and asked me if I would support his bill on HA–LEU. And I think it is a good bill. I am glad to do that. But I do have a concern about proliferation. I think that is something that we all are worried about.

The world has changed in the last few months, and I am worried about where we are going with additional capabilities, especially if it is in the commercial sector. Could you address that, Mr. Park?

Dr. PARK. Your concern is to certify everybody in this room and throughout the Government system. But, again, we have not relaxed reviews and assessments of how we share our nuclear technologies with our partners, international partners and so on.

Mr. MCNERNEY. Were you to have more commercial control of that information?

Dr. PARK. From my perspective, and obviously Ed McGinnis actually should chime in, but again as the person responsible for issuing the safeguards aspect of sharing the nuclear technologies, we first have to evaluate the whole big picture. It is a balancing act. Cannot delay forever.

Mr. MCNERNEY. Right.

Dr. PARK. We cannot expedite without actually doing the right analysis so we know what the risks are and we need to mitigate those. And as far as country partnership and the—what we are actually concerned about is more of with the technologies that we share with country A could be sent to somewhere else without our knowing. So safeguards is not one-to-one, it's actually one of many that we have to worry about.

So that is where my guys come in to do a very careful analysis working with the State Department and other interagency partners.

Mr. MCNERNEY. Mr. McGinnis, do you see SMRs and microreactors becoming prominent in the next decade or two?

Mr. MCGINNIS. Yes, very possibly I do. And they offer many attributes that one does not see in the current class of reactors, from far more passive safety aspects. Some of these reactors will—are designed to safely shut down even in the event of a complete loss of power indefinitely, or a complete loss of coolant.

Some of these reactors, micro and others, reactors are smaller source term, more manageable. Some of these have life of core where you do not need refueling such as every 18 months for a fuel reactor, so, or a large reactor.

But with respect to international I would just like to make one thing very clear in my view. I have worked international as the Deputy Assistant Secretary for 11 years. There is no other country on this planet that has a higher standard, more stringent standard on nonproliferation and safety than us. I can assure you the Russians, the Chinese, and the others, they do not insist on the level of nonpro and safety, even in our current 123 and our Part 810 process and the others. We are very proud of it. And I think you will hear the U.S. industry continue to say that is a key aspect of

our product, that we bring the safest products and with the highest levels of nonproliferation.

Mr. MCNERNEY. Well, I think the SMR promise is good. And I am looking forward to seeing that realized in our country. And I recognize, along with everyone here I think, that the industry is struggling at the moment. But how do we make it easier for the industry to prosper without harming the NRC's ability to regulate effectively?

Mr. MCGINNIS. Yes, indeed, that is the question. We, in my view, we want the most efficient process for the regulatory reviews. And we want the least costly but in a manner that does not compromise in any way, shape, or form the current standard of safety. That is our objective.

The Department of Energy is ready. We made it clear with the NRC and we continue to do it, make all of our capabilities, model, in simulation and testing, available to help them and help the vendors go through this process.

Mr. MCNERNEY. Thank you. I yield back, Mr. Chairman.

Mr. UPTON. Mr. McKinley.

Mr. MCKINLEY. Thank you, Mr. Chairman.

Not long ago the Defense Science Board put out a report that said our grid system, our national grid system is fragile, vulnerable, and near its capacity. And as a result of that, or perhaps influenced by that, DoD has been expressing more and more of an interest in using small nuclear reactors, and much like maybe Barton was talking about, the microreactors on plant or on bases so that they could be islands of independence from the grid, a fascinating concept with that.

Do you, do either of you agree with the Defense Science Board, with their conclusion? Because we have been having quite a few hearings about this grid reliability, about reliability and resilience, do you agree with their, their findings that there are problems with the—with reliability and resilience?

Mr. MCGINNIS. I agree that resiliency is a huge issue. And it is only going to get more challenging if we don't get new baseload plants coming in, including nuclear.

I would also say there is still no other energy source on the planet that compares to the attributes of nuclear power: clean baseload, no refueling for at least 18 months. The new SMRs coming in they could possibly go 4 years or longer.

With regards to resiliency and microreactors and the 2016 Defense Science Board, we think it certainly, while we see that it is driving the Department of Defense in evaluating their options with microreactors now for that very purpose of resiliency. Obviously, resiliency——

Mr. MCKINLEY. If I could on that, I might disagree slightly with you on that, and that is your own department there—excuse me, DOE, has come out with its own report saying that actually to improve reliability and resilience it is nuclear and coal because of the storage, the capabilities of onsite storage and the lack of interruption of supply.

So you are saying you share that concern?

Mr. MCGINNIS. Oh yes, indeed.

Mr. MCKINLEY. Let me go to the next issue that is a little bit more sensitive to this. Because I am fascinated with the nuclear industry. We don't have any plants in West Virginia but we did have a shipping port that was not very far from where I live and in my district.

But not long ago, it was just last October, The Hill came out with a report that talked about how Russia's Putin was trying to influence and get involved and take more influence, control over our atomic energy business in the United States. And he was using, according to the article, there was litigation over bribery, kickbacks, extortion, and money laundering, all that took place in and around sale of Uranium One and how we—how CFIUS apparently dropped the ball and allowed us to lose a lot of control of our uranium.

So with this issue of nuclear energy as much, how do we, how do we restore the confidence that we are not, we are not allowing a foreign entity like Russia to influence our nuclear energy field, given that the history. And I am curious, what has taken place internally to reverse the damage that was done under the previous administration as a result of this?

Mr. MCGINNIS. I would say first of all it is very important to have a diversity of supply. In the United States there is about 5 percent of the uranium that comes from U.S. uranium mining miners. That is an historic low.

For enrichment, apart from LES, again which we appreciate for an enricher in the United States, but the fact is we have zero American-owned enrichers.

With regards to supply, between 17 and 20 percent of all the enrichment that comes into our Nation's 99 reactors comes from Russia. There is a suspension agreement that limits them to go where they cannot supply more than 20 percent. That suspension agreement is slated to end in 2020. The Department of Commerce is following that very closely.

I can't speak to the details of what you said, but I can say that it is very important for us to have a balanced and diverse supply, including strong supply capability for the front end, as was mentioned, for fuel supply in this country.

Mr. MCKINLEY. And my time has expired. So I just going to ask you if you could please, could you stop by my office? I would like to have more of a conversation about this, how we—what are the next steps that need to be done.

Thank you, and I yield back.

Mr. UPTON. Mr. Green.

Mr. GREEN. Thank you, Mr. Chairman and Ranking Member Rush, for holding this hearing.

We are discussing these four important bills that deal with various aspects of domestic nuclear energy. As a fuel source, nuclear energy generates 20 percent of our domestic power and constitutes over 60 percent of the country's clean energy. While renewables have grown by leaps and bounds in recent years, I think it is important to remember that nuclear generation is the original environmental friendly source of power generation.

While most of our fleet is under strain from economic factors, the legislation we are discussing today has the potential to reshape our focus and bring our nuclear fleet into the 21st Century. I particu-

larly want to thank my friend Congressman Doyle for working on language to address the burden that our NRC fee structure places on plants.

Mr. Park, Mr. McGinnis thank you for being here today. I would like to talk about my friend Mr. Flores' bill, the Advanced Nuclear Fuel Availability Act. This legislation is aimed at addressing many of the challenges faced by the high-assay low-enriched uranium fuel, HA–LEU, or HA–LOW. I don't know how, in my Texas accent.

Mr. Park, would you talk about how the enriching process is different compared to the typical uranium?

Dr. PARK. If you are talking about HA–LEU or H–A-L–E-U, right now the only way we can do it is by downblending from the aging stockpile that we have. Right now we can only enrich up to 5 percent. The HA–LEU is over 5 percent, below 20. So you need more work to get to HA–LEU, yes.

Mr. GREEN. In 2016, the Office of Defense Programs began working to establish domestic uranium enrichment capability in time to establish a supply of need for tritium production. What is the current domestic capacity for this production? And what do you expect the DOE capacity to be going forward when it comes to HA–LEU?

Dr. PARK. So, right now our current projection is we will run out of tritium production capacity in about 20 years or so from today. 2038 is the projected time line. So we are actually in the Office of Defense Programs at NNSA is in the process of looking at the options to see if we can actually produce our own enrichment enriched uranium for tritium production. And what we are looking for is industry partners working with Ed McGinnis and others to actually share with us their requirements.

It might be possible for us to fold in that requirement on top of DOE. We are actually very anxious to look for purpose of opportunity with the industry partners. And so it is in progress.

Mr. GREEN. What are the challenges that transportation of this highly enriched uranium lead to in comparison with the typical levels of enrichment?

Dr. PARK. So, obviously the 5 percent is the LEU. When you go to higher level of enrichment it requires totally different containers, transportation methods, and so on and so forth. And the quantity—and this is worth pointing out, and I'm going to hand it over to Ed to talk about this—quantity we are potentially facing is much larger than we ever faced. It requires a different look at the—a bit of R&D on top of everything.

Mr. GREEN. Mr. McGinnis?

Mr. MCGINNIS. Yes, indeed. In fact, transportation is key. I would like to express appreciation for this subcommittee and the bill to address the issue of transportation. I think it is time, very timely to look at it now. We need to plan in advance to support, hopefully, a successful advanced reactor fleet coming in through the pipeline with new high-assay LEU fuel.

As Dr. Park said, right now we are relying on a limited and ever-decreasing supply of high-enriched uranium. Ultimately there are a couple of additional pathways one can secure that supply. And the most traditional way is through enrichment.

And as Dr. Park said, the Department of—well, the NNSA side of the Department of Energy is looking at it from defense require-

ments primarily in tritium production. So that time line I would suggest—and this is part of the challenge—we may have a much earlier time line in the commercial sector, maybe as soon, as I indicated, mid-2020s where the commercial sector will need high-assay LEU. When you get that, you also not just need enrichment cascades, but you are going to need conversion, you are going to need fabrication, you are going to need actually new NRC license packages, transportation packages. So there is quite a lot to be done.

Mr. GREEN. One last question. Do you think——

Mr. SHIMKUS [presiding]. The gentleman's time has expired.

Mr. GREEN [continuing]. The legislation addresses these challenges?

Mr. MCGINNIS. I would say that I appreciate the focus. We do believe that it addresses the challenges. And we stand ready to work with the subcommittee.

Mr. GREEN. Appreciate the chairman.

Mr. SHIMKUS. Pretty sneaky getting that last question in there.

The chairman now recognizes the gentleman from Illinois, and one of the authors of this legislation, Mr. Kinzinger, for 5 minutes.

Mr. KINZINGER. Thank you, Mr. Chairman. And thanks for your leadership on this issue as well. And thanks for holding today's hearing.

As many of you know, my district is home to four nuclear power plants. And I continue to be deeply concerned that we are ceding U.S. global leadership in the nuclear space. I introduced H.R. 1320, the NUKE Act, with Congressman Doyle to make common sense reforms in the NRC recovery structure, fee recovery structure. And I am pleased to see it included.

I still like NUKEPA, but in the spirit of our Founding Fathers and compromise, I was happy to relent on that.

Section 2 of Congressman Johnson's bill requires the Secretary of Energy to report on all legal, regulatory, and commercial barriers imposed on our domestic nuclear industry. Compare those to our foreign—compared to our foreign competitors and recommend ways to improve our global competitiveness.

Dr. Park, as part of your confirmation process you stated that you would continue to work with American companies so that they may engage in civil nuclear commerce around the world. Based on your previous experience, as well as your initial impressions leading NNSA's Defense Nuclear Proliferation Office, have you identified some of the actions that inhibit competitiveness at the U.S. nuclear industry?

Dr. PARK. So the standard practice asked me that. As I mentioned earlier, we look at the big picture and we do the best we can. And now the challenge is that the world is evolving so fast, as it was stated, in the last four months alone the world changed. And that there are new actors coming in to have more nuclear power and so on and so forth. And I need to recognize the fact that our policies, and procedures, and processes are a little bit behind time at times, and that we need to find a way to accelerate it and make it more meaningful so that we can apply the latest standards.

So I would not necessarily call them deficiencies. That is how our system works. But at the same time, I appreciate your involvement

and the committee's engagement so we can actually better implement the guidelines you might give to us.

Mr. KINZINGER. Thank you.

Mr. McGinnis, you have heard me speak about the DOE's Nuclear Energy International Program. Could you offer some preliminary observations about how our foreign competition, specifically the Russians and the Chinese, use state-backed resources to strategically use their civilian nuclear programs and undercut our interests?

Mr. MCGINNIS. Indeed they do. And they use the full breadth of resources that they can draw on from their respective governments. I have seen it firsthand with Rosatom in Russia and the Big 3 utilities in China.

The competition, one cannot overstate how foreboding and how challenging it is for American companies to compete against states. That is the fact. They bring financing. They bring deep, deep offers for training, for resources. In many other areas we are working really hard to try and support in our own—let me back up and say what we don't want to do is try and compete and be seen like a Russian company, like a Chinese company. We believe we are far more innovative, far more appealing. We bring our systems, our safety and security. So we do believe we can compete and win.

But it takes strong Government support and advocacy from the United States. And it takes—and I think we need to all be, you know, just always continue to say we need to try and do better, in our efficiency for our regulatory reviews, for our license reviews. We need to continuously try and maintain the high level of safety while making it as easy as possible for these companies that are already in a formidable position to be able to complete and win.

Mr. KINZINGER. Let me ask you, and I am sorry to do this, but put yourself in the sick and twisted mind of Vladimir Putin. What would be the reason you would want government support for the nuclear industry? What is your 10- or 20-year goal in that? What do you want to see a world that looks like X?

Mr. MCGINNIS. Well, in just my own opinion, again having worked with Rosatom employees for quite some time in a competitive way, first of all they want to dominate the nuclear sector. I don't think, at least my colleagues, I have had difficulty with my Russian company colleagues seeing the virtue of competition. It is more of a monopoly objective.

Mr. KINZINGER. And let me ask you more specifically, do you think Vladimir Putin looks at this as an economic benefit to his country or a national security benefit and ability to spread influence of Russia?

Mr. MCGINNIS. Oh, so my first point was economically or sectoral-wise dominating as much as possible, but strategically nuclear energy goes well beyond, certainly in foreign countries, well beyond just electricity on the grid. So when one wins a commercial nuclear deal for a reactor, it is a 100-year relationship. It is a unique leverage point one has with those foreign countries. And it is, frankly, coveted by our competitors from a strategic perspective.

Mr. KINZINGER. Thank you. And thanks, Mr. Chairman, I yield back.

Mr. SHIMKUS. The gentleman's time has expired. The Chair now recognizes the gentleman from Pennsylvania, Mr. Doyle, for 5 minutes.

Mr. DOYLE. Thank you, Mr. Chairman.

Dr. Park, I appreciate the Department's commitment to streamlining the processing times to export nuclear-related goods under the Part 810 process. International markets represent a critical opportunity for domestic nuclear companies and their suppliers. And the ability to export these products remains important for U.S. companies. These opportunities can mean hundreds, even thousands of jobs, for hardworking Americans.

My question is, how is the NNSA working with other agencies to ensure that this trade can continue to support American jobs without violating the NDAA review requirements and without posing a threat to national security? And more specifically, can you provide more information on the agency's overall strategy with regards to exports to China?

Dr. PARK. So, when it comes to China, there is a very specific requirement under NDAA 2016 that requires OD&I review. And it gets very difficult. So I would be more than happy to provide additional information.

When it comes to NNSA doing its job to help accelerate the appropriate sharing, peaceful use of nuclear technologies and so on, I think that with this committee's help and assistance and guidance I think we have got the right frame of mind in terms of what we can do. For example, as I stated earlier, there is parallel processing. In other words, we don't wait for State Department to achieve, to get the country assurance on safeguards. We actually do the processing as if it is a done deal and we converge at the end.

So instead of doing things in serial or the sequential manner, we do things in parallel at the same time. This new e810 process that we have adopted that you encouraged us to pursue is putting more what I call a transparency to all the users. They know what the package is. It is actually worth repeating a couple more times because instead of—in the past they didn't know where their package was in the approval process. But now they can actually call us.

You know, some of the stories that my staff have been sharing with me, for example. You know, a couple of them got to know how to use the e810 system. It took them a while, but now they are thinking, the program managers are sitting in the back or they help because they can actually move things along much faster than ever before. And these are repeat users that we are talking about. And I am happy to report to you, again, roughly 15 percent of the users from the commercial sector using our e810, I think that number would grow.

And so there are some really good signs with the e810 process. And, again, I need to caution all of us, you know, much of the delay does not come from our side. But, again, we have to wait for country assurances through the State Department, and sometimes that takes a year or more.

Mr. DOYLE. I would appreciate you corresponding with our office. We'd like to get a better sense of the strategy with regards to China. And I would appreciate that.

Dr. PARK. Yes.

Mr. DOYLE. Mr. McGinnis, I am glad to see your department's commitment to nuclear energy. We all know that investments in research and advanced nuclear technology are important, and in addition to supporting our existing fleet. I am concerned, though, that the President's fiscal year 2019 budget has proposed to reduce funding for nuclear energy by cutting $259 million below the FY 2017 enacted level.

Do you think that reforming the NRC fee structure could reduce the downward pressure on nuclear plant operators?

Mr. MCGINNIS. With regards to the—thank you very much for the question. I respectfully would need to defer to the NRC as an independent agency on the fee structure. But I will say overall, obviously as indicated earlier, the fees are a significant factor in many U.S. companies attempting to get their technologies licensed and their operation license received. So it is a very significant factor.

And so we certainly support the most efficient, least costly pathway with the highest standards of safety that makes us world-class products that we have to provide.

Mr. DOYLE. Let me ask you this, too. I do think that energy markets currently consider carbon, the carbon-free attributes of nuclear energy. And we have seen State policies that take these attributes into account. And I want to—do you support States' ability to properly account for these attributes?

Mr. MCGINNIS. Certainly respect the States' decisions to do, to decide how to do that. That is the States' rights. And so we approach it from a resiliency perspective, trying to address the structural issues that, frankly, at times don't price, or don't price the value of resiliency.

But with regards to States, certainly we respect that approach to support their electricity sources.

Mr. DOYLE. Thank you. I yield back, Mr. Chairman.

Mr. UPTON [presiding]. Mr. Long.

Mr. LONG. Thank you, Mr. Chairman.

Mr. McGinnis and Dr. Park, I have got a question for both of you. Dr. Lyman's testimony suggests that any country that has access to light-water reactor technology is just a step away from becoming a nuclear weapons state. However, his testimony neglects to mention the International Atomic Energy Agency and international safeguards that are in place in addition to the U.S.'s capability to monitor nuclear fuel cycle programs around the world.

Would you please describe the respective roles of NNSA and the Office of Nuclear Energy in supporting the IAEA program?

Dr. PARK. So, yes. NNSA does work closely with IAEA. In fact, we provide much of the technologies to IAEA and train them, and in terms of light-water reactor and so on and so forth.

Any nuclear technology that actually produces plutonium we care about, we worry about. And there are no exceptions. As I stated earlier, we actually look for who these partners are and how they actually protect the materials, spent fuels, or whatnots, to make a determination as to what kind of arrangement we could have. But, again, there is no one-size-fits-all approach that we have.

But, again, the light-water reactor, the fuel does have plutonium built in, so we need to worry about the results. We cannot ignore that aspect.

Mr. LONG. Mr. McGinnis?

Mr. MCGINNIS. Yes. The Office of Nuclear Energy also works closely with the IAEA and also the NNSA. And we do commit a significant amount of funds for that work, including for safeguards, and security, and safety ultimately, both directly and indirectly.

I would say one other point. And this is my view, it is just reality. We have these large state-owned suppliers. They are going to provide the choice if we don't provide an option to foreign countries that are considering nuclear energy. If we just say no, then they will very likely still proceed. And they will just proceed with another supplier with a lower level of safety and security. And we will also have lost a great number of other benefits, including a 100-year relationship with the highest standards of safety and security.

Mr. LONG. Again for both of you, can you briefly describe the U.S. programs to track and identify emerging international nuclear programs?

Dr. PARK. So, obviously, there is open literature. And we actually do track, you know, the progress being made throughout the world. And we have avenues, as well, that I am more than happy to brief you at appropriate locations.

Mr. MCGINNIS. And we do participate in the materials tracking within the Department, with NNSA playing a lead role.

Mr. LONG. Well, would you agree with Mr. Lyman's assertion that any country that has access to nuclear energy can easily develop a nuclear weapons program, presumably without the international community's knowledge?

Mr. PARK. So, as a physicist, is it a possibility? Yes. Is it likely? It is very difficult. Especially at what we call the production scale, I hope our monitoring technologies, and our partnerships with IAEA, and our international partners we should be able to do a good job on who these actors might be.

And should I be concerned? Of course. But, again, we have adequate technologies to help us to monitor the situation globally. And, again, I am more than happy to provide you with additional information.

Mr. LONG. Yes, well that is what I would hope. And that is, that is what I would think. But I just wanted your opinion.

Mr. McGinnis, do you care to weigh in?

Mr. MCGINNIS. I do not believe it would be easy.

Mr. LONG. OK, thank you.

For you, Mr. McGinnis. In your testimony you mentioned the advancements around nuclear reactor design that are currently underway. Can you talk a little bit about these technologies and, if proven to work, how they can help revolutionize or revitalize, excuse me, revitalize our nuclear energy sector?

Mr. MCGINNIS. Thank you very much. Yes, we are in my view at the precipice of an entirely new, innovative phase in the U.S. nuclear energy sector. I don't say that lightly. We are seeing it happen right now.

The advance reactors such as the advanced SMR for the first time going through the NRC, receiving the first phase approval, in-

cluding passive safety features, validates that they do not need any electric pumps or motors in order to be able to safely shut down because of the passive safety system. This is just one example of many of the advanced reactor designs that are coming out of the United States' nuclear innovation community that offers a step change, step change improvement on what is already strong safety in our reactors, number one.

Number two is their versatility. We are witnessing reactors being designed that are unlike anything we have seen. We have reactors, advanced reactors that are designed to be able to go from 0 to 100 percent power in 60 minutes. That is load following. We haven't seen that with large reactors.

We have finance ability for the advanced reactors unlike what we have seen. Instead of $8 billion per unit, not including financing, we are talking maybe a billion, maybe a billion and a half for a substantial generating capacity.

We also have distributed opportunity where we have the opportunity now to place smaller reactors, modular scaled-up reactors in locations we never could do with a large reactor. So, product choice, versatility in application, desalinization or hydrogen production, this is an entirely new class of disruptive reactors, and that is why we are so excited about this.

Mr. LONG. This is a very important hearing we are having here today. And I want to thank both of you for taking the time to be here and sharing your knowledge with us.

Mr. Chairman, I yield back.

Mr. UPTON. The gentleman yields back.

Mr. Tonko.

Mr. TONKO. Thank you. Thank you, Mr. Chair. And thank you, gentlemen, for joining us and for your insights on these bills.

Administrator Park, Dr. Park, I have a few questions on the discussion draft that addresses the Part 810 process. It is my understanding that Section 3 would expedite the review process for, and I quote, "low proliferation risk reactor technologies." However, I do not believe that these technologies are defined in the draft.

Can you offer us a sense of what types of technologies would be captured by these low proliferation risk reactor technologies?

Dr. PARK. Yes. So, obviously this is interagency effort. DOE does have a lead on determining what would go in the category, but at the same time we need to coordinate that review process with the other agencies, including State, for example. Again, it's to a large extent a case-by-case. But there is no single category that says if it falls in the category, it's free for all. It doesn't work that way.

Really because one agency appreciates or gives us flexibility at the same time as different challenges. But what is in the middle is country assurance. And that actually changes the calculation by the way. If it is a country that we have a 123 agreement with, it is straightforward. But, again, if it is not one of those countries, or China, India, or other countries it is very difficult. So we need to look at it from what I call a totality or big picture perspective.

So to that extent you can actually categorize as light-water, low-risk, et cetera, but it really depends on who the recipients are.

Mr. TONKO. Thank you. Currently, would those Part 810 reviews qualify as low proliferation risks?

Dr. PARK. I need to get back to you. I don't, basically don't have specifics on.

Mr. TONKO. OK, thank you. Does the Part 810 process look just at the technology or also the conditions within the potential partner country? That is to say is the current review process the same for each potential partner country?

Mr. PARK. I also need to get back to you because it is quite different from, you know, case to case. So maybe it might be more appropriate for us to give you solid data with a sample, with great examples as to what we are doing for several countries so you have appreciation for the challenges that we have.

Mr. TONKO. OK. And you will forward that to us?

Dr. PARK. Yes.

Mr. TONKO. Your testimony mentions that currently the lengthiest part of the review is the time it takes partner countries to provide the required governmental nonproliferation assurances. Can you give us some examples of these assurances?

Dr. PARK. So, we actually apply conditions so that they can actually enjoy U.S.-developed technologies. But these conditions require that they do not share with the third parties, and they do not actually modify without conditions and so on. It goes on and on and on.

Oftentimes the host countries or the recipient countries when I think about this because there are obviously ramifications for they sign up for some things without fully understanding. But so it's along that line that satisfies.

Mr. TONKO. But are these assurances different for each export partner country?

Dr. PARK. To a large extent. There is variation, obviously. As, for example, countries that we have a 123 agreements went through the review process with us at the highest level, so they know the what I call boundary conditions as to how to receive our U.S.-developed technologies.

But, again, when you leave that small group of countries, which is 20-some-odd countries, the rest of the world still needs to go through the category process, how they respond to our requests and so on. We do a lot of hand holding but there is a limit as to how much we can do. We cannot speak for their countries.

Mr. TONKO. My understanding is that the discussion draft would allow DOE to continue the review while it waits for the State Department to secure the assurances. Would this bill reduce or limit the time it takes for the State Department to secure those given assurances?

Dr. PARK. It is a separate process, somewhat decoupled. At the same time because of our experience working with our international partners and our industry partners who are actually trying to export the technologies, I think we can actually give them the right answers. It is up to them whether to take them or not. But, again, we can actually show them what steps they need to take. And, again, this is open to test, if I can use that phrase.

Mr. TONKO. But do you think there should be limitations on how long the State Department might have to obtain these assurances?

Dr. PARK. So, it also depends on whether we have agreement with a country. I would stress, as was stated, that it really depends

on what kind of assurance they provide us to safeguard our technologies.

The biggest fear I personally have is our technologies go into wrong hands and we don't have any assurance that we know what they do with that technology that we have transferred. Safeguards concerns are monumental in what we do, even in the e810 process.

Mr. TONKO. So those limitations are—could be critical.

Dr. PARK. Yes.

Mr. TONKO. With that, Mr. Chair, I thank you and yield back.

Mr. UPTON. The gentleman yields back.

Dr. Bucshon.

Mr. BUCSHON. Thank you, Mr. Chairman.

The Department of Energy's public/private partnership with Nuscale Power which followed a similar effort that led to the licensing and construction of Southern Company's new nuclear reactors has proven to be a successful model to address a costly regulatory approval process for new nuclear technologies. Congressman Flores' legislation builds on that model with a public/private partnership for advanced nuclear fuel needs.

Mr. McGinnis, DOE's Isotope Program includes an industry consortium to help meet specific needs, material needs of californium-252, which is used for an assortment of industrial applications. This consortium could be a model for the consortium in Mr. Flores' bill.

Has your office discussed how the Isotope Consortium could apply to an advanced fuel program?

Mr. MCGINNIS. Thank you very much. Isotope production is very important. There are certainly applications for advanced reactor technologies. But with regards to the lead for isotope production, that is both within the Office of Science and also NNSA. So if you don't mind, respectfully I may ask Dr. Park. I don't know if you have any refer—anything you want to say on the isotope production.

Dr. PARK. If it is appropriate we will get back to you because it involves yet another member within the DOE family, and they do more of that work. And isotope production that we are responsible for is really just purifications for medical isotopes or in R&D.

Mr. BUCSHON. Yes, if you can get a response back to the committee, that would be great. I would appreciate it.

I yield the balance of my time to Mr. Shimkus.

Mr. SHIMKUS. I thank my colleague.

I just wanted to follow up on Adam Kinzinger's comments about the international aspect of this. I deal a lot with the Baltic countries, Eastern European issues, so I focus a lot on the Astravets plant being constructed on the border between Lithuania and Belarus. And I just want to highlight a couple issues on this.

The International Atomic Energy Commission recommended a six-step process to review building of nuclear power plants to prevent disasters like Chernobyl and also, recently, Fukushima. Belarus has chosen to skip four of the six steps. That already identifies a concern.

When asked why they want to build this plant, the President of Belarus said, "This is a," and I quote, "a fishbone in the throat of the European Union and the Baltic States." So it is not a power

plant being constructed for energy security, energy efficiency, it is really economic warfare against Eastern European countries.

Nuclear power plants in sensitive areas should be discussed within the Espoo Convention, which this is not. Nearly all of Lithuania is 300 kilometers of the plant, which means that if a disaster were to strike, long-term food consumption in the country could be affected, the drinking water could be affected.

But there is also concerns, again highlighting what Adam was trying to raise on the national security aspects of this. Incidents occurring and cast on Belarus' commitment to working with neighbors and ensuring the plant's safety. In 2016, six serious incidents occurred, and Belarus has failed to be up front with Lithuania about any of them. A 330-ton nuclear reactor shell was allegedly dropped from about 13 feet. This was two summers ago now, not last summer. Belarus did not reveal anything about the incident until independent media reported it, and then downplayed it.

Earlier, a structural frame at the site collapsed after workers, apparently under time pressure, filled it too quickly.

So, and this is all based upon a statement in the record I did for the Congressional Record on the floor just raising this issue. So the international concern, state-sponsored actors versus competitive marketplace do bring a point of needed discussion to this debate. So I appreciate that. I just wanted to be additive to what Congressman Kinzinger has stated.

With that, I want to thank my colleague from Indiana and yield back to him.

Mr. BUCSHON. Yes, I yield back, Mr. Chairman.

Mr. JOHNSON [presiding]. The gentleman yields back.

We now recognize the gentlewoman from Florida, Ms. Castor.

Ms. CASTOR. Thank you very much. And thank you, Dr. Park and Mr. McGinnis, for being here today.

I am very passionate about the United States remaining a leader in technology and innovation, especially in nuclear energy. I believe the commercialization of nuclear technology can be positive in that expanding and exporting this technology can be beneficial to businesses here on our economy and on international security.

But I have concerns about the discussion draft that makes changes to DOE's Part 810 process. I believe the Secretary of Energy should have more discretion when reviewing authorization. But I question whether or not the legislation as drafted is as precise as it should be, actually providing a firm definition of low proliferation risk.

And then I am also concerned that the application time line for low proliferation risk reactor technology will be untenable in the long run.

Dr. Park, can you share with us how DOE currently defines low proliferation risk?

Dr. PARK. So with the—because of the many different parameters in reviewing the applications, for example, again the biggest factor is the recipient country risk. It is not a simple formula that actually would work for us. So only as they fit in the certain categories, for example, as I stated earlier, if we already have established a relationship through 123 agreements we can go through a 5-week

expedited process. It is not a big deal. We actually have done that before.

But, again, if you don't belong in that category it becomes much more difficult. We need to actually work with them so they know what we are looking for and they can provide responses that we need to have to make sure that our technologies aren't shared in a manner that is not appropriate.

So I do appreciate the fact that we need to find a way to expedite the processes. Again, we are somewhat limited in what we can do in terms of whether they already have an agreement with us or not. So, to that extent I would like to look for ways to work in these countries as best as we can so we can minimize, we can actually manage the risks in sharing U.S. technologies with these countries.

I do apologize for giving you a roundabout answer, but it really depends on who the host countries are.

Ms. CASTOR. Mr. McGinnis, do you have a comment on that?

Mr. MCGINNIS. Just to say, obviously the Office of Nuclear Energy, its mission, the U.S. nuclear industry greatly relies upon this very important Part 810 process, as well as the two other export control authorities at the Department of Commerce and also NRC, as well as the 123. So this is a process, I think, that we are all collectively always trying to improve.

Ms. CASTOR. Maybe you can rally those folks to look at that, that portion of and definition.

Mr. MCGINNIS. Yes.

Ms. CASTOR. That would be helpful.

Mr. MCGINNIS. Will do.

Ms. CASTOR. Dr. Park, do you foresee any challenges with the draft legislation that could hinder the U.S. as a producer of commercialized nuclear technology?

Dr. PARK. I don't see any showstoppers. If I can give you that as a response. The fact that the committee is very involved with us and asking our technical assistance and interpretations, we welcome it. We look forward to continue the relationship. I think it is a positive step where we see many positive signs.

Ms. CASTOR. How about national security risk? I know you can't go into detail, great detail there, but are there any national security risks that could develop as a result of the changes made in the discussion draft?

Dr. PARK. There are always possibilities and potentials. And I think we are comfortable, we are confident that we can actually mitigate some of those risks along the way. And again, the minimizing and managing risks is what we do on NNSA's side. And so far I think that we have a pretty good handle on how to move forward with this whole situation and as far as the process of technology sharing and so on and so forth.

But again, there are some things that just take time. And we appreciate your patience on it.

Ms. CASTOR. Sometimes time is important when we are talking about national security. But I, I believe that the U.S. has to remain the leader in nuclear technology. And as I mentioned before, there are many benefits associated with reforming Part 810, but there could also be unintended consequences. And that's what we need to focus on.

I want to ensure, I want to ensure that we are proactive and efficient, as you said, when it comes to the commercialization of the nuclear technology. But we are counting on you and the experts out there to help poke and prod at this piece of legislation to make sure there are not unintended consequences.

Dr. PARK. We will. And we will work with you.

Ms. CASTOR. Thank you. And I yield back.

Mr. JOHNSON. The gentlewoman yields back. The Chair now recognizes himself for 5 minutes.

Dr. Park, I understand that for many years the Department allowed the Secretary to delegate signature authority on Part 810 authorizations. And it was only recently that DOE's general counsel revised its previous interpretation to disallow this delegation.

Section 3 of my discussion draft simply clarifies in the Atomic Energy Act that the previous process was acceptable. So do you know if there were any delegations to your knowledge that involved unacceptable proliferation risk or created an unacceptable lack of visibility by the Secretary's office over the proposed exports?

Dr. PARK. So, my understanding is that there was not a delegation because of interpretation of the law, the way our general counsel read the law. And it is not because of lack of the appreciation for our technical staff.

But again, we actually welcome this opportunity to delegate some of these "routine" things, although there is nothing routine about sharing nuclear technologies. But again, we appreciate it.

Mr. JOHNSON. But I mean back when they were, because it was previously delegation was allowed. So when delegation was allowed are you aware of any delegations that, that involved any unacceptable proliferation risks?

Dr. PARK. I don't think there was any delegation in the past. That's my understanding.

I am more than happy to correct myself after this hearing and get back to you.

Mr. JOHNSON. OK. Well, based on your understanding of the decision, was the legal interpretation made in any way because staff weren't qualified or able to appropriately consider the impacts of the specific application?

Dr. PARK. Not at all. I think there is the highest confidence from the beginning of all the secretaries we have had on the technical qualifications and their judgment. It is a matter of how one read the law, and it is as simple as that.

Mr. JOHNSON. Back to that first question. Would you, would you go back and take a look at that? Would you look and see if there were any delegations? Because it was my understanding that we used to do it that way and that there were. So I would like to clear that one up.

Dr. PARK. We will get back to you.

Mr. JOHNSON. OK, thank you.

Based on NNSA's review of the process, would enactment of this bill to revert to the previous delegation process have the practical effect of shortening the review process with minimal proliferation risk? Do you think it is a smart thing to do?

Dr. PARK. One-word answer: Yes. And obviously, as a physicist I will give you a 10-minute answer which you don't need right now.

But, again, I think there are enough good qualities in the proposed legislation, and we will work with you. I think this is a positive sign. So, there are many things that we know how to fix. And this legislation will certainly help us to achieve that goal.

Mr. JOHNSON. OK. All right.

Dr. Park, continuing on, could reverting to the pre-2005 process by which DOE can review an authorization in a concurrent process as the State Department's required process, would that help reduce the overall time frame, approval time frame?

Dr. PARK. Yes. The biggest challenge, again, is waiting for our partner countries to provide assurances. And there is just no simple way to get the answers.

At the same time, one of the things that we have been doing is that we actually give "credit" for these countries having 123 agreements with us. So there are some exceptions that allow us to accelerate the sharing the technologies. But, again, there are just a few dozen countries that we have a relationship with.

Mr. JOHNSON. OK. All right. And would this change to the approvable process in any way reduce information that is reviewed, weaken the rigor of such reviews, or alter the various agencies that concur, or consult on the authorization in a manner that could undermine our national security interests?

Dr. PARK. So when I look at the positive side of this legislation it might actually help us because, for example, this online system would allow all the reviewers to actually look at each others' comments, for example, in real time. So I see potential positive changes that this system, this legislation will produce. But, also, we will look for unintended consequences along the way. You don't want to hurry up too fast, too much on some of the review processes.

But, again, there are enough positive signs that we are really embracing this legislation.

Mr. JOHNSON. OK. All right. Well, I will yield back my total of 21 seconds. And with that I think we have no colleagues on the left that want to ask questions.

Mr. Flores, you are recognized for 5 minutes.

Mr. FLORES. Well, thank you, Mr. Chairman. I want to thank the witnesses also for joining us today. This is an important discussion. Nuclear power is the ultimate admissions-free, green-power source, particularly when it comes to the generation of baseload electricity. And so it is important for our country moving forward, not only for economic opportunity, national security, and also for the environment.

Earlier this year I asked both Under Secretary Menezes and you, Mr. McGinnis, about collaborating to develop a policy to provide high-assay LEU. NNSA officials also testified at both of these hearings. Thus far DOE and NNSA's input in this discussion draft has been limited.

Dr. Park's testimony notes that there are efforts underway relating to high-assay LEU, and I hope to increase our collaboration as we work towards formally introducing this legislation.

Let's turn to a few questions. One provision in my discussion draft relates to the need to develop what is known as criticality benchmark data. This data is important to develop the underlying information to establish the necessary safe regulatory framework

for the provision of nuclear fuels. Mr. McGinnis, can you succinctly describe the nature of this criticality information, why it is necessary, and what Government or non-Government facilities will be able to gather this type of data?

Mr. MCGINNIS. Thank you very much. The benchmarking data is very important for a number of reasons, including transportation and packaging. This, in part, is because the criticality issues where you have a higher level of enrichment, and so whether it is needing new NRC licensed transportation systems to be able to transport in the U.S. enriched fuel above 5 percent, much of the fuel that is anticipated to be needed will be as high as 17, 18, or 19 percent.

Mr. FLORES. Right.

Mr. MCGINNIS. So the configuration, the way the materials is packaged. But a lot of this also is driven by what we are waiting on. And that is waiting to get a better sense, even though we want to get as much data as possible, who are the first movers? And what are the types of reactors—are we talking metal or are we talking oxide fuel? And different reactors designs have different types of fuels.

Then there are other options for transportation as well, including in gas form.

Mr. FLORES. Can we move to the next part of the question, that is, what Government or non-Government facilities are available to gather this type of data?

Mr. MCGINNIS. Well, the Department of Energy—first of all let me, again, recognize that the front end enrichment capacity is addressed, is being addressed fairly well in the U.S., particular by—in particular by LES for the enrichment services. And I would say that the industry is poised to respond to additional needs, including high-assay LEU when they see the market coming and the customers coming in at a sufficient volume. So, in the meantime the Department of Energy does stand ready to make available its facilities to be able to do that data benchmarking, and other testing.

We are doing some now. We are working with industry now in order to get as much of a clear understanding of what types of fuels are going to be needed when.

Mr. FLORES. OK. Dr. Park, you indicate in your testimony that you agree that advanced reactors will require HA–LEU. You note further that you will evaluate that need alongside the needs for our Nation's defense programs. The question is are these two programs on the same time frame or different time frames?

According to your testimony there is ample fuel for weapons use available today. But it is unclear that there will be ample fuel for advanced civilian reactor use over the next 10 years. Is it appropriate to suggest that DOE's civilian nuclear program should focus on the near term commercial needs while your office can look at the longer term defense enrichment requirements?

Dr. PARK. So, as it turns out, even for the self-absorption program tritium production requirement that we need to start the work today because of the long lead time it takes to get the production up and running. So time is appropriate for us to collect the requirements from industry partners.

It doesn't necessarily mean we will incorporate the commercial sectors we find through our DOE. Our commitment is to review all

possibilities and make sure we stretch every dollar that we have to produce the enriched uranium. But, again, at the earliest moment we can collect and incorporate the requirements we will have a better idea as to what actions are available. If indeed we start with the enriched uranium enrichment then later it will stretch out into much longer and that will give us more options in terms of entertaining possibilities of supporting commercial sectors.

So it really depends on the requirements within——

Mr. FLORES. It is possible our bill could help you in terms of our Nation's defense needs, as well as taking care of HA–LEU for advanced, for the advanced sector.

OK, we have run out of time. I will submit additional questions for the record. I appreciate those responses.

Thank you. I yield back.

Mr. JOHNSON. The gentleman yields back. And I want to, seeing that there are—I am sorry, I didn't see Mr. Griffith walk in. Mr. Griffith is recognized for 5 minutes.

Mr. GRIFFITH. Thank you very much.

Mr. McGinnis, nearly a year ago President Trump announced the administration was going to conduct a complete review of the Nation's civil nuclear policy. Following your appearance before this committee in early February you were asked to provide information for the record regarding this ongoing review. Nearly three months after those questions were submitted to you, we have not yet received a response from you or your team.

So, I would like to ask a few questions about this ongoing civil nuclear review, and I would request that you please answer yes or no so we have time to get to all of them.

As a principal on the National Security Council is the Secretary of Energy providing direct input into this ongoing review? Yes or no?

Mr. MCGINNIS. Yes.

Mr. GRIFFITH. Are you aware if the review is engaging with other governmental agencies such as the Department of Commerce and the Department of State?

Mr. MCGINNIS. Yes.

Mr. GRIFFITH. Are you aware if this review is receiving input from non-Government stakeholders?

Mr. MCGINNIS. I cannot say yes or no on that one. I do not know.

Mr. GRIFFITH. OK, thank you.

Are you aware if the review intends to seek input from Congress to inform the review?

Mr. MCGINNIS. Again, I can't speak for the White House on whether they, when they plan, if they plan to give input.

Mr. GRIFFITH. But input's a good thing from Congress, wouldn't you agree? Yes or no?

Mr. MCGINNIS. It's a good thing.

Mr. GRIFFITH. All right. To the best of your understanding, and obviously this can't be yes or no, to the best of your understanding when do you expect the review to be completed?

Mr. MCGINNIS. I do not know the answer to that, other than the fact that I can tell you that we have attended quite a few meetings, very substantive. We have made significant progress.

And I can also say that our charge at the Department was not to wait for any completion to be able to do things that we can do now, whether it is loan guarantees, whether it is notice of proposed rulemaking, whether it is industry quotas or supporting the revitalization.

Mr. GRIFFITH. And I appreciate that. And I hope included in that would be recommendations that you need legislative support. And that was the last of my series of questions as to the best of your understanding where the review makes specific legislative recommendations for Congress to consider. And I would hope that even if it is not finished, if you find one let us know, because we cannot operate on those suggestions if you don't give them to us.

Mr. MCGINNIS. And, respectfully, I would like to apologize for not getting those answers to you. I am fully aware of them. I have been part of that process giving the answers. But, unfortunately, it is taking longer than we had hoped for to get them back to you. We will get them back to you.

Mr. GRIFFITH. Well, I appreciate that. I am glad we were able to clear this up a little bit today.

As this morning's hearing clearly indicates, as well as the dozens of other Energy and Commerce Committee hearings in this Congress there is a strong bipartisan support to address key challenges confronting our Nation's nuclear sector. And I hope the administration will commit to working with us as we go forward.

Mr. MCGINNIS. Absolutely.

Mr. GRIFFITH. Thank you very much. And I yield back.

Mr. JOHNSON. The gentleman yields back.

We are now pleased to recognize the gentleman from North Carolina, Mr. Hudson, for 5 minutes.

Mr. HUDSON. Thank you, Mr. Chairman. I want to first thank Chairman Upton and Ranking Member Rush for holding this very important hearing. Thank both our witnesses for being here and taking so much time with us.

A number of studies have identified the potential benefits of applying advanced nuclear reactor designs to fill specific national security needs. Mr. McGinnis, you have talked a lot about the microreactors and sort of what you see in the future. I represent Fort Bragg, the largest military base in America. This is an issue that I am very interested in.

I believe it is critical that we have your input on how we can improve the safety and security of our soldiers in the field on military installations, as well as critical DOE sites around the country. Mr. McGinnis, I asked for information regarding ongoing DOE and Department of Defense discussions on this topic back in February after a subcommittee hearing. And I am disappointed that I haven't gotten any response. I really wanted to get some of this feedback as we were developing my discussion draft.

I hope you will carry this message back to the Department's senior leadership that this committee expects more timely and coordinated response in advance on our agenda because, again, we value your input and think it will improve the process.

Mr. MCGINNIS. Again I apologize. But I would like to reinforce the importance of microreactors as a key aspect potentially for resiliency and also, of course, security, establishing a secure energy

supply chain by having indigenous generation on site. So there is tremendous potential value to having a microreactor potentially on site supplying power for a base or other Federal or non-Federal facility.

Mr. HUDSON. I appreciate that.

And I want to thank Mr. Peters for working with me on the discussion draft. Our discussion draft asks a number of questions to help identify key components of how a pilot program might be developed. Briefly, Mr. McGinnis, are the topics in this bipartisan bill the right questions to ask for Congress to make a fully informed decision on the framework of this pilot program?

Mr. MCGINNIS. Yes, indeed. In fact, I have been meaning to say how timely and how appropriate and, frankly, how important the issues that have been addressed, are addressed in these four pieces of legislation, are incredibly important. We are in a key moment in time to revitalize, and the support as we are seeing in this legislation, the issues that are going to be vital if we are to succeed.

Mr. HUDSON. Thank you for that.

Are there any additional issues that we should be aware of relative to, particularly, my discussion draft?

Mr. MCGINNIS. Just to say, again, we are in a key moment in time. Industry needs all the help we can give them in the appropriate way to get back on a revitalized footing to be able to not only supply resilient power in the United States but to be globally very, very competitive. Thank you.

Mr. HUDSON. I appreciate that.

Dr. Park, Congressman Johnson's discussion draft includes a section that creates an expedited process or procedures for low proliferation risk technologies. Will you please describe how you envision the development and implementation of that process?

Dr. PARK. As we have been building up the cases where we were able to, we are able to transfer technologies we would like to be able to copy that over as much as possible. But, again, there are challenges related to who the host countries are. So we still need to juggle both ends to make sure we actually provide safeguard assurances at the same time we do expedited process and approval. So it's a balancing act.

Mr. HUDSON. Appreciate that.

Like the other sections of this discussion draft, these procedures will help enable our domestic suppliers to more effectively compete in the world market, as has been mentioned by my colleagues, while not impacting our national security interests, and allowing NNSA to focus on the applications that truly present national security risks. Do you believe this section will have that intended effect? Do you think we strike the right balance?

Dr. PARK. I think it is on the right path.

Mr. HUDSON. Great. I appreciate that. And with that, Mr. Chairman, I yield back.

Mr. JOHNSON. The gentleman yields back.

And now seeing that there are no further Members wishing to ask questions I would like to thank our panelists, our witnesses for joining us here today. You are excused.

We will call up our second panel, if they would take their seats. These include Jeffrey S. Merrifield, partner at Pillsbury Winthrop

Shaw Pittman; and Melissa Mann, president of URENCO; Nick Irvin, Director, Research and Development for Strategy in Advanced Nuclear Technology, Southern Company; and Edwin Lyman, Senior Scientist, Global Security Program, Union of Concerned Scientists.

And as soon as our second panel takes their seat, just for Members' understanding and information, we will get through as many of these introductory or the witness testimonies as possible before we have to break for an anticipated vote sometime in the next 10, 15 minutes or so.

So, with that, Mr. Merrifield, would recognize you for 5 minutes.

STATEMENTS OF JEFFREY S. MERRIFIELD, PARTNER, PILLSBURY WINTHROP SHAW PITTMAN LLP, AND SENIOR ADVISOR, CLEARPATH ACTION; MELISSA C. MANN, PRESIDENT, URENCO USA, INC., AND MEMBER, UNITED STATES NUCLEAR INDUSTRY COUNCIL; JAMES NICHOLAS IRVIN, DIRECTOR, RESEARCH AND DEVELOPMENT, STRATEGY, ADVANCED NUCLEAR, AND CROSSCUTTING TECHNOLOGY, SOUTHERN COMPANY, AND MEMBER, ADVANCED REACTOR WORKING GROUP, NUCLEAR ENERGY INSTITUTE; AND EDWIN LYMAN, PH.D., SENIOR SCIENTIST, GLOBAL SECURITY PROGRAM, UNION OF CONCERNED SCIENTISTS

STATEMENT OF JEFFREY S. MERRIFIELD

Mr. MERRIFIELD. Thank you. Chairman, Ranking Member Rush, and members of the subcommittee, it is a pleasure to testify before a committee that I had the opportunity to be in front of when I was an NRC Commissioner. I am here today as a senior advisor to ClearPath Action, although I am a full-time partner in Pillsbury Law.

Founded by businessman Jay Faison, ClearPath Action's mission is to accelerate conservative clean energy solutions. To advance the mission, ClearPath Action develops cutting-edge policy and messaging and works with policymakers and industry.

During my time at the NRC and in positions I have held since then, I have had the opportunity to visit all 99 nuclear power plants in the United States, and over half of the 450 nuclear power plants around the world. I have been impressed by the commitment to excellence in nuclear power operations that I have seen at all the plants I have visited.

I would first like to turn to the matter of advanced nuclear reactors. These designs, which utilize high temperature gas, molten salt, and liquid metal, among other designs, range from microreactors of a few megawatts to large gigawatt-size reactors. While they represent a diversity of sizes and cooling methods, they generally possess enhanced safety features as well as improved economics when compared to existing reactors.

In a report issued by ClearPath in the Nuclear Industry Council in February, Pillsbury identified that of the over 50 advanced reactor designs in North America the vast majority of these are planning to use higher enrichments of fuel, typically between 8 and 19.75 percent. And some of these designs could come to the U.S. market by the mid to late 2020s.

As the development of a fuel supply and regulatory approval can take multiple years, work must begin immediately to ensure a sufficient supply of this high-assay low-enriched uranium. Unfortunately, the Department of Energy, which has been a traditional supplier of these enriched levels of material, does not currently possess the high-assay enriched uranium or enrichment capabilities that are needed for advanced reactors as the current inventory is dedicated to other needs such as research reactors and the Navy propulsion program.

The draft legislation sponsored by Representative Flores is a positive step in the right direction to address the need for DOE to create an inventory of HA–LEU material, the need for criticality information to develop and license transportation packages, and the need for the NRC to develop an appropriate and timely licensing framework.

In addition to strongly supporting this legislation, ClearPath Action's written comments provide specific suggestions for improving this legislation.

We also support the draft legislation offered by Congressman Wilson to require the DOE to prepare a report on the potential deployment of privately developed microreactors at DoD and DOE facilities. ClearPath's written testimony also includes a recommendation for strengthening this legislation.

The NRC has continued to make commendable progress in rightsizing its workforce and budget. ClearPath Action believes the Commission can and should take further steps to streamline its services consistent with the mission to protect public health, safety, and the environment.

The legislation sponsored by Congressman Kinzinger and Congressman Doyle appears to be a common sense step to provide the agency with a funding mechanism that aligns its mission and costs. We applaud the provision that excludes fees for the development of the regulatory infrastructure for advanced reactor technologies. We believe this exclusion will allow the NRC to be appropriately prepared to review these technologies, yet avoid placing the cost burden for these preparations on the nascent developers of these promising designs.

As it relates to the provision in the bill to require a study about the elimination of the Foreign Licensing Restrictions of Section 103(d) and 104(d) of the Atomic Energy Act, while I would prefer the outright elimination of the ownership requirement, I understand the rationale for commissioning a study and support it.

Recently, the U.S. has had several perfectly good nuclear reactors shut down for economic reasons. Previously, Pillsbury was previously approached by several European utilities who were interested in purchasing U.S. nuclear reactors but were prohibited from doing so. Eliminating this requirement could provide an opportunity to save these vital clean energy facilities through investment by friendly foreign utilities.

I would note that in 2008, British Energy's nuclear fleet faced similar financial hardships, and a decision to permit EDF to purchase these units allowed the continued operation of these clean UK energy assets.

We have reviewed the draft submitted by Congressman Johnson to facilitate the process by which DOE authorizes export of civilian nuclear technologies. We believe this legis—we support this legislation and believe it makes an important step to further streamline the process for some applications submitted under 10 C.F.R. Part 50.10. That said, we remain concerned that the legislation only targets a limited portion of the nuclear technology export approvals process. We have submitted some specific suggestions for improvement in our written testimony.

Thank you. And we thank you for allowing me to testify on this important topic.

[The prepared statement of Mr. Merrifield follows:]

U.S. House of Representatives' Subcommittee on Energy and Power Hearing on "DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies"

The Honorable Jeffrey S. Merrifield Commissioner, U.S. Nuclear Regulatory Commission (1998-2007)
Partner, Pillsbury Winthrop Shaw Pittman &
Senior Advisor, ClearPath
May 22, 2018

Chairman Upton, Ranking Member Rush and members of the Subcommittee, it is indeed a pleasure to testify before a Committee that I had the opportunity to testify previously during the time I served as a Commissioner of the U.S. Nuclear Regulatory Commission (NRC). I am appearing here today in my role as Senior Advisor to ClearPath Action, although my full time occupation is as a Partner in the nuclear energy practice group of Pillsbury Law Firm.

Founded by businessman Jay Faison, ClearPath Action's mission is to accelerate conservative clean energy solutions. To advance the mission, ClearPath Action develops cutting-edge policy and messaging and works with policymakers and industry.

My testimony today will focus on the future of the U.S. nuclear program, opportunities for growth and export of U.S. nuclear technologies and areas where support from the Congress and the Trump Administration would be helpful in spurring these positive developments. I will also provide comments on the four legislative measures that are the subject of this hearing.

Today, there are approximately 450 nuclear power plants worldwide that operate in 30 countries and there are approximately 60 additional plants that are under construction in 17 countries. These plants produce 11% of the total world power generation and 35% of the world's carbon free generation. In the United States, we have 99 nuclear units, and collectively these plants produce 20% of our total power, 60% of the U.S. carbon free generation and operate over 92% of the time. This is an extraordinary record of accomplishment of providing safe, clean, reliable and resilient power.

During my time at the NRC and in positions I have held since then, I have had the opportunity to visit every nuclear plant in the United States and over half of the nuclear plants in the world. I have been impressed by the commitment to excellence in nuclear power operations that I have seen at the plants I have visited. Yet, I have also been disappointed by the lack of appreciation that many in government, the public and the media have for the vital role that these nuclear units serve in ensuring our nation's energy security, sustainable economic growth and clean energy supply.

Over the last several decades, at both the state and federal level, significant incentives, grants

and portfolio standards have been established to support renewable power programs, namely wind and solar. While that has helped to diversify our nation's energy portfolio with additional carbon free generation, these policies gave short shrift to the clean energy benefits of nuclear power. I commend this Committee as well as the Trump Administration for recognizing the need for our nation to have a balanced energy portfolio and that the clean and reliable power that nuclear energy provides to our nation deserves equal standing and support.

Status of Nuclear Power Construction and Advanced Reactors

While it was just over a year ago, in March of 2017, that Westinghouse Corporation declared bankruptcy, today things look far different. Just a few weeks ago, China announced that Sanmen Unit 1, which is a Westinghouse AP1000 unit, would begin loading fuel as a prelude to initiating operations in the next few months. This was a major milestone, and China may have as many as three AP1000's, two at Sanmen and one at Haiyang, that could begin operations in 2018. While construction was, unfortunately, halted at two Westinghouse units in South Carolina, Southern Company is continuing positive momentum in its efforts to complete two new AP1000 Units in Georgia at the Vogtle site. All of this positive progress is reinforced by a recent decision of the Bankruptcy Court to allow the sale of Westinghouse to Brookfield for $4.6 billion.

Yet, when one looks worldwide, China, India, Russia and Korea continue to lead the United States in the deployment of large 1000+ megawatt nuclear units, despite the U.S. possessing the leading Generation III+ technologies. While there are a number of opportunities on the horizon for U.S. nuclear suppliers in Saudi Arabia, India, Poland and Jordan among others, continued support of the U.S. Government, including appropriate support of the ExIm Bank will be needed to level the playing field for these efforts.

An area of future growth for the U.S. nuclear industry is the continued development of advanced nuclear reactors. These designs, which utilize high-temperature gas, molten salt and liquid metal among others designs, range in size from micro-reactors of a few megawatts to large gigawatt size reactors. While there is a diversity of sizes and cooling methods among these designs, they generally possess enhanced safety features as well as improved economics when compared to existing reactors. Given those capabilities, these advanced reactors not only provide an opportunity to replace some of the nuclear units that will be retiring in the U.S. over the next 20+ years, but their enhanced safety profile could allow them to be deployed at a wider range of sites and applications than the current U.S. nuclear fleet.

Need for High Assay Low Enriched Uranium

While the pending development of advanced reactors brings with it the potential for improved economics, lowered operating costs, higher utilization factors, enhanced safety margins and greater modularity, the fuels used to operate these reactors will be of a much greater variety in their form and composition. Additionally, many, but not all of these advanced designs, will utilize higher enrichments of fuel (between 8% and 19.75%) than the current light water reactor ("LWR") fleet (typically 4%-5%).

As I stated in a report I wrote on this subject back in February, "To fully document the potential for the advanced reactor designs, Third Way, which is a Washington, D.C. based think tank, issued a report on May 18, 2017, that indicated that there are currently 56 advanced nuclear concepts in North America under development with large numbers also underway outside the U.S.[1] From information that the authors (Pillsbury) gathered, the vast majority of these reactor designs are planning to utilize higher enrichments of fuel, and some of these designs are proposed to come to the U.S. market in the mid to late 2020s. Further, a March 2017 survey of 18 leading U.S.-based advanced reactors developers found that 67% of the companies said that an "assured supply of High Assay LEU" was either urgent or important, with squarely 50% of the overall respondents saying it was "urgent." [2] As the development of a fuel supply and regulatory approval can take multiple years, work must begin immediately to ensure sufficient supply of HA-LEU.

As the infrastructure for the production of civilian nuclear fuel, as well as the regulatory processes overseeing its production and use, have all been based on the existing LWR market, virtually every element of the nuclear fuel cycle[3] has been tailored precisely for these reactors. As development and future deployment of many of the current advanced reactor designs requires utilizing fuel with higher enrichments of uranium, appropriate sources of this material will need to be identified or created, as no commercial, domestic source currently exists. This includes the means to enrich, transport, manufacture, store and dispose of this fuel. For its part, the NRC will also need to tailor its regulatory framework to meet this need.

Unfortunately, the Department of Energy ("DOE"), which has been the traditional supplier of these enriched levels of material, does not currently possess the high assay enriched uranium or enrichment capabilities that is needed for advanced reactors as the current inventory is dedicated to other needs such as research reactors and the Navy propulsion program. Our understanding is that DOE has identified some materials that could be modified to meet these needs and the recent Energy and Water Appropriations Bill that was recently marked out of Subcommittee provides helpful funding to initiate DOE's efforts.

The draft legislation that has been sponsored by Representative Flores, entitled, the "Advanced Nuclear Fuel Availability Act" is a positive step in the right direction to address the need for high assay low enriched uranium otherwise known as HA-LEU. This draft legislation quite rightly recognizes the importance of HA-LEU in the development of advanced reactors and focuses on key issues such as the need to have DOE create an inventory of this material, the need for criticality information to develop and license transportation packages, and the need for the NRC to develop an appropriate and timely licensing framework. For these reasons, ClearPath strongly supports this legislation.

We would note that Section 2 (B)(7) requires that DOE develop a program for full cost recovery of providing this HA-LEU. While we understand the fiscal discipline intended by this provision,

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[1] http://www.thirdway.org/infographic/the-global-race-for-advanced-nuclear

[2] Advanced Fuels – Looming Crisis in Fueling Advanced and Innovative Nuclear Reactor Technologies, Clearpath/Nuclear Infrastructure Council White Paper on High Assay Low Enriched Uranium, p.2.

[3] The nuclear fuel cycle includes all the steps needed to mine, process, enrich, manufacture, use, store and permanently dispose of radioactive materials, including U-235 based fuels that are used for civilian and naval power and propulsion purposes.

and support the concept that this program should ultimately be self-sustaining, we are concerned that imposing the initial DOE startup costs on a group of developers in the early stages of this effort could be prohibitive and counter-productive to jump-starting this effort. We would be happy to work with the Committee to identify options for modifying this language.

Pilot Program for Micro Reactors

Consistent with our comments above, we would also support the draft legislation offered by Congressman Wilson to require the Department of Energy to prepare a report on the potential deployment of privately developed "micro-reactors" at Department of Defense and Department of Energy facilities. We believe that this legislation has the potential to provide an important kick-start for the prompt deployment of multiple advanced reactor designs and is consistent with previous efforts to support the development of clean energy technologies at federal facilities. That said, there is one area we would suggest for strengthening the legislation.

In previous work Pillsbury has done regarding the development of power projects on federal facilities, we have found the federal contracting framework to be both confusing and overly complicated. Further, we have sometimes found our federal counterparts to be less than enthusiastic and sometimes uncooperative in carrying out Congressional mandates to develop power generation at federal facilities. You may wish to consider a new section of the report that would authorize the Government Accountability Office to review existing federal power purchase and power siting agreements and make recommendations on how they may be streamlined in a way that would better meet the intentions that you so rightly support in this draft legislation.

NRC Fee Policies, Corporate Support Cost and Licensing

Two years ago, when I most recently testified in front of this Committee, I noted that "I understand and sympathize with the concerns previously voiced by members of this Committee regarding the size of the Agency, the decrease in efficiency of the Agency's licensing actions and a view that the-overhead-activities at the Agency have grown to a level which is not commensurate with the number of licensees currently under the purview of the NRC."

Since that time the NRC has continued to make progress in rightsizing its workforce and budget and has also demonstrated an improved ability to be more timely in processing licensing actions. To that extent, we would commend the Agency. Nonetheless, we believe the Commission could and should take further steps to streamline its services consistent with its mission to protect public health, safety and the environment.

ClearPath Action believes that H.R. 1320, the Nuclear Utilization and Keynote Energy Act, sponsored by Congressman Kinzinger and Congressman Doyle, which is focused on reducing the NRC's corporate support costs and realigning the Agency's fee structure, appears to be a common sense step to provide the Agency with a funding mechanism that aligns its mission and costs. Specifically, we would applaud section (3)(b)(1)(B)(iii) which provides an exclusion of fees for those costs associated with the development of the regulatory infrastructure for advanced nuclear reactor technologies. We believe this exclusion will allow the NRC to be

appropriately prepared to review these technologies, yet avoid placing the cost burden for these preparations on the nascent developers of these promising designs. We would also suggest that the Committee consider the potential to allow some of these off-the-fee-base funds be directed towards anticipatory regulatory research that would better position the NRC to efficiently and effectively oversee advanced nuclear technologies.

We commend the Committee for continuing to encourage the Agency to focus on providing more timely and risk informed decision-making. For the purposes of developing advanced reactors, having a timely and predictable licensing process is critical, and we urge this Committee to hold the Commission accountable in this area. Consistent with this focus, we support the provisions in Section 7 of the bill which would streamline the Agency's licensing and environmental review process. As a Commissioner, I led a task force that looked at many of these same issues, and I concur with the recommended changes that are included in the discussion draft.

Finally, I would like to comment on a number of the other reforms that are included in Congressman Kinzinger's discussion draft.

Foreign Licensing Restrictions, Mandatory Hearing and Informal Hearing Procedures

As it relates to the study included in Section 4 of H.R. 1320 that would eliminate the Foreign Licensing Restrictions of Sections 103(d) and 104(d) of the Atomic Energy Act, while I would preferred that Congress simply eliminate this provision as an antiquated artifact of the Cold War, I understand the rationale for commissioning a study and support it. When I was on the Commission during the early 2000s, I and my colleagues testified in favor of the elimination of this provision as today we live in a world in which the United States is but one of 30 countries that operate civilian nuclear reactors.

Currently, Section 103(d) contains a two-part test, the first of which prohibits the issuance of a license to an individual or company that is" owned, controlled or dominated by an alien, a foreign corporation or a foreign government." The second test allows the Commission to prohibit issuing a license if in its view, "the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public." In my view, as long as the second test is maintained, the blanket prohibition on foreign ownership is unnecessary, stifles innovation and is inconsistent with free trade.

Over the last several years, we have had a number of perfectly good operating nuclear reactors shut down because of economic challenges posed by the current market for electrical power, with recent news that First Energy has said it will shut down its 4 units at Beaver Valley, Davis Besse and Perry. I can say, unequivocally, that our law firm has been approached a number of times within the last few years by utilities located in Europe which would like to purchase U.S. nuclear reactors but could not do so because of this prohibition. Lifting the foreign ownership provision could potentially provide an opportunity to save these vital clean energy facilities through investment by friendly foreign utility partners. I would further note that in the United Kingdom, the nuclear fleet operated by British Energy was faced with similar financial hardships and the decision to allow the French company, EDF, to purchase these assets in 2008

allowed for the continued operation of this key element of the UK energy system.

As an NRC Commissioner, I led a task force that looked at how to make the NRC new reactor licensing process more efficient. Among the recommendations that were included in our report was a proposal to eliminate the mandatory hearing requirements related to the issuance of power reactor licenses under Part 50 and Part 52. We made this recommendation because the Administrative Procedure Act and the National Environmental Policy Act, combined with the very open and inclusive public comment process that has been established by the NRC, provides stakeholders with fulsome opportunities to comment on proposed new reactors. For this reason, we support the study included in Section 5.

Efforts to Streamline the Part 810 Export Licensing Process

In order to ensure that the United States continues to play a leading role in the export and development of nuclear projects worldwide, it is vital that the Federal Government promptly evaluates, and where appropriate, approves these transfers. Unlike 30 years ago, when the U.S. had a virtual monopoly in nuclear commerce, today, we are just but one of many highly competitive countries vying for a role in supporting the development and operation of nuclear power plants overseas.

We have reviewed the discussion draft submitted by Congressman Johnson which would facilitate the process by which the Secretary of Energy authorizes the transfer of certain civilian nuclear technology and assistance. We support the legislation and believe it takes an important step to further the efforts to streamline the process for some applications submitted under 10 CFR Part 810. That said, we remain concerned that the legislation only targets a limited portion of the nuclear technology export approvals process and does not go far enough to establish a truly expedited process. Specifically, we submit the following comments:

1. The legislation seeks to establish an expedited process for process of "low proliferation technologies" to be designated by the Secretary. We submit that "low proliferation technologies" should be defined as technologies for the development, construction and operation of commercial nuclear reactors other than reactors especially designed to use mixed-oxide fuel.

2. The expedited process proposed by the legislation for low proliferation technologies maintains the laborious interagency approval process. This involves a review by five different agencies and includes the State Department concurrence process, which requires obtaining assurances from foreign governments. We note that DOE and NNSA have already made a valiant effort to improve the Part 810 process, and any additional improvements would be significantly limited by maintain the interagency review process. Accordingly, we submit that the interagency review process for low proliferation technologies should be limited to DOE/NNSA approval. If government-to-government assurances are to be sought, there should be a streamlined State Department concurrence based on obtaining a generic set of assurances from foreign governments.

ClearPath Action supports efforts that would allow U.S. companies to swiftly obtain Part 810

approvals and have the ability to compete effectively in nuclear export markets. We support the Committee's efforts to assist in this regard.

Ensuring the Vitality of the Current and Future Nuclear Fleet

The companies and people who operate our nation's 99 nuclear power plants have done a tremendous service in providing clean, safe, reliable and resilient power. As a country, not only should we continue to support this key element of our carbon free generation, but we also need to adopt measures to promote the development of a new generation of advanced nuclear reactors that will allow U.S. companies to regain their leading role in the international nuclear export market. The host of legislation that this Committee is considering today is consistent with this vision, and ClearPath Action would commend them to you for adoption. We stand ready to work with the Committee to assure their prompt passage.

Thank you for allowing me to testify on this important subject.

Mr. JOHNSON. Thank you, Mr. Merrifield.
Ms. Mann, you are now recognized for 5 minutes.

STATEMENT OF MELISSA C. MANN

Ms. MANN. Thank you, Mr. Chairman, Ranking Member Rush, and members of the subcommittee. We appreciate your leadership on nuclear energy issues. And it is a privilege to speak with you today about means of increasing the competitiveness of the nuclear fleet and advancing advanced technologies and infrastructure.

I am Melissa Mann, president of URENCO USA and the owner of the only operating uranium enrichment facility in the United States. But I am also here today as a member of the U.S. Nuclear Industry Council, whose 82 members represent the full breadth of the nuclear supply chain.

On behalf of the Council we salute the full committee and this subcommittee's laser focus on sustaining the current fleet and pushing forward advanced technologies. And we salute the multifaceted initiatives that are covered by the four bills under discussion today. I would like to focus specifically on Mr. Flores' discussion draft on what we now know we call HA–LEU, or high-assay low-enriched uranium.

The current nuclear fleet relies on a uranium fuel enriched to just under 5 percent in the uranium-235 isotope. And we have a fuel cycle that is able to process that material. But a comparable fuel cycle does not exist for many advanced designs because they require higher enrichment at levels above 5 but just below 20 percent.

There is a broad community of users who would benefit from HA–LEU supply. They include research and test reactors, including those currently fueled by the Department of Energy, both here and abroad.

It includes many advanced reactor designs and advanced fuels, including accident tolerant fuels.

It includes producers of targets for medical isotope production, and even existing light-water reactors who are seeking certain fuel reliability and cost performance enhancers.

A complete and sustainable HA–LEU fuel cycle would necessarily include three components: an enrichment facility; a conversion facility to take that material to the form of metal or oxide; and one or more fabrication facilities to manufacture the full type of fuel forms required.

And there is a strong potential to develop the HA–LEU fuel cycle in the United States. The New Mexico enrichment plant, the technology that it uses is already capable of producing at the full gamut of HA–LEU enrichments. And only an NRC license amendment is required to bring that capacity to bear.

Two fabrication facilities supporting NNSA missions already operate at much higher enrichment levels, demonstrating both the viability of licensing and operating at these greater enrichments.

There is several, three in particular, critical fleet conditions that need to be met before we can move forward:

First, it is imperative that you license and develop the enrichment, conversion, and fabrication capabilities concurrently, otherwise you will have critical gaps.

Secondly, we need a predictable and streamlined licensing framework, and the regulator needs the appropriate resources to manage timely and contemporaneous reviews.

And we have talked a little bit about nuclear criticality benchmarks. We need those both for the fixed facilities and for transportation packages. We are also seeking clear NRC guidance on physical protection, security, and material control and accountability.

And, finally, those companies that are making investments in HA–LEU facilities need to be assured of a reasonable return on investment. A consortium-based approach in cooperation with DOE, as envisioned by this discussion draft, is a good step in that direction.

I am speaking about these recommendations not just as a member of the fuel cycle. My company is also a designer of a small microreactor, 10-megawatt, thermal, high-temperature, gas-cooled design that itself relies on HA–LEU. What we know is that without fuel, reactors don't run. And that is perhaps the most significant aspect of the discussion draft, that it recognizes the need for collaboration, because unless the users of this material, the fuel cycle itself, the Department, and the NRC effectively hold hands and jump forward together, we won't be able to reap the benefit of these designs.

Thank you.

[The prepared statement of Ms. Mann follows:]

Testimony of Melissa C. Mann
President, URENCO USA, Inc. and Member, United States Nuclear Industry Council
Before the
U.S. House Committee on Energy and Commerce
Subcommittee on Energy

May 22, 2018

Chairman Upton, Ranking Member Rush, and Members of the Subcommittee, thank you for your leadership on nuclear energy issues. It is a privilege to speak with you today about means of increasing the competitiveness of the U.S. nuclear energy industry and facilitating the development of advanced nuclear energy technologies.

I am Melissa Mann, President, URENCO USA, Inc., owner and operator of this nation's only operating uranium enrichment facility.[1] I am here today on behalf of my organization and as a member of the United States Nuclear Industry Council (USNIC) whose 82 members represent the breadth of the commercial nuclear supply chain community.[2] Our companies are focused on revitalizing the existing industry and leading the development of critical new advanced nuclear energy infrastructure.

On behalf of the Council, we salute the full Committee and this Subcommittee's laser focus on sustaining the current fleet and propelling advanced nuclear energy as well as development of critical new infrastructure. These initiatives include U.S. Department of Energy (DOE) oversight

[1] The URENCO USA uranium enrichment facility is located in Lea County, New Mexico and was the first facility to be licensed and constructed under a Nuclear Regulatory Commission-approved Combined Construction and Operating License. The facility received its license in 2006 and entered into operation in 2010. At its current capacity, the facility is capable of meeting roughly one-third of U.S. reactor demand for low enriched uranium and holds a license authorizing a doubling of its output.

[2] A full list of USNIC members is available at https://www.usnic.org/clients.

and modernization, NRC reform and modernization, an updated Nuclear Waste Policy Act Amendments and accelerated nuclear energy innovation.

To this end, we welcome the multi-faceted initiatives proposed by the suite of four bills under discussion today as a means of enhancing these goals. In general we support the objectives inherent in H.R. 1320 in enhancing NRC licensing surety and fee reform. Similarly, we support the thrust of the discussion draft to streamline the DOE's Part 810 export review procedures. We have provided specific enhancements to Rep. Johnson on this draft which are absolutely pivotal to U.S. exports and jobs. We applaud as well the discussion draft to require the Secretary of Energy to develop a pilot program to site, construct and operate "micro-reactors" at critical government facilities. Along with Gen 3+ reactors, SMRs and non-light water SMRs, micro-reactors can be a workhorse to provide resilient power for national security grid requirements as well as the commercial market in the U.S. and globally.

We particularly applaud the currently-entitled "Advanced Nuclear Fuel Availability Act" and its efforts to drive development of a new fuel supply chain needed to support critical activities, including development of advanced technologies. The comments and recommendations identified herein reflect our experience as a member of the current nuclear fuel cycle but we also well understand the pressures facing advanced reactor designers. My company is also involved in development of a micro-reactor – the U-Battery, a 10 MWt high-temperature gas-cooled reactor. As with other designers, our ability to bring this design to market is dependent on the ability to obtain the fuel.

We welcome the opportunity to discuss:

(1) The need for a High Assay Low Enriched Uranium fuel cycle and the community of users it would support;

(2) The type of supply chain needed to serve this demand;

(3) Need for an appropriate regulatory environment and security framework;

(4) Critical packaging and transportation needs.

High Assay Low Enriched Uranium

The current fleet of light water reactors (LWRs) in the United States relies on uranium fuel enriched in the isotope uranium-235 at a percentage less than 5.0%^{235}U. A nuclear fuel cycle industry exists to mine, convert, enrich, and fabricate the uranium into suitable forms and to package and transport these materials between each of the steps in this supply chain.

A comparable fuel cycle does not exist for many advanced reactor and fuel designs because they require higher enrichments at levels between 5.0%^{235}U and 20.0%^{235}U. We refer to such material as High Assay Low Enriched Uranium (HA-LEU). This designation reflects the clear distinction between HA-LEU and highly-enriched uranium (HEU) - uranium enriched to levels above 20.0%^{235}U which could represent a security and proliferation threat due to its potential application in nuclear weapons.

There is a broad community of users who stand to benefit from HA-LEU supply:

- **Research and test reactors**, including reactors fueled by the U.S. Department of Energy (DOE) in the United States and overseas: Many of these facilities currently rely on fuel enriched to 19.75%^{235}U. The U.S. also has a policy of encouraging other research and test reactors currently using HEU fuel to convert to HA-LEU as part of the nation's non-proliferation strategy;

- **Advanced reactors**, including many non-LWR designs;
- **Advanced fuel designs**, including Accident Tolerant Fuel for LWRs;
- **Producers of targets for medical isotope production**; and
- **Operators of existing LWRs seeking improvements in fuel reliability and costs** through higher fuel burnup[3] and extended operating cycles: Enrichment levels of 6.0%^{235}U to 8.0%^{235}U could allow utilities to obtain more power from their fuel before replacing it. This means that the reactors can operate longer between refueling and use less fuel per reload batch.

DOE currently services its research and test reactor clients through use of inventories including HEU stocks that are down-blended to HA-LEU. These are finite resources and DOE's National Nuclear Security Administration (NNSA) is investigating industry interest in developing a HA-LEU fuel supply capability. NNSA held an Industry Day in November 2017 and received several strong indications of interest to participate in development of such a fuel cycle.

Response to NNSA's Industry Day demonstrates clear commercial interest in developing a HA-LEU fuel cycle but much more is needed to ensure that a fully-functioning HA-LEU fuel production capability exists.

The HA-LEU Fuel Cycle

A complete and sustainable HA-LEU fuel cycle would include three fundamental capabilities:

- A **uranium enrichment** facility licensed to produce enrichments up to 19.9%^{235}U: Such uranium will be in the form of uranium hexafluoride (UF_6);

[3] Higher burnup is generally deemed to exceed the current, average burnup of roughly 45 gigawatt-days per metric ton of uranium (GWd/MTU).

- A **conversion** facility to convert HA-LEU UF_6 into metal or oxide as appropriate for different reactor designs and fuel types;
- One or more **fabrication** facilities that can manufacture the specific fuel types required by the various reactor and fuel designs.

There is strong potential to develop a HA-LEU fuel cycle in the United States. While the existing New Mexico enrichment plant delivers material at a maximum level of 5.0% ^{235}U, its advanced gas centrifuge design is currently capable of producing at the full span of HA-LEU enrichments without further development or testing. Only an amended Nuclear Regulatory Commission (NRC) license would be required to support a new HA-LEU enrichment module. We estimate that if detailed design, site permitting and contractor selection were undertaken during the NRC review process, we could construct, commission and start-up such a module within 24 months of NRC licensing.

Two U.S. fuel fabrication plants are already licensed by the NRC to use higher enrichments: the Nuclear Fuel Services facility in Erwin, Tennessee and the BWXT Nuclear Operations Group facility in Lynchburg, Virginia. These facilities are employed in support of the U.S. Naval Reactors program but also support NNSA in its existing HEU down-blend activities and the production of research reactor fuel. These currently-operating facilities demonstrate the viability of licensing and operating at higher enrichments.

Three critical factors underpin the further development of this new U.S. fuel cycle:

Firstly, it is imperative that enrichment, conversion and fabrication capabilities be licensed and developed on concurrent schedules. Otherwise there will be gaps in the fuel cycle and the industry will not be able to reap the benefits of advanced designs and Accident Tolerant Fuels.

Secondly, the licensing framework needs to support development of the HA-LEU fuel cycle. Earlier this year USNIC partnered with the Nuclear Innovation Alliance and the Nuclear Energy Institute to highlight the need for a streamlined and predictable licensing pathway for development of new nuclear technologies. Many of the same principles apply to licensing the new and/or modified fuel facilities needed for the HA-LEU community. Moreover, the regulator needs to have sufficient resources to support timely, contemporaneous licensing reviews.

Finally, companies making investments in HA-LEU facilities need to be sufficiently assured that appropriate return on these expenditures is viable.

A consortium-based approach involving the full gamut of the user community – in partnership with the DOE – to purchase HA-LEU materials and to develop a schedule for full cost recovery as articulated in the "Advanced Nuclear Fuel Availability Act" would be a significant step in providing such assurance.

This approach would also be key to positioning U.S. companies to develop a robust HA-LEU fuel cycle and serve the growing community of users. Such public-private cooperation would: foster development of a domestic infrastructure supporting HA-LEU supply to already-operating research and test reactors; provide suitable HA-LEU materials for testing and start-up of prototype fuels and reactors by the middle of the next decade; and further support deployment of advanced technologies by the end of that decade.

Licensing and Security Aspects of the HA-LEU Fuel Cycle

NRC licensing of HA-LEU fuel facilities involves several technical and regulatory issues, many of which are linked to nuclear criticality controls associated with HA-LEU enrichment levels.

Existing LWR fuel facilities are licensed to deliver materials at an enrichment level of up to 5.0%^{235}U. Significantly, the criticality analyses and benchmarking codes underpinning these existing licenses do not adequately address HA-LEU enrichment levels.

New criticality benchmarking data will be required to support licensing of enrichment, conversion and fabrication facilities (as well as transport packages) at HA-LEU enrichments. Ideally, such data would also be developed on a consortium basis with DOE backing. This would provide for use of consistent data across the industry and allow the NRC to focus its resources on evaluating use of these federally-backed codes for specific applications and facilities. The language proposed in the "Advanced Nuclear Fuel Availability Act" is a significant step in supporting this need.

HA-LEU at enrichments between 10.0%^{235}U and 20.0%^{235}U is classified as "Special nuclear material of moderate strategic significance," also known as "Category II" material, under NRC safeguards regulations. HA-LEU fuel facilities licensed to handle and produce Category II material must be capable of developing and implementing appropriate physical protection and security plans. Development of clear NRC guidance for implementing such programs, especially if done in coordination with DOE, would provide a consistent approach for licensees.

Similarly, Category II facilities need to develop Material Control & Accountability (MC&A) programs that are responsive to special nuclear material of moderate strategic significance. In combination with physical protection plans, MC&A procedures allow licensees to effectively deter, prevent or respond to unauthorized possession or use of enriched material via theft or diversion and to take measures to protect against radiological sabotage of such materials and facilities. The NRC has clear MC&A guidance for the existing low enriched facilities (Category III facilities) and for HEU facilities (Category I) but does not currently have full guidance available

for Category II sites. This gap should be addressed in the near-term to support HA-LEU licensing needs.

The balance of NRC licensing requirements for fuel cycle facilities will also need to be met. The U.S. nuclear energy industry has decades of experience in licensing activities, experience that provides a strong baseline for new regulatory approvals. One means of reducing the time and burden associated with new licensing reviews is to consider siting of HA-LEU capabilities on existing NRC-licensed sites so as to take advantage of well-characterized and understood geographies and environmental impacts and of existing site infrastructure, manpower and security.

Critical Packaging and Transportation Needs

The specially-designed packages currently used to transport commercial volumes of low enriched uranium between existing fuel cycle facilities are licensed for a maximum enrichment of 5.0%^{235}U. Critical to the HA-LEU fuel cycle is development and certification of new packages for the transport of higher enrichments. The time frame required to design, test and license new packaging designs for fissile contents – in my experience typically between four and seven years – means that activity should be undertaken with dispatch in order to ensure that new reactor testing and deployment schedules are not disrupted.

Especially critical is development of a new shipping package that is authorized for uranium hexafluoride at HA-LEU enrichment levels. NRC regulations for transport packages (10 U.S. Code of Federal Regulations Part 71) impose additional performance criteria for UF_6 exceeding 5% enrichments.

Approved packages are also required for HA-LEU materials once converted to metal or oxide form and additionally for fabricated fuels. Given the potential diversity of final fuel forms, multiple package designs are likely to be required for fabricated materials.

An alternative approach for managing UF_6 packaging needs would be to consider the co-location of HA-LEU enrichment and conversion facilities. Such co-location would allow consolidation of HA-LEU processing at fewer sites and would obviate the need to transport HA-LEU as UF_6 on public roadways, thus reducing the expenses associated with new packages for this transport segment. Co-location could conceivably be extended to encompass the fabrication step as well.

As with facility licensing, new nuclear criticality codes will be required to support licensing of new package designs. Such codes should be developed via an industry-DOE-NRC approach and used on a consistent basis. The proposed bill clearly and appropriately recognizes this need.

Summary

In summary, we welcome the timely and crucial focus on increasing the competitiveness of the U.S. nuclear energy industry and facilitating the development of advanced nuclear technologies. The multiple initiatives proposed by the four bills under discussion today advance discussion on improvements that can be made.

The "Advanced Nuclear Fuel Availability Act" is a significant step in advancing the development of advanced reactor and fuel technologies as it recognizes the critical importance of the fuel cycle in enabling the deployment of these innovative designs.

In general we support the objectives inherent in H.R. 1320 in enhancing NRC licensing surety and fee reform.

Similarly, we support the thrust of the discussion draft to streamline the DOE's Part 810 export review procedures.

We applaud as well the discussion draft to require the Secretary of Energy to develop a pilot program to site, construct and operate "micro reactors" at critical government facilities.

We look forward to working further with members of Congress on these issues of mutual interest.

Mr. JOHNSON. Ms. Mann yields back. Mr. Irvin, you are now recognized for 5 minutes. And if I could remind our witnesses votes have just been called. We are going to get through both of your testimonies. Don't want to cut you short but we will not hold it against you if you speak fast.

STATEMENT OF JAMES NICHOLAS IRVIN

Mr. IRVIN. Shouldn't be a problem as I am from Alabama, sir. We speak pretty fast in the south.

Thank you for the opportunity, Mr. Chairman, thank you, Member Rush, to appear before you about this very important topic of advanced nuclear technology. My name is Nick Irvin. I am the Director of R&D at Southern Company. And I have responsibility for developing advanced reactor technology, as well as supporting our efforts to modernize the licensing framework for those technologies.

At Southern Company we talk a lot about providing our customers with clean, safe, reliable, and affordable energy. And for me personally that is a very important concept in that I believe that access to energy is foundational to maintaining a high quality of life for every human on this planet.

In addition, I was raised in a home where continuous learning is—was a requirement, and not only to be a continuous learner but to also put that learning to good use. And so, to work at a company like Southern Company that provides energy but also provides a strong focus on innovation makes me one of the lucky ones.

When it comes to innovation, a very important component of innovation is collaboration. And a very important collaboration that we have maintained for the entirety of our history in R&D is a strong relationship with the Department of Energy through public/private partnerships. We believe public/private partnerships are essential to help manage the transition of new technology, particularly in the energy space, from concept to deployment and where the technology and financial risks become married in that process.

To that end, we currently operate as a contractor to the Department of Energy, developing an advanced reactor in collaboration with a company called TerraPower where we are in year two, approaching year three, of a 5-year agreement to advance that technology towards deployment in the mid-2030s. We believe it is an important technology that has a potential to not only advance the components of the advanced reactors that we think about, nominally safety, baseload electricity, but also do so in a very cost competitive way, which is important, again, to protect the interests of our customers.

Additionally, we are working in partnership with the Department of Energy on a project called a licensing modernization project. It is an effort to reflect the differences in the nature of these advanced reactors and how the regulatory approach needs to be modified so that we can be efficient and effective in regulating those to the same standards as we currently regulate the light-water reactor fleet.

As we look at the four bills that were presented from the subcommittee, we feel like they are all very supportive and aligned with our mission goals and our activities at Southern Company. Specifically, this idea of an efficient and effective regulator is a

critically important component to maintaining the competitiveness of nuclear reactor technology in the nuclear industry, both domestically and globally. We do see nuclear energy as a global market. And as a consumer of nuclear technology, we see the vital importance of having a healthy supply chain in order to maintain access to those, those components and technologies here domestically.

And given that the market domestically is challenged, the international markets may maintain that foundation from which we need to build advanced reactors.

Given the prior comment about a global market, we can't miss the opportunity to take advantage of near-term opportunities such as the ones identified in the bill discussing microreactors as it relates to resiliency with the Department of Defense. We think these microreactors can be deployed in the near term, and do provide a great opportunity to, for lack of a better term, pilot the entire, the entire concepts necessary to deploy advanced reactors in a very measurable way, given their size and scale.

And then as was previously mentioned, none of these machines operate without fuel. And so, access to HA–LEU is a critically important component that I do believe it is time to begin working towards if we want to support early or mid-next decade either deployment of microreactors, or demonstration reactors, or some other technologies.

Again, I appreciate the opportunity to provide comments and look forward to your questions.

[The prepared statement of Mr. Irvin follows:]

Statement of James Nicholas Irvin
Southern Company

BEFORE THE SUBCOMMITTEE ON ENERGY
COMMITTEE ON ENERGY & COMMERCE
U.S. HOUSE OF REPRESENTATIVES

DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies
May 22, 2018

Good morning Chairman Upton, Ranking Member Rush and Members of the Subcommittee. Thank you for the opportunity to appear before you today. My name is James Nicholas ("Nick") Irvin, and I am the Director of Research and Development (R&D); Strategy, Advanced Nuclear, and Crosscutting Technology at Southern Company. It is an honor to appear before this Subcommittee to share my views on advanced nuclear technologies and the four pieces of legislation affecting these technologies before the Subcommittee today. This is an area that is pivotal to our nation's future and worthy of this Subcommittee's interest and attention. In my role as Director of R&D at Southern Company, I am responsible for the evaluation, development, and demonstration of innovative technologies to support Southern Company's operations, including advanced nuclear technology. I lead an internal portfolio of cross-cutting R&D programs, as well as representing Southern Company in many external alliances, including energy R&D collaborative programs with the Electric Power Research Institute (EPRI). I also serve as a representative to the Policy Committee of the Generation IV Nuclear International Forum on behalf of the U.S. nuclear industry, in addition to numerous other industry committees. In my testimony today, I will discuss Southern Company's efforts to develop advanced nuclear technologies. I will also share my personal perspectives on prospects for advanced nuclear reactors and the merits of continued governmental and private sector interest and investment.

Southern Company

Southern Company is a natural gas and electric utility holding company headquartered in Atlanta, Georgia, with executive offices also located in Birmingham, Alabama. The nation's premier energy company, Southern Company provides clean, safe, reliable, affordable energy to 9 million gas and electric utility customers in 11 states. Southern Company is developing the full portfolio of energy resources, including carbon-free nuclear, advanced carbon capture

technologies, natural gas, renewables, energy efficiency and storage technology, and creating new products and services for the benefit of customers.

Innovation is a central part of our strategy. We foster a culture that seeks to make transformational changes and understand that innovation and technology are engines of American greatness. This belief is demonstrated by Southern Company's 50-year commitment to the research, development and deployment of emerging energy technologies. We actively collaborate with the U.S. government, other utilities, universities and technology developers and remain at the forefront of technology development for the production, delivery and end-use of energy. It is within this context that Southern Company is investing in advanced reactor technology R&D and looking ahead toward the steps needed to promote the licensing, construction and utilization of these technologies.

Southern Nuclear

Southern Nuclear, a subsidiary of Southern Company, currently operates six nuclear reactors: Units 1 and 2 at Plant Farley near Dothan, Alabama; Units 1 and 2 at Plant Hatch near Baxley, Georgia; and Units 1 and 2 at Plant Vogtle near Augusta, Georgia.[1] We have been in the nuclear power business for almost 50 years, dating back to Southern Company's decision in 1967 to build Plant Hatch, our very first nuclear power plant, which began commercial operation in 1975. Together, Plants Farley, Hatch and Vogtle provide approximately 20% of the electricity used in Alabama and Georgia. This is made possible by our talented and committed workforce of more than 4,000 men and women working at our fleet of nuclear power plants and corporate offices, all of whom are also part

[1] Plant Farley is owned by Alabama Power Company. Plants Hatch and Vogtle are co-owned by Georgia Power Company, Oglethorpe Power Corporation, the Municipal Electric Authority of Georgia, and Dalton Utilities.

of the larger Southern Company team of over 32,000 employees who are building the future of energy for the customers they serve.

Nuclear power is a leading source of affordable, reliable, clean, American energy that powers our economy, protects our national security, preserves the environment, and provides high-paying jobs for thousands of our fellow citizens. Southern Nuclear's top priority is the safety and health of the public and our employees. We are committed to the safe operation of our nuclear generating facilities with equipment and systems that meet rigorous safety and design regulations.

Delivering the Next Generation of Nuclear Power

Southern Company is leading the nation by constructing first of a kind new nuclear units at Plant Vogtle. Taken together, these state-of-the-art Westinghouse AP1000 units are projected to supply over 2,200 megawatts (MW) of new, baseload, zero-emission electric generation, creating more than 5,000 total construction jobs and 800 permanent jobs.

An important stimulus for the Vogtle project has been the consistent support of Congress and the Department of Energy (DOE) in fostering a central role for nuclear power in the nation's energy policies. The Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007 sought to expand the commercial utilization of nuclear energy in the United States, while also reducing emissions and ensuring affordable, reliable, and clean domestic energy for Americans. Those acts made substantial investments in programs designed to promote the development and deployment of modern nuclear reactors and to improve the nuclear licensing process. These policies, combined with an innovative and constructive state regulatory environment, were a catalyst for the construction of new reactors at Plant Vogtle, and support for the continuation of the loan guarantee program, tax benefits, and licensing reforms for advanced

nuclear, among other policies, by DOE and subsequent Congresses has been essential to the survival of that project.

However, even as we make significant progress toward commercial deployment of "Generation III+" reactors like the AP1000 at Plant Vogtle, we are already exploring the next generation of nuclear technologies commonly referred to as "Generation IV" (or "Gen-IV") reactors. Our Advanced Nuclear R&D program is a robust program designed primarily to support the evaluation and development of new technology. Through these activities, which are with a wide variety of technologies including liquid metal cooled fast reactors, high temperature gas reactors, as well as molten salt reactors, we provide our perspective and expertise on technology requirements and developmental strategies garnered from our over 40 years of operating and R&D experience.

A specific example of close collaboration with an emerging technology developer is our work with TerraPower and the Department of Energy. On January 15, 2016, the Department of Energy through its Advanced Reactor Concepts program selected a Southern Company-led proposal as one of two recipients of approximately $40 million, 5-year program to explore, develop and demonstrate advanced nuclear reactor technologies. Our partners in this public-private partnership are TerraPower, Oak Ridge National Laboratory (ORNL), EPRI, and Vanderbilt University. The technology research activities of our project will bolster the development of molten chloride fast reactors (MCFR), an advanced concept for nuclear generation under development by TerraPower.

In addition to our R&D activities, Southern Company subsidiary Southern Nuclear Development (SND) provides program management consultation to technology and project development partners. Specifically associated with the Advanced Reactor Concepts program

mentioned above, SND is supporting X-Energy, the other DOE award recipient, on conceptual design for its high temperature gas-cooled pebble bed reactor.

As a company, we are proud to be afforded these opportunities and we look forward to seeing additional collaboration to strengthen this partnership through delivering results for our partners, DOE, and the American taxpayers.

As I noted earlier, nuclear energy enjoys tremendous advantages over other forms of electric generation: zero emissions, capacity factors exceeding 90%, safety records that exceed those of other energy sources, as well as affordability over the long term without the price swings common to other fuels. The AP1000 design adds even more layers of safety redundancies and with a simplified plant design. We believe the next generation of advanced reactors will build on these advantages, with even more advanced safety systems, less byproduct materials, and greater cost efficiencies. Gen-IV reactors will use non-light water reactor technologies with higher temperature output and size variations ranging from rather small electric generators to massive power plant reactors exceeding the size of many of the largest nuclear power plants in operation today. Further, these designs afford opportunity for nuclear energy to extend into other sectors of the economy including industrial process heat and transportation fuels, offering the same benefits of zero emissions and security of supply for generations to come.

Innovation Requires Collaboration

. Within our own company, we take great pride in our culture of innovation and desire for step-up performance improvement in all facets of our business. We also believe that our federal government partners have the capability to create the right environment for innovation in the

nuclear technology arena to flourish, and allow the market to respond. This includes public-private partnerships that can harness the power of collaboration.

In much the same way, we cannot achieve sustainability in innovation by ourselves. Collaboration among private sector, governmental, academic, and international actors is key.

The NEI's Advanced Reactor Working Group (ARWG) was created with the understanding that decisions as to what technologies will replace recent and upcoming nuclear reactor retirements will be made within the next 10–20 years. In the short- to medium-term, light water reactors will remain the dominant and most economic means of electricity production from nuclear energy. If utilities are to consider advanced (Generation IV) non-light water reactors in their future decision making, significant progress toward commercialization is necessary.

With this reality in mind, the ARWG is charged with developing an industry vision of a long-term sustainable program that will support the development and commercialization of advanced reactors, ultimately supporting the commercial availability of advanced reactors for utilities or other entities in the 2035–2040 timeframe.

Achieving this will require this kind of collaboration, resulting in innovative policies, licensing frameworks, and regulatory structures that facilitate the efficient and predictable deployment of these new technologies and encourage private investment. I believe it will also require our federal partners to share the cost of state-of-the-knowledge improvements. DOE, universities, vendors and our centers of knowledge will need to leverage the best talent our nation has to offer.

Public-private partnerships are, in the context of advanced reactors, uniquely necessary as these technologies are subject to an extensive and expensive regulatory regime requiring complex technical work necessary to build the safety case for new reactors. These endeavors also require

new fuel types to be developed and tested, the development of supply chains for new kinds of equipment, design and testing of prototypes and, ultimately, the design, approval, construction, and operation of a first-of-a-kind commercial reactor. We are already seeing increased private sector investment in proposed new reactor startups and systems reaching, by some estimates, more than $1 billion. Nonetheless, because of the expense, regulatory uncertainty, and timeframes involved, continued public sector investment will be necessary to make the leap from the laboratory to commercial deployment.

Additionally, as was true in the early days of nuclear technology development, we need to work with our national labs to safeguard our nation's significant investment in nuclear technology and to demonstrate newer, more advanced nuclear technologies, to ensure we remain the world leader in this area. I greatly appreciate the work of the Idaho National Lab, which, as DOE's lead Nuclear Energy Laboratory, is doing phenomenal work in the area of nuclear energy technologies. The DOE Office of Nuclear Energy, in conjunction with the Idaho, Argonne, and Oak Ridge National Laboratories, has a program called "Gateway for Accelerated Innovation in Nuclear" (GAIN), which is intended to "provide the nuclear energy community with access to the technical, regulatory, and financial support necessary to move new or advanced nuclear reactor designs toward commercialization while ensuring the continued safe, reliable, and economic operation of the existing nuclear fleet." A key element of the GAIN initiative is to provide all nuclear stakeholders with a "single point of access" to the host of federal assets and programs, including the DOE complex and national labs.

Southern is proud to be partnering with Oak Ridge National Laboratory and TerraPower on the DOE-awarded research project involving the MCFR technology and we commend ORNL's

role in supporting the use of nuclear technology for the nation's security as well as commercial interests.

As a range of technology options are explored, we will advocate for and encourage similar industry-led collaboration with DOE, vendors, utilities, universities and national labs to leverage capabilities and share some of the risks. We will continue to monitor, and assist where appropriate, the complete range of technology options, to ensure the highest probability of success for this critical suite of technologies.

Modernizing the Licensing Framework for Advanced Reactors

Our current regulatory framework for the licensing of nuclear power plants has its roots in the federal government's initial efforts to promote commercial nuclear power after the passage of the Atomic Energy Act of 1954 (the "AEA") when the Atomic Energy Commission (AEC) began to encourage the development of commercial nuclear power production in the private market. The federal government helped spur innovation and investment in nuclear power production through research and development efforts such as test reactors and laboratories that would eventually share information with the private nuclear power industry. At the same time, the federal government provided economic assistance to those private companies willing to take the first steps to construct and license nuclear power plants. The AEC and the private sector researched and experimented with several different types of reactors, including light-water reactors, salt-cooled reactors, and fast-breeder reactors.

Prompted by the backing of the AEC, the commercial nuclear power industry started to take shape, and the United States led the way in nuclear power innovation as the nuclear power industry grew rapidly throughout the 1960s. Eventually, the AEC and the industry focused on light-water reactor technology. The reactor licensing framework and process grew up around the

need to license the light-water reactor designs the industry planned to construct and was, therefore, molded to fit the needs of licensing nuclear power plants with light-water reactor designs. This tailoring of the regulation to the dominant technology resulted in a more efficient licensing process and one in which the nuclear power industry could remain generally assured of the regulatory framework for its investment, for the time being.

With the passage of the Energy Reorganization Act of 1974, the AEC was abandoned, and its dual functions of regulating the nuclear power industry while simultaneously promoting nuclear power to the private sector were split among the Nuclear Regulatory Commission (NRC) and the Energy Research and Development Administration (ERDA), respectively. In 1977, ERDA's functions were transferred to the Department of Energy (DOE), an agency deserving of credit for much of the innovation in commercial nuclear power after the passage of the Act. Because the DOE is charged with the promotion of commercial nuclear power, most of its nuclear facilities and programs are exempt from NRC regulation, allowing it to research and develop technologies that may otherwise remain unexplored. Consequently, much of the research and development in the nuclear power industry hinges on decisions of the federal government.

NRC's adoption of, and Congress's later codification of (in the EPAct of 1992), a more efficient regime in 10 CFR Part 52 and incentives in the EPAct of 2005 were major drivers in the development of the only nuclear power plant under construction in the United States, but they have not to date been sufficient to achieve the nuclear renaissance predicted early in this century. Construction of large light water reactors is still an expensive and time-consuming proposition. In order to retain the benefits of the current fleet of nuclear power plants as aging plants are decommissioned over the next thirty years, the federal government, state and local governments, and private industry will have to continue to work together to develop technologies that can be put

into commercial use more quickly and with less expense, while still retaining or improving on the safety and environmental benefits of the current fleet and Gen III+ designs like the AP-1000.

So, the nuclear power industry stands at yet another crossroads. Commercial nuclear power is expanding across the world yet the United States is not currently at the center of the technological innovation driving much of the expansion. In April of this year, China began loading fuel into a Westinghouse AP-1000 reactor—one of 4 under construction in that country, with larger designs in the planning stages. In contrast, at this time, the only active advanced nuclear construction project in the U.S. is at Southern Company's Vogtle site.

While the new Part 52 one-step licensing process has proved beneficial to the industry, the fact that it, like the initial two-step licensing process, is based on light-water reactor technology limits its efficacy for the licensing of the next generation of advanced nuclear reactors. While possible using a patchwork approach with many exemptions, licensing advanced nuclear reactors that do not use light-water reactor technology in the current regulatory scheme remains ineffective, creating a barrier against engagement of the private sector in the required public-private partnership. The introduction of a new regulatory scheme that effectively addresses the needs associated with licensing non-light-water reactors will signal to the industry that it can invest in research and development of advanced reactors knowing that the licensing environment does not favor a single technology.

As Congress recognized in 1992, an efficient, predictable, licensing framework is imperative to the success of advanced reactors in the United States. Safety must remain a key focus, although the regulatory framework should be performance-based, risk-informed, and allow for various kinds of technologies to be developed and licensed. When developing a licensing framework that can work for advanced reactors, I would endorse the "triple A" approach. That is,

where existing regulations are appropriate, "adopt" them; where simple changes are needed to modify existing rules in order to make them a better fit for advanced reactors, "adapt" them; and where the characteristics of advanced reactors require new regulatory structures and programs, "advance" them. In all respects, the safety regulator (NRC) should determine the required safety performance metrics, while the industry and its partners should focus, through consensus standards organizations, on developing the "how" to comply with performance standards and design requirements. By doing so, we can prevent stagnation in the development of advanced reactor designs and ensure that the newest, safest, and most efficient nuclear reactors will be built in the United States.

To this end, the Licensing Modernization Project (LMP) is a Southern Company-led effort, cost-shared with the DOE, to develop foundational elements of a modernized technology-inclusive regulatory framework. Such a framework uses a risk-informed and performance-based methodology to set technical requirements for design and licensing of advanced non-LWRs. As such it incentivizes innovative approaches to safety improvements by leveraging these enhancements to reduce regulatory complexity and by removing unnecessary burden. The work also allows the regulator to be able to be better prepared for structured conversations with a number of developers who are developing spectrum of technologies and designs. Nuclear Regulatory Commission plans to endorse the LMP proposals via a regulatory guide in 2019.

To this end, I commend the House for passing the Advanced Nuclear Technology Development Act of 2017 (H.R. 590), cosponsored by Congressmen Latta, McNerney, Fleischmann, Doyle, Hudson, and Tonko. This bill would encourage cooperation between DOE and NRC to develop a new framework for licensing advanced nuclear energy technologies and directs the NRC to develop an efficient, risk-informed, technology-neutral framework for advanced reactor designs.

Encouraging a more technology-neutral, performance-based and safety-focused regulatory process would reduce unnecessary regulatory burden, reduce licensing and operating costs, and improve the economic viability of these newer technologies.

H.R. 1320, Nuclear Utilization of Keynote Energy Act

H.R. 1320, Nuclear Utilization of Keynote Energy Act, co-sponsored by Congressmen Kinzinger and Doyle, would mandate a long-overdue reform of the NRC fee structure. As the testimony previously provided to this Committee by Maria Korsnick, on behalf of the Nuclear Energy Institute, indicated, the nuclear industry believes that H.R. 1320 provides a more rational fee recovery process for the NRC that limits spending on corporate support and caps annual fees on operating reactors, while continuing to provide sufficient funding for the Commission's public health, safety and security missions. Notably, the bill does not affect "fee for service" activities such as the resident inspector program and other safety and security inspections and reviews, and provides vital resources for the development of a regulatory infrastructure for advanced reactor licensing. The industry also supports the reforms contained in H.R. 1320 that would fight "regulatory creep" by focusing licensing reviews on areas that are safety-significant.

H.R. (Discussion Draft) Nuclear Energy Competitiveness

As noted in previous testimony before this Subcommittee, the nuclear industry supports efforts to streamline the requirements of 10 C.F.R. 810 with regard to the export of non-classified nuclear technology. Requiring individual DOE approval for each application has put U.S. suppliers at a distinct disadvantage with regard to overseas

competitors. Nuclear technology is a global market, and the United States is in imminent danger of ceding leadership to our international competitors, as China and Russia and others aggressively pursue market opportunities in the developing world. These overseas markets, and the export of clean, safe American nuclear technology, would provide efficiencies of scale that would support a nuclear manufacturing and engineering infrastructure that can simultaneously create American jobs and improve national security by allowing the U.S. to continue to influence worldwide nuclear safety, security and nonproliferation policies. We greatly appreciate your attention to our request for review of Part 810; systematic reform of the export approval process will allow U.S. suppliers to compete in international markets and restore the U.S. to a position of leadership with regard nuclear technology.

H.R. ____ (Discussion Draft) Report on Pilot Program for Micro-Reactors

Construction of advanced reactors at DOD and DOE facilities is another way to "harness the power of collaboration" that I referenced above, and will support the development and commercialization of advanced nuclear technologies while enhancing the resilience of our national security infrastructure. The type and size of reactors that are likely to be utilized in this service will allow for agile and efficient deployment, providing for early experience in the regulatory processes necessary to support deployment of larger, utility scale technologies in the coming years. If we can successfully combine the purchasing power of the Department of Defense, the technological expertise of the Department of Energy and the innovation and agility of the private sector, the whole truly will be greater than the sum of its parts. Another word for this is "synergy." Sometimes overused, Webster's tells us that the term is based on the Greek

word "sunergos" which translates as "work together." Because these technologies are so new, our recommendation is that DOE be allowed some flexibility with regard to both the type and size of the reactors that qualify for the program.

H.R. ____ (Discussion Draft) Advanced Nuclear Fuel Availability Act

Many of not all of the advanced reactor concepts rely on a new or innovative fuel design, often requiring High Assay Low Enriched Uranium (between 5% and 20% enrichment) for commercial deployment. Further, and perhaps more critically from a timeliness perspective, many of the demonstration scale reactors will also require HALEU. It is imperative that the DOE and private sector initiate programs to support not only the supply of HALEU, but also the infrastructure requirements necessary for its transport and regulation.

Conclusion

I applaud this Subcommittee and the Congress, as a whole, for its support of advanced nuclear technologies. I would also stress our appreciation for the DOE's and the Administration's continued support for nuclear innovation. We face a pivotal moment for the nuclear industry in the United States. Congress, DOE, the nuclear industry and other stakeholders must to work collaboratively to create a technological and regulatory framework that will allow advanced reactor technologies to become a commercial reality. The legislation before the Subcommittee today would make significant strides toward that goal. The benefits to American citizens in terms of U.S. national security, global leadership, global economic competitiveness, technological superiority, development of high paying jobs, and the environment are vast and justify a strong federal role.

Thank you for allowing me to appear before this Subcommittee today. I will be glad to answer any questions you might have.

Mr. JOHNSON. Thank you, Mr. Irvin.

Dr. Lyman, you are now recognized for 5 minutes.

STATEMENT OF EDWIN LYMAN

Dr. LYMAN. Thank you. On behalf of the Union of Concerned Scientists I would like to thank the chairman, ranking member, and other members of the committee for the opportunity to testify today.

UCS supports DOE investment in nuclear energy research and development, but with a focus on increasing safety and security of the once-through cycle.

In the near term we see promise in projects such as developing accident tolerant fuels for current light-water reactors. But our analysis to date has not identified any advanced reactor design that offers clear safety and security improvements over today's light-water reactors.

So, it is in that spirit that I would like to comment on the four bills today.

We support the discussion draft on advanced nuclear fuel availability. We think it makes sense for an assessment to be made of the availability or the likely availability of HA–LEU. And that will help to assess the viability of advanced reactor declining in midterm. But the acquisition of HA–LEU should be closely tied to realistic projections of the need for the material.

A couple of additions. We think that the study shouldn't evaluate the larger nonproliferation implications of the production of HA–LEU. Even though HA–LEU is low-enriched uranium and cannot be directly used in nuclear weapons, the material does pose proliferation security concerns and if there is going to be expanded production and use of that material, as well as the potential for exports of reactors that would use it, and foreign customers, we think that that is not—that evaluation has not been made yet, and it should be.

On H.R. 1320, we oppose most aspects of the bill because we do not support so-called streamlining of licensing that might lead to shortcuts in the approval of advanced reactors without fully resolving the safety and security concerns that are unique to these new designs.

On the nuclear energy competitiveness discussion draft we share a lot of the concerns that we have heard today about the definition of lost proliferation risk technology, and how that must be evaluated within the context of any export, especially today.

And I would just like to clarify the record. My testimony did not say that it is easy for a country to misuse a light-water reactor to produce plutonium for weapons, however, it is not out of the question. In fact, the technology for processing has been available now publicly for many decades. So you can't discount that. And you need to consider the risk of breakout—that is, throwing the IAEA inspectors out and using the facilities you have to make weapons rapidly—in any export consideration.

Finally, on the issue of microreactors, we do not share the optimism about the promise of these facilities, especially for Department of Defense sites and energy resilience. We think that the military should cast a skeptical eye on the stories that they are

being told about how these reactors are going to be so safe and secure they can't melt down, and especially how they can provide resilience. In fact, any nuclear reactor really requires electrical power to operate safely, and the only way these reactors could provide power and disconnect it from the grid is in what is called island mode, which is not well established in any designs.

So, I would urge that the study include an assessment of the safety and security, and the potential applications for the safety of U.S. military personnel and usability of military facilities if there were a safety, or security, or sabotage incident that would lead to large-array large release.

I hope these observations are useful. I welcome your questions. Thank you.

[The prepared statement of Dr. Lyman follows:]

Testimony of Dr. Edwin Lyman

Senior Scientist, Global Security Program

Union of Concerned Scientists

"DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies"

Before the

Committee on Energy and Commerce

Subcommittee on Environment

U.S. House of Representatives

May 22, 2018

SUMMARY OF UCS TESTIMONY

- The Union of Concerned Scientists (UCS) supports federal investment in nuclear energy research and development focused on increasing the safety and security of the once-through fuel cycle.
- UCS supports the Advanced Nuclear Fuel Availability initiative, provided that the program includes a study to address the proliferation and security implications of commercial-scale production and use of high-assay low enriched uranium (HA-LEU).
- UCS is neutral on the provisions in H.R. 1320 regarding Nuclear Regulatory Commission corporate support and user fee caps but opposes the provisions regarding regulatory streamlining in Sections 4-7.
- UCS believes the provisions in Section 3 of the Nuclear Energy Competitiveness discussion draft regarding improvements to the Part 810 process are premature and raise proliferation concerns. They should first be evaluated in the Section 2 review.
- UCS does not see a compelling need for the pilot program to develop micro-reactors at critical national security locations that would be defined by the study called for in the Report on a Pilot Program for Micro-Reactors discussion draft. In addition, the study outlined in the draft does not specifically address crucial considerations, such as the safety and security of micro-reactors.

On behalf of the Union of Concerned Scientists, I would like to thank Chairman Upton, Ranking Member Rush, and the other distinguished members of the Subcommittee for the opportunity to provide our views on the legislation being discussed today.

The Union of Concerned Scientists (UCS) has more than half a million supporters, united by a central concern: that we need sound scientific analysis to create a healthy, safe, and sustainable future. UCS, while neither pro- nor anti-nuclear power, has served as a nuclear safety and security watchdog for nearly fifty years. Combating the threat of global climate change is one of our priorities, and we have not ruled out an expansion of nuclear power as an option to help reduce greenhouse gas emissions—provided that it meets high standards of safety and security. It is from this perspective that I offer the comments below.

UCS supports DOE investment in nuclear energy research and development, with a focus on increasing the safety and security of the once-through fuel cycle. This applies to both evolutionary improvements in current-generation light-water reactor technology and advanced reactor development. In the near term we see promise in projects such as the Accident Tolerant Fuel program, designed to improve light-water reactor fuel behavior during both normal operation and accidents. However, our analysis to date has not identified any advanced reactor design that offers clear safety and security improvements over today's light-water reactors. In fact, some reactor concepts introduce new and significant safety and security issues. These must be effectively resolved in the design phase if advanced reactors are to be viable candidates for wide-scale deployment.

Unfortunately, there are troubling trends today that have the potential to undercut advances in nuclear safety and security. The commercialization of any non-light water reactor will take decades and require billions of dollars in investment. There are no feasible shortcuts in the technology development process that is required. Attempting to accelerate the commercialization of advanced reactors by allowing reactor applicants to bypass important technical work and mandating "streamlined" regulatory reviews could result in the premature deployment of designs whose safety characteristics have not been fully validated. Also, a drive to reduce capital and operating costs to make advanced reactors more competitive could be counterproductive if it involves weakening the standards that apply to current-generation reactors, including requirements for a high-strength, leak-tight containment building, a robust security force to protect against terrorist attacks, and off-site emergency evacuation plans. We hope that in addition to the issues addressed by the legislation being discussed today, the Subcommittee will take a hard look at all the necessary aspects of a program that would facilitate the deployment of a new generation of reactors that are genuinely safer and more secure than the current one.

We address the four pieces of legislation below.

1. Advanced Nuclear Fuel Availability (Discussion Draft)

UCS supports the initiative that would be authorized by this bill. A number of advanced reactor designs would require large quantities of high-assay low enriched uranium (HA-LEU) fuel (which has greater than 5 percent and less than 20 percent uranium-235). In addition, some accident-tolerant fuels for light-water reactors may require HA-LEU toward the lower end of the

enrichment range. But the existing supply chain for this material is very limited, and is currently needed to support operation of research and test reactors and medical isotope production facilities around the world. The draft's provision in Section 2(b)(4) for periodic surveys to assess demand for HA-LEU is sensible. The study will also provide useful data on the cost and time needed to establish a reliable supply of HA-LEU, as well as the infrastructure to support its processing, and will help to assess the viability of advanced reactor deployment in the near term. Acquisition of HA-LEU by the DOE should be closely tied to realistic projections of need for the material. The DOE should also be prepared for the possibility that it may need a substantial supply of HA-LEU to fuel the Versatile Test Reactor now under consideration. Although the DOE's preferred fuel for the reactor is plutonium, it is likely, in our view, that plutonium fuel use will prove infeasible.

We recommend a few additions to the discussion draft. First, the DOE program should prioritize acquisition of HA-LEU through downblending of excess highly enriched uranium (HEU) stocks. A recent independent assessment by a scholar at Princeton University estimates that the U.S. has more than 100 metric tons of HEU reserved for military purposes that could be declared excess to nuclear stockpile requirements. In addition, should relations with Russia improve, as we hope, a revived nuclear cooperation program to purchase Russian HEU for downblending to HA-LEU would be a win-win endeavor.

Second, the draft should require that the DOE evaluate separately HA-LEU with enrichments of less than 10 percent uranium-235 and HA-LEU with more than 10 percent uranium-235. Both

the Nuclear Regulatory Commission (NRC) and the International Atomic Energy Agency (IAEA) classify these materials differently with respect to security. A 10-kilogram quantity of the latter material is classified as Category II, whereas 10 kilograms of the former would be Category III, the same as LEU with enrichments of 5 percent or less. This is an important distinction because, as the committee staff's hearing memo points out, the U.S. does not have any Category II commercial fuel cycle facilities. Understanding the differences in projected demand between these two categories of enrichment would help to guide the DOE's development of an appropriate acquisition strategy.

Finally, the report to Congress that Section 3 requires should include a non-proliferation and security impact assessment of any new DOE program for acquisition and supply of HA-LEU. Although HA-LEU is classified as low-enriched uranium and is therefore regarded as highly impractical for direct use in a nuclear weapon, the material does pose proliferation and security concerns, especially in the higher enrichment range, as reflected by the NRC and IAEA Category II classifications. HA-LEU with enrichment just below 20 percent was deemed too risky by the international community to be stockpiled by Iran. Therefore, the DOE should carefully evaluate the international impact of the precedent that the U.S. would establish by creating a new program for HA-LEU supply. Moreover, since U.S. advanced reactor developers may seek to sell HA-LEU-fueled designs overseas, and foreign advanced reactor vendors may seek to purchase U.S. HA-LEU, the proliferation and security implications of U.S. HA-LEU exports warrant close examination.

2. H.R. 1320, Nuclear Utilization of Keynote Energy Act

UCS has many concerns with this bill. We oppose the bill's arbitrary deadlines for completing environmental reviews and licensing actions, and the provisions that would curtail the hearing rights of intervenors in regulatory proceedings. In our view, such changes are unlikely to have a meaningful effect on the time required for the commercial deployment of advanced reactors, but will compromise safety and security. There will be new technical and policy issues associated with new reactor technologies, and addressing those issues may be time-consuming and resource-intensive. It may simply be infeasible to speed up the process. In any event, addressing these issues during the design and preliminary licensing stage will be easier and cheaper than doing so during construction or after startup.

We also do not support H.R 2340's attempt to micromanage the NRC by imposing arbitrary caps on corporate support costs and user fees. However, we acknowledge that the provisions limiting these costs and fees, Section 3(a)(3) and Section 3(b)(3), contain the caveat that they are imposed only "to the maximum extent practicable." Moreover, the bill provides for a 1-year waiver of the annual fee cap by the NRC. To the extent that these measures give the NRC the ability to routinely exceed the caps as necessary to ensure safety and security, we take a neutral position on the cap provisions.

We strongly oppose most other sections of the bill for the above-stated reasons. Section 7(c)(1) imposes one-size-fits-all timelines on the NRC's environmental and safety reviews for new reactors, without any technical justification. Section 7(c)(4) would allow the NRC to grant

licenses for nuclear reactors or spent fuel reprocessing plants before hearings on the license applications are concluded. And Section 6 would automatically impose informal hearing procedures for nuclear reactor licensing actions, with very limited exceptions, instead of allowing the presiding officer of the hearing to make that determination, as is currently the rule.

We also have concerns about Sections 4 and 5. These would require the Comptroller General to provide studies on the implications of repealing restrictions on foreign ownership, control, or domination of nuclear facilities in the United States, and on the implications of eliminating the requirement for mandatory hearings in NRC licensing proceedings. Although UCS does not oppose studies, provided they are well-formulated, in these cases we see little point in more study of dangerous proposals. With regard to elimination of mandatory hearings, I would refer you to our 2016 Senate testimony opposing a similar provision in the Nuclear Energy Innovation and Modernization Act, S.2795 (which was subsequently stricken).

3. Nuclear Energy Competitiveness (Discussion Draft)

This bill would amend the Atomic Energy Act to allow for the expedited consideration of requests for transfers of "low proliferation risk reactor technologies." The Secretary of Energy would be given the authority to determine which technologies could be classified as "low proliferation risk." Fuel fabrication and other fuel cycle technologies (e.g. "sensitive nuclear technologies") would be excluded.

The purpose of the draft bill appears to be creation of a fast track for authorizing exports of nuclear reactors that use low-enriched uranium fuel to countries that are predetermined to be trustworthy. But the proliferation risk of any technology is not an intrinsic and absolute characteristic, and the potential proliferation threat posed by any country depends on many factors and can change rapidly. Technology transfers cannot be undone. Any light-water reactor can become a plutonium factory if a country decides to do so and develops a reprocessing capability. As the example of Iran has shown, the latent proliferation potential of technology acquisition and the risk of "breakout" must be fully considered, with an eye to the future. Given today's geopolitical dangers, the scope of proliferation impacts of nuclear technology transfers—both direct and indirect—should be broadened, not limited.

For instance, exporting nuclear reactors to a country that already has an established nuclear industry, such as the United Kingdom, could have quite different proliferation implications than exporting the same reactors to a country that is new to the nuclear business, such as Saudi Arabia. And if that new entrant uses the acquisition of nuclear reactors as justification for developing indigenous enrichment or reprocessing facilities, or its neighbors are prompted to acquire nuclear technology themselves, the proliferation risk of the reactor exports could be significant. These types of considerations are presumably part of the DOE's current assessment of applications for activities requiring specific authorizations, such as nuclear reactor technology exports. It is not clear that fast-tracking the review process can be done without increasing the risk that important factors may be overlooked that could ultimately jeopardize our own security.

In any event, as NNSA Assistant Deputy Administrator Art Atkins testified before this Subcommittee in February of this year, the long pole in the tent is not the DOE review, but the often lengthy period of time that foreign countries take to submit the assurances that the Department of State requires for concurrence. A fast track that eliminated the need for these assurances would not be advisable.

Finally, we do not give credence to the often-heard argument that the United States needs to engage in a race to the bottom with other, less responsible nuclear export nations by weakening critical nonproliferation criteria to make U.S. exports more competitive. U.S. nuclear vendors should focus on making products that are so safe and secure that foreign customers would be glad to accept a slightly longer wait to receive them.

We therefore propose that rather than modify current law, the discussion draft should incorporate its Section 3 proposal for a fast-track into the review of civil nuclear commerce required by Section 2. This will enable a full evaluation of its risks and benefits.

4. Report on Pilot Program for Micro-Reactors (Discussion Draft)

This discussion draft would require the Secretary of Energy to develop a report describing "a pilot program to provide resilience … at Department of Defense and Department of Energy facilities by contracting with a commercial entity to site, construct, and operate at least one licensed micro-reactor" by December 31, 2027. (In the draft, "micro-reactor" is defined as a

reactor with a power capacity of up to 50 megawatts. Other sources, such as ARPA-E, define it as a reactor of 10 megawatts-electric or less. A 50-megawatt reactor, such as a single NuScale module, is typically considered a "small" modular reactor.)

As stated above, UCS will not object to a good study that will advance knowledge and understanding. But the list of required elements of the study in the discussion draft is not sufficient to furnish all the information needed for a fair evaluation of the merits of the proposed pilot program, or of the risks and benefits of a plan to deploy micro-reactors at DOD and DOE sites to provide "energy resilience."

For instance, the draft vaguely calls for "assessments" of different nuclear technologies, but does not explicitly require analyses of nuclear safety and security: top-line information that a base commander would want to know. Even a so-called micro-reactor would contain enough potentially dispersible radioactivity to render large areas of a site instantly unusable or even uninhabitable in the event of a severe accident, sabotage, or an enemy military strike. It is not clear why the military would want to be saddled with the additional burden of protecting nuclear reactors and their irradiated fuel, and having to deal with the aftermath of a radiological release.

The 2016 Defense Science Board study on energy systems for forward/remote operating bases, while barely addressing safety issues, includes a recommendation that the "Defense Threat Reduction Agency (DTRA) with the Department of Energy (DOE) should conduct a study to

assess … consequence management scenarios" for very small reactors. Such a study, including a comprehensive safety and security review, should be incorporated into the discussion draft's proposed pilot plant report.

Some advocates for micro-reactors underplay safety and security risks, asserting that the reactors are "passively safe." But passive safety systems are not infallible—especially with respect to sabotage— and no nuclear reactor is completely immune to meltdown. For instance, a 2017 Idaho National Laboratory study of one of the candidate micro-reactors, the two megawatt-electric Special Purpose Reactor, identified many unknowns that are "major concerns," including seismic event impacts. Flooding was also found to be a potentially serious accident initiator. And the study found that the reactor lacked sufficient defense-in-depth to prevent fission product release.

In addition, the INL study sheds light on the key question of to what extent micro-reactors could improve "energy resilience" in practice. As demonstrated by the 2011 Fukushima nuclear disaster, which was initiated by a total loss of power, nuclear reactors generally require access to independent sources of power to remain safe in an emergency. This is also true for passively safe micro-reactors. The INL study considered events where the Special Purpose Reactor would lose electrical power and found the "potential for significant core damage," with the "potential need for [a] backup generator" and "battery backup." Thus the reactor that is supposed to provide energy resilience itself needs backup diesel or battery power to keep from melting down. Some small modular reactor designs, such as NuScale, have proposed an "island mode" of operation in

which a subset of modules is designated to supply electrical power to other modules in the event of a loss of external power. But this requires deployment of multiple modules and introduces complexity. Issues such as these should be included in the pilot plant study in order to make it as balanced and useful as possible.

We hope that these observations are useful for the Subcommittee's deliberations. Thank you for your attention.

Mr. JOHNSON. Thank you, Dr. Lyman.

The committee will now stand in recess until after votes. And we will reconvene and begin our rounds of questions. Thank you.

[Recess.]

Mr. JOHNSON. The hearing will come to order. And the Chair will now recognize himself for 5 minutes for questions.

Mr. Merrifield, your testimony notes that the discussion draft's expedited process for low proliferation risk technologies could be improved. How can the legislation find the right balance between having a defined set of technologies that would clearly be directed under the new process while still providing flexibility going forward that future innovations are not limited?

Mr. MERRIFIELD. Well, I think, Mr. Chairman, there are a couple aspects that we would focus on. One is obviously how you define low proliferation technologies. And we, it is our view that defining that, those technologies, commercial nuclear reactors other than those which are designed to utilize mixed oxide fuel would be a common sense way of doing that.

We have a, you know, obviously, very stringent process with the NNSA here in the United States, as well as IAEA, which looks very closely at countries that operate those, those reactors. That is a solid and common sense framework that provides I think an appropriate level of protection.

As it relates to the U.S. Governmental process, I think one of the issues that really drags these things out right now is the interagency process. That, combined with the assurance processes is, as it is currently put in place, has really caused many U.S. companies which are exporting these technologies to really be put at disadvantage and they are having their applications really dragged out far longer than they need to be.

So, simplifying that process for obtaining those assurances potentially by having more standardized form of assurances we think makes a whole lot of sense. At the end of the day if we make it too hard to export U.S. technologies, people will go elsewhere to countries that don't have those concerns.

Mr. JOHNSON. All right. Well, thank you.

Ms. Mann, the legislation that I am proposing to reform DOE's Part 810 review process is meant to provide the U.S. nuclear industry at least a level playing field in the global nuclear marketplace, as in some countries, the suppliers are primarily, if not exclusively, government-owned vendors.

In your experience can you tell me how has, how has your experience been working with DOE on 810 applications? What have you experienced?

Ms. MANN. Thank you. So because our, our activity involves uranium enrichment we are absolutely caught entirely by the 810 system, and at the very highest level of the licensing restrictions for everything we do. You know, that process is not necessarily fun or painless, but we have found that the Department of Energy has been incredibly professional in working with us.

Now, do those approvals take longer than they need to? In many cases they do. That is partly due to the problem we have been talking about, getting the foreign government assurances. But we see that many of the reforms that have been made to date with elec-

tronic licensing, increased transparency, and accountability have been incredibly helpful.

But I do think that your draft makes some very useful recommendations: the delegation of authority, and looking at ways that you can improve what falls into the general license category, will definitely support American users.

Mr. JOHNSON. OK. Well, what further needs to be done to ensure that regulatory requirements don't have a chilling impact on U.S. exports of nuclear technology and assistance to those countries requesting it?

Ms. MANN. The balance between promotion and protection is always a tricky one. And as a company that does deal with very sensitive technology, that is the balance that we are always looking to have in place.

I think that, again, the transparency and the accountability in the process go far towards supporting that process. The recommendation that Commissioner Merrifield is making about a more standardized form of assurance helps. And whatever you can do to get those time frames down.

But I also note that the 810 system does something for the U.S. that we don't see our competitors having an advantage of, and that is the general license system. So, to the extent that we can improve that further, we will get better, you know, better gains.

Mr. JOHNSON. OK.

Mr. MERRIFIELD. Mr. Chairman.

Mr. JOHNSON. Did you want to comment?

Mr. MERRIFIELD. Well, I was just going to say one thing I forgot to mention in our suggestion is also the notion of reducing the number of agencies that need to concur. The DOE and NNSA are perfectly capable of doing the vast bulk of these. We ought to let them go ahead and do it and not necessarily need some of the others in the process.

Mr. JOHNSON. OK. Nuclear power plants last a long time. And I would think U.S. engagement with those reactors around the world can help ensure many years of economic cooperation and peace. According to the EIA, almost 200 gigawatts of new nuclear energy capacity are projected to be added throughout the world by 2050. These plants are going to be built.

Mr. Merrifield, in your testimony you mention that today the U.S. is but one of many highly competitive countries vying for a role in supporting the development of, development of operations of nuclear power plants overseas. Can you describe the type of competition U.S. suppliers face and the benefits of U.S. engagement in these opportunities around the world?

Mr. MERRIFIELD. Well, it is——

Mr. JOHNSON. And I am already out of time. So if you can make it a quick answer I would appreciate it.

Mr. MERRIFIELD. Yes. It is very strong competition. You have got China and Russia, which are often very competitive technologies with a lot of financing behind them. You have Korea, which has a demonstrated technology which is going to deploy four units in the UAE, which is a very aggressive competitor. And France has been very successful in a variety of other countries.

The U.S. has strong competition. We don't have the same economic tools behind us. We really do need all of the effort of the U.S. Government if we are to increase these U.S., these vital U.S. technologies.

Mr. JOHNSON. Thank you. I yield——

Mr. MERRIFIELD. Oh, I was going to say these are 100-year relationships. That is what our competitors know and that is what we need to focus on.

Mr. JOHNSON. The long term.

I yield back the balance of my time, which I have none, and I recognize Mr. McNerney for 5 minutes.

Mr. MCNERNEY. Well, I thank the Chair. And I thank the witnesses. I apologize for missing your testimony. I was in another committee.

I am going to start with Mr. Lyman. What are the costs associated with fabricating HA–LEU through downblending of excessive highly enriched uranium stocks as opposed to using conventional or alternative fabrication methods?

Dr. LYMAN. Well, I think until—it is hard to talk about the cost of the alternative until the scope of the program has been established, as well as what it would take not only to—what it would take really to support Ms. Mann's effort to acquire a capability to reconfigure plants and license them for producing HA–LEU.

So until that scope is recognized, there are a factors on the costs, so I couldn't say. But clearly if existing HA–LEU stocks are available, that downblending, depending on the quality of the source material, could be, you know, a competitive option I would think since——

Mr. MCNERNEY. Thank you. What about the nonproliferation comments, could you expand on that a little bit?

Dr. LYMAN. Yes. Well, in general HA–LEU, even though it is below the 20 percent enrichment threshold, it is only if you look at a material that is right below that threshold it only takes about one-tenth of the separated work to produce weapons grade uranium over 90 percent as it does for natural uranium.

So, having a stock of that moderately enriched uranium does give a leg up to a nation that might want to start producing high-enriched uranium for weapons. And that is our point now, that is why Iran, there was so much concern about Iran stockpiling this material.

In addition, that material could be used for radiological weapons which has been their study in the past.

So it is important to examine those issues if you do develop a new demand and production capacity for this material, start exporting, other countries may be kind of interested in similar designs, want to start producing HA–LEU themselves. I think that warrants further exploration.

Mr. MCNERNEY. Thank you. Mr. Irvin, where does the Southern Company see small modular reactors fitting into their business model?

Mr. IRVIN. That is a good question and it is an interesting one. We view SMRs as being a critical component of the maintaining the supply chain as we go forward for advanced reactors. We are always looking at our customers' needs and evaluating what they

are telling us with regards to their price and performance requirements.

I believe that SMRs have a critical challenge with respect to being competitive against natural gas combined cycle in the U.S. That doesn't mean that that future is not bright. And certainly there is a significant opportunity for SMRs, but I do think it is challenged.

We, we see advanced reactors as providing a potential to drive down the costs low enough to be competitive with the natural gas combined cycle. And so really the core component of SMR is providing a bridge to that future.

Mr. MCNERNEY. Good segue.

Mr. Merrifield, how do you, how do we help jump start the industry without hampering the NRC's capability to do their job?

Mr. MERRIFIELD. Well, I think, I think, you know, a number of pieces of legislation that you have before you today would be, would be helpful. In terms of the NRC's process, I think the agency's made a lot of, a lot of progress on right-sizing itself. I think putting in specific deadlines for reviewing applications, reviewing environmental reviews, I think that is certainly appropriate and I certainly would support that.

Overall, in the part of the advanced reactor community, I think having appropriate funding through other committees of Congress is going to be important to your technologies which have great promise. They are certainly deployable in the late 2020s, and the U.S. is ahead in this technology. Certainly want to take advantage of that for export purposes.

Mr. MCNERNEY. So in honor of the sitting chairman, what about the nuclear waste issue? Do you see a resolution of that in the works or what are your feeling about that?

Mr. MERRIFIELD. Is that directed toward me?

Mr. MCNERNEY. Yes. Yes, sir.

Mr. MERRIFIELD. Well, I have a specific prohibition against lobbying Congress on Yucca Mountain related issues. So, with that caveat I think that there are common-sensical ways to address the material. There are several proposals for interim storage facilities, both in Texas and New Mexico, which provide I think common sense ways of dealing with this in the interim.

At the end of the day, my personal view as an American is Yucca Mountain is a perfectly safe place to put that fuel.

Mr. MCNERNEY. Thank you. Mr. Chairman, I yield back.

Mr. SHIMKUS [presiding]. Thank you. The gentleman yields back his time.

It is great to have you here. It is great to be in the chair for the Energy Subcommittee. So let me go with my round of questions, kind of similar to what I did with the first panel. I want to go to Ms. Mann.

Your testimony notes that your NRC-licensed facility is capable of producing high-assay LEU or low-enrichment uranium for advanced nuclear fuels. I would like a brief clarification. Are there any technical, regulatory, or other legal restrictions from your enrichment plant to make high-assay LEU for commercial purposes?

Ms. MANN. Certainly the technology is fully capable now of doing that. The site that we have we think is certainly suitable. We do

need a nuclear NRC license amendment to build a HA–LEU enrichment module. But there are no other restrictions on that technology or that proposal other than, of course, having a market that we can serve.

Mr. SHIMKUS. Markets are important as you directly put.

Are you aware—and you were in here for the first panel, so this is a similar question—are you aware of the GAO report that recently analyzed the NNSA's preliminary cost estimates and mission statement regarding future enrichment needs for American defense purposes?

Ms. MANN. I am generally familiar.

Mr. SHIMKUS. Based on your experience in building and operating the only enrichment plant in the United States, what is your perspective on GAO's conclusions on NNSA's cost estimates?

Ms. MANN. There are certainly two very different things. We built a greenfield commercial enrichment facility in New Mexico, taking it from what was a effectively a square mile of scrub brush and coyotes in 2006, and turning it into a high class enrichment facility. And investment to date is about $5 billion.

I think that is very different than the cost range that was envisioned for a much smaller footprint of capacity for the DOE domestic uranium program.

Two comments on that. One, I do believe there is strictly a clear delineation between civil and military programs. I can also tell you that the cost estimates that are in that GAO report are unsustainable, whether it be for the commercial fleet or for an emerging advanced reactor community.

Mr. SHIMKUS. So you were, again, here during the first panel. And what do you respond—and he could have stayed, too—Mr. McGinnis' comments on the similar question?

Ms. MANN. I certainly appreciate that the Department has other missions it needs to fulfill. And I understand that they may be looking to merge some of those. But what we are looking at is the near-term need for HA–LEU fuel for commercial reactors, on a relatively small demand, even if you aggregate all of those small pieces from different users.

If you try to put the defense program on that backs of that, you will break it.

Mr. SHIMKUS. And Mr. McGinnis' comment which, you know, I fleshed out a little bit but not enough, he seemed to be making the debate of competitive marketplace and having two production facilities. How would you comment on that?

Ms. MANN. We certainly support competition. And I can tell you we are very much aware of the competition that we see, both in the enrichment market and other parts of the fuel cycle. And that's really up to the market to bear.

We know that utilities, like Southern here, like a very diverse range of supplier. I think the question is until we know what the full demand profile is, how many advanced designs, advanced fuel types move forward I am not sure what that industry is capable of sustaining in the earliest years.

Mr. SHIMKUS. Well, I think that's been my point, too, because I would concur that we would like to have multiple sources, like to have competition. We want lower costs and more efficiencies.

But I am also concerned about the Government overbuilding on a projected market which may not be there immediately to fulfill the production needs and desires, and you will have stranded costs there in producing fuel that you may not need to do.

Ms. MANN. I will just tell you quickly that the existing fuel cycle is under quite duress due to the falling demand, to the significant amount of inventories, to state-sponsored competition. We are trying to sustain that. And if you look at trying to add additional pressures on top of that, it's not sustainable.

Mr. SHIMKUS. Well, and I follow it very closely because I have the Honeywell facility. And I have talked with DOE quite a bit about the multiple individual markets that don't produce it, but then the repurposing of, in essence, Government-subsidized ability to purchase and buy and then also create fuel waste. It makes it hard for a corporate entity to be able to provide that certainty.

So, I am going to yield back my time. And thank you for answering those questions. And then yield to Mr. Green for 5 minutes, from Texas.

Mr. GREEN. Thank you, Mr. Chairman. I thank our witnesses for waiting here today.

Mr. Merrifield, based on your vast experience in the Nuclear Regulatory Commission I would like to ask you a few questions on the NRC's fee and Mr. Kinzinger and Mr. Doyle's bill.

Section 3(b) of the bill would provide an exclusion of fees for those costs associated with the development of regulatory infrastructure for advanced nuclear reactor technology. Can you talk a little bit about why this provision is so important to this new industry and how our current NRC fee structure stifles growth in the sector?

Mr. MERRIFIELD. Yes. Thank you very much, Congressman, for that question.

A couple of things. First, I think if you look historically, with the current fee in nuclear reactors they did not have to pay those kind of fees when those reactors were developed in the 1960s, 1970s, and 1980s. So concurrently I think that is one issue.

The second one is these are nascent technologies. These are not large companies that are developing these technologies. They are smaller. They are innovative. And they are currently in the market seeking funding to bring those designs forward.

Placing on top of all of that effort the costs of the NRC, building its regulatory infrastructure would be, would be potentially crushing. And that's really a role and responsibility that is more appropriately left to the U.S. Government. And so I believe, and ClearPath Action believes that the language is appropriate.

Mr. GREEN. As more and more nuclear plants go offline across the country, the fee burden is felt more heavily by those who remain. Do you feel the current NRC structure is sustainable? And if not, is there a tipping point that you expect to come?

Mr. MERRIFIELD. I think that is, I think that is a great question. And I agree with the direction from which it comes.

Yes, I do think Congress is going to have to continue to take a look at the number of reactors and adjust the amount of fees that are put on licensees as a result of it. The NRC has certain breadth of work that they have to do. But there will become a point at

which I think there will need to be increased general revenues dedicated to that to make sure that that fee structure isn't overly burdensome to U.S. utilities.

Mr. GREEN. So, do you have a year. I mean, because some of this legislation needs, sometimes it takes years to get something passed. Do you have any idea when that may be, looking into the future?

Mr. MERRIFIELD. Well, I think, I think this is something that this committee should be thinking about and Congress should be thinking about right now. I mean the discussion is as many of a quarter of the reactors could potentially go offline. I think, you know, changing the current ration that previously was 90:10, I think taking it to a different ratio makes sense currently right now.

Mr. GREEN. Do you feel the draft legislation adequately addresses these challenges?

Mr. MERRIFIELD. I think the legislation is a great step in the right direction.

Mr. GREEN. While I made clear before that I am not fond of DOE's recent notice of public review that proposed subsidizing certain industries, I do think we face a challenge that needs to be addressed. We have heard from many witnesses on multiple pieces of legislation.

What else should Congress be looking at to shore up the domestic nuclear energy production in the coming year other than these legislations?

Mr. MERRIFIELD. Well, I think having, having the fast reactor capability out in Idaho is going to be important for the testing of the various rules that will be used for these reactors. So I think that is an important one.

I think the actions that Congress has made to make sure the DOE loan guarantee program stays in place is important.

I think the Ex-Im Bank is an important tool for the export of these reactors, so I would certainly recommend continuation and, frankly, some strengthening of their nuclear capabilities.

Those are among some of the things I think Congress ought to look at.

Mr. GREEN. Well, hopefully next time we reauthorize Ex-Im Bank it won't take such a battle as we had last time.

Mr. Chairman, I will yield back my time. And thank you for my earlier extra 20 seconds.

Mr. SHIMKUS. The gentleman yields back his time. And the Chair recognizes the gentleman from Missouri, Mr. Long, for 5 minutes.

Mr. LONG. Thank you, Mr. Chairman.

Mr. Irvin, your testimony focuses a lot on the research and development of advanced nuclear reactors. What are the long-term benefits your customers will see after Southern Company invests in these new technologies?

Mr. IRVIN. So, the industry at large, we talked a lot today about the nuclear industry being in the crossroads, but I think the industry at large is at a crossroads as well. We have seen the influx of lots of new technologies being disruptive across the board. And so as we look forward, we believe investing in technology that is, I am going to use the phrase, options positive. So I want to create options. Knowing that I am believing that the future is uncertain I

want to create technologies that provide multiple options for my customers.

So, the first and foremost for me is the technology, does it have a potential to drive down the cost of energy? I believe advanced reactors do have that potential.

But further than that, does the technology have the potential to serve more than just electricity needs? Does it have options for a multitude of product slates? And these advanced reactors and the nature in which they operate creates opportunities for nuclear energy to be transitioned into the industrial sector, into the transportation sector, but certainly providing low cost electrons.

And so, we see the opportunity for this long-term, stable energy supply to be pervasive across the entire energy economy.

Mr. LONG. What does Congress or the Department of Energy need to do to help companies like Southern Company and other companies streamline the development of these advanced reactors?

Mr. IRVIN. Well, I think the one of the most important things there, and it is something I have seen out of the Department over the last 5 years do more and more is really seek out industry's input and partner with industry in a collaborative way, and take that feedback from industry as to where we need to move the technologies to. I think industry, in partnership with the Department, can accelerate. And we need that collaboration with the Department on things like fundamental science, testing capabilities such as the advanced reactor, fast test reactor that was mentioned earlier.

But then, ultimately, as that collaboration matures we need the Department and Federal Government to allow industry to then move forward and commercialize and take advantage of the investment that has been put in before it.

Mr. LONG. OK. This next question is for everyone. We will just start Merrifield, Mann, Irvin, and Lyman down the line if we can.

But for all of you, I have seen some of your testimonies reference the—in reference to China starting to load fuel into new nuclear power, a new nuclear power plant, and India, Russia, and Korea leading the United States in deploying large nuclear reactors over 1,000 megawatt units. Is the United States falling behind these countries in the field of nuclear energy and nuclear technology in your opinion, Mr. Merrifield?

Mr. MERRIFIELD. That is—I have got a mixed answer to that. Frankly, the reactor that is being built in China is a Westinghouse technology. The United States continues to possess the most modern nuclear design out there in that particular technology, so we are leading in that regard.

In terms of construction, obviously Southern Company has two of those reactors that continue to be built. It is unfortunate that the cost of natural gas is what it is, which is hindering utilities like Southern, more and more of those. But certainly there is a robust export market. And certainly the United States should be a leader in that, in that regard.

Mr. LONG. OK. Ms. Mann, is the United States falling behind these other countries in the field of nuclear energy, nuclear technology in your opinion?

Ms. MANN. Mr. Long, my specialty is on the nuclear fuel cycle. And in that regard the answer is clearly no.

But in order to be able to supply into China we need to have an open market. And that is one of the things we are concerned about is to make sure that they are able to continue to receive the output of American technology in their home.

Mr. LONG. Mr. Irvin?

Mr. IRVIN. Personally, I think the race is a little too close to call right now. But I think the reference to natural gas being low, by the way it is a good thing for Southern Company if natural gas prices are low, but it is a clear indication that when the U.S., when we put U.S. innovation to work through collaboration with the Federal Government, like we did with learning how to frack, and finding shale gas, then we can clearly stay ahead and put ourselves further ahead than the rest of the world. And so that is the reason why we are so focused on innovation.

Mr. LONG. Dr. Lyman?

Dr. LYMAN. Well, I would say the answer is no. From our perspective safety and security are paramount. And I do agree with Mr. McGinnis when he said that the U.S. as far as its safety and security infrastructure for nuclear power is probably the best in the world.

So we would like to see those concepts, you know, exported. We don't want to see a race to the bottom where the U.S. has to compromise on its own principles just to compete with China on nuclear safety concerns. So we think that that is the best selling point of U.S. technology is that backbone of safety and security.

Mr. LONG. Thank you, Mr. Chairman. I yield back.

Mr. SHIMKUS. The gentleman's time has expired. The Chair recognizes the gentleman from Pennsylvania, Mr. Doyle, for 5 minutes.

Mr. DOYLE. Thank you, Mr. Chairman.

Commissioner Merrifield, welcome back. I want to thank you for taking the time to speak to the committee on nuclear energy issues and the NUKE Act. The NUKE Act made several changes from the discussion draft that was under consideration when you last testified before the committee. These changes include significantly longer time lines for major license applications, milestones for new plants, and the removal of deemed approved language.

Under the current version of the NUKE Act, if the NRC does not meet the time lines that are laid out in the bill will that have any effect on an operator's application?

Mr. MERRIFIELD. Yes, I would have to go back and look at the explicit detail, but I think it does provide an opportunity for that process to continue. So I don't think it has a hindrance. But I will certainly look at that and give you some comments.

Mr. DOYLE. Now, do you think the current language gives the NRC sufficient flexibility?

Mr. MERRIFIELD. I do. I do.

Mr. DOYLE. Do you think the current NRC fee structure is able to appropriately adjust to reflect current market and future changes to our national energy portfolio without congressional action?

Mr. MERRIFIELD. As I indicated—great question—as I indicated in the questions earlier, I believe there needs to be additional revisions to that fee structure, part of which is envisioned by the legislation we have been talking about today. I think that is going to be a continually evolving issue if there are additional U.S. reactors that go into decommissioning prematurely.

Mr. DOYLE. Can you speak to the current budgetary burden that is placed on remaining nuclear reactors when a plant retires? I mean, how do you anticipate this is going to affect our nuclear fleet if it is not addressed?

And do you see the changes that are proposed in the NUKE Act as helping to address this problem?

Mr. MERRIFIELD. Well, I will start with, I will start with the second question first. I do think they are helpful. But there is no question there are certain fixed assets that the agency has that it needs in order to be an effective regulator. At some point that will become large enough that the burden placed on the individual reactor operators will become larger and larger. And that is troublesome and problematic because it makes even more complicated the likelihood that some of those reactors will be shut down. And I don't think that is a good thing.

Those are important, carbon-free, clean-generating assets for our country. I think there are some that have shut down that have been, frankly, a real shame.

Mr. DOYLE. Thank you very much. Mr. Chairman, I yield back.

Mr. SHIMKUS. The gentleman yields back his time. The Chair would now like to recognize the gentleman from Illinois, Mr. Kinzinger, for 5 minutes.

Mr. KINZINGER. Thank you, Mr. Chairman. Thank you all for being here today. I very much appreciate it.

Mr. Merrifield, Section 7 of H.R. 1320 sets time lines and goals for the NRC to issue environmental impact statements and safety evaluation reports for several NRC licensing actions such as early site permits, construction or operating permits, and combining operating licenses. Are the time lines in Section 7 generally reasonable to expect based on historical processing times?

Mr. MERRIFIELD. I believe so.

Mr. KINZINGER. And in your view would instituting such time lines in any way weaken the underlying stringency of the established reasonable assurance regulatory requirements?

Mr. MERRIFIELD. I do not believe so. And frankly, you know, we looked, and as I mentioned in prior testimony before this committee, I led a task force that looked at some of these very same issues when I was on the Commission. We felt at that time there was really a need to streamline some of those processes, and it didn't really happen. I think the language that you all have put into that draft will be very—would be a very welcome change and would give the discipline necessary for you just to go ahead and do that without sacrificing their mission of protecting public health, safety, and the environment.

Mr. KINZINGER. Thank you.

Ms. Mann, your enrichment facility holds an NRC license and is subject to NRC's fee recovery. My bill, or our bill creates reasonable and predictable expectations for NRC's fee recovery process. I un-

derstand the number of licensees who fund NRC fuel cycle activities has decreased recently without a reduction in overall NRC staffing.

Will you discuss recent trends associated with NRC fuel cycle facilities?

Ms. MANN. Certainly. What we are seeing on the fuel cycle in many way echoes what we have just talked about with regard to the reactors. The first I would note is that since our enrichment plant started operation in 2010, we have seen on average a 12-percent-a-year increase across the board. And even though the amount of work that is being done at our facility has slightly gone down now, we are fully operational.

As the number of fuel cycle facilities that are licensed has dropped, the fees, the total fees that they are trying to collect have not gone down. And we are, in fact, spreading those fees across a fewer number of licensees. And so, by that logic, if we were to perhaps be the last one standing we would be bearing the full $25-million-a-year burden.

What I think is also notable, and we touched on it a little bit, is there are things that have to be paid for at the NRC that have nothing to do with the operation of an individual facility. And right now what we are looking at is that 74 percent of our fees go to those nondirect services rather than directly to licensing our site. And we certainly understand the need to share that burden, but that burden is becoming prohibitively high.

Mr. KINZINGER. Thank you. And how does this embed cost in the nuclear fuel cycle that you have touched on, business, and ultimately impact the commercial nuclear industry and electricity rates that my constituents pay?

Ms. MANN. Well, I can tell you sitting next here to one of the utilities is that it is highly unlikely we would be able to pass those additional costs along to any of our utility customers. They have other choices and they have other suppliers who don't bear the burden of those fees. So we need to be careful.

And, likewise, we understand why Nick couldn't do that, he can't pass it on to his customers. So the question is what is a more rational way to spread those total fees across, and then also reflect the individual licensing work being done at each of our sites.

Mr. KINZINGER. And that, by definition, would skew the whole energy mix anyway, which is something that we are obviously very concerned with. And so, would enacting this legislation help control those costs in your mind?

Ms. MANN. Yes, it would.

Mr. KINZINGER. Thank you.

Mr. Lyman, H.R. 1320 contains substantially similar language regarding NRC's fee structure as the Nuclear Energy Innovation and Modernization Act sponsored by the Senate EPW Chairman Barrasso. With respect to that, though, your organization said the bill balanced reforms to the licensing process while allowing the NRC flexibility to regulate in the public interest and the Union of Concerned Scientists took a neutral position on the bill. Does that position also apply to the same language fee that is included in my legislation?

Dr. LYMAN. Yes, it does. And as you see in my testimony with regard to the fee cap and the corporate support costs, we also, you see that we take a neutral position because we think there is language in there that provides enough flexibility. We just don't want to see Congress mandate an arbitrary cap that would force the NRC to curtail important safety and security work and needs some flexibility. And I think the way the language is written now they would have that.

Mr. KINZINGER. Thank you. And I yield back.

Mr. SHIMKUS. The gentleman yields back. At this time the Chair recognizes the ranking member of the Environment Subcommittee, Mr. Tonko, for 5 minutes.

Mr. TONKO. We have the environment team here and——

Mr. SHIMKUS. They are taking over.

Mr. TONKO [continuing]. The energy team. So only kidding.

Welcome to our witnesses, and thank you for your input. Mr. Merrifield, H.R. 1320 would exempt a number of activities from NRC's fee structure. Can you give us the sense of what those activities would include?

Mr. MERRIFIELD. I don't have, I don't have the list in front of me right now. The one that we focused on is an exclusion for costs associated with developing a regulatory infrastructure for regulation on advanced reactors. We think that that, that particular language makes a lot of sense. It is important the NRC put that structure in place. It is working very hard to do so right now.

There are upfront costs that are associated with that kind of activity. And certainly we think that should be borne by the general revenues rather than individual developers.

One of the elements I included in my written testimony is the suggestion that you may wish to increase that to allow some degree of regulatory research as part of that advanced reactor program so the NRC had the tools looking forward to appropriately regulate those, including an appropriate balance of risk-informed regulation in that part. So that, we certainly think that that is a very good element of that program.

Mr. TONKO. So the NRC currently recovers approximately 90 percent of its budget from license fees?

Mr. MERRIFIELD. Yes.

Mr. TONKO. Are any activities exempted under this bill currently recoverable by NRC?

Mr. MERRIFIELD. I would have to look at, I would have to look at the individual elements of the legislation that go past it. And there are certainly some areas where there may be an overlap, but I would have to confirm that.

Mr. TONKO. OK, thank you.

And do you have any estimates, and if not, Mr. Chair, maybe we could ask NRC, of how this bill might change that 90:10 cost recovery, if enacted?

Mr. MERRIFIELD. I do not have an estimate of that. And I do think you are quite correct, directing that to the NRC would be more appropriate.

Mr. TONKO. Thank you. The bill also places a cap on the fees that NRC can charge an operating reactor. Mr. Merrifield or Mr.

Irvin, do you know the current average annual fees assessed on operating reactors?

Mr. MERRIFIELD. I am going to pass that one to Mr. Irvin.

Mr. IRVIN. Unfortunately, I don't, I don't know that. I am in the R&D sector, not the operations side, so.

Mr. TONKO. OK, thank you.

Dr. Lyman, you expressed concerns about the expedited review process in Section 7 of H.R. 1320, which would require the draft environmental impact statement within 24 months and a 42-month deadline for technical review process and final environmental impact statement. Can you explain your concerns with the time line for these reviews?

Dr. LYMAN. Yes. As a policy matter we don't support the micromanagement by Congress of regulatory agencies to that extent that they should be given these strict time lines to conduct environmental reviews. Often during the review new issues will arise that simply take time to resolve. And I do not think that it is appropriate to try to force resolution of those where they are right.

So that is why we don't think, unless there was more discretion to the agency to be able to exempt those time lines, we don't think it is appropriate.

Mr. TONKO. Thank you. And, Dr. Lyman, again, and let's switch to Part 810, it seems you believe we should err on the side of caution for nuclear technology transfers. What role should the State Department play in assessing proliferation threats?

Mr. IRVIN. I think the State Department has a critical role and brings its own expertise to these reviews. And in particular by taking a broader view that we did hear about this morning, that any technology export has to be seen in context. So, even a light-water reactor without any fuel cycle technology could potentially pose undue risk if it goes to, let's say, a region of the world like the Middle East or Saudi Arabia where the countries are stating its desire to acquire fuel cycle technology possibly from somewhere else.

So if, if we give them cover to be able to acquire that technology, possibly for eventual misuse for nuclear weapons, I think that would be a dangerous development.

Mr. TONKO. And is it important to be able to reassess those risks in real time?

Mr. IRVIN. Yes. One would hope getting information and making decisions is always based on the best available information at the time, but also by looking ahead. And understanding we heard earlier a nuclear reactor, you know, could be a 60- or a 100-year proposition. Well, that cuts both ways. Governments often don't last that long. So you have to look forward and make conservative projections about what may happen in the future with that technology.

Mr. TONKO. Thank you to all of you. I yield back.

Mr. SHIMKUS. The gentleman's time has expired. The Chair recognizes the gentleman from Michigan, Mr. Walberg, for 5 minutes.

Mr. WALBERG. Thank you, Mr. Chairman, and thanks to the panel for being here.

Ms. Mann, your testimony notes that there is a need to address packaging and transportation needs. But you also note that we already transport nuclear fuel to meet the needs of the commercial

fleet. Additionally, we currently ship HA–LEU for research reactors and other purposes.

Can you please provide a bit more context on what is different about the needs and designs for transportation packages for HA–LEU on a larger scale?

And, second, why are the existing packages not adequate for widespread commercial use for uranium enriched at higher levels?

Ms. MANN. Certainly. Thank you.

One of the things that we, that we know is that the HA–LEU is at a higher enrichment level than the commercial industry. And when we look at the HA–LEU fuel cycle, the first piece of that, the enrichment piece, will come out in the form of what we call uranium hexafluoride. There are no current commercial packages that are suitable for HA–LEU enrichments of uranium hexafluoride.

Moreover, existing NRC regulations require additional performance requirements for such packages. So what we need to do is to develop that, that capability. Similarly, we don't have packages for higher enrichments of oxides in most cases. We do for some metals. And we have used the research reactor fuel that is in metallic form. However, there is only a handful of I think six to ten packages in total that would not serve the full breadth of the industry.

So what we are looking to do is develop that capability. Or, alternatively, is one of the things we suggest in our written testimony is you could obviate some of that need by collocating one or more of those HA–LEU fuel cycle steps on a single facility, thus avoiding public transportation.

Mr. WALBERG. Is that in the works?

Ms. MANN. Certainly we would be happy to find a dance partner if there were somebody who wanted to collocate with us in New Mexico. That makes a lot of sense as well from an economic standpoint, as well as from a regulator standpoint, because these existing licensed sites are known to the NRC, they are well characterized. We could take advantage of existing infrastructure, security, manpower.

Mr. WALBERG. You also note that the design, development, testing, and NRC certification for transportation packages typically take between 4 to 7 years. Would the program required by the Advanced Nuclear Fuel Availability Act help move the time frame earlier through a public/private partnership for the design and the DOE efforts to develop criticality benchmark data?

Ms. MANN. It would in two important ways. First, it recognizes that there is a transportation challenge. And I think that has been lower on the priority list, as much of the focus has appropriately been on the reactor design.

But, secondly, we talked a little bit in the earlier session about the need for nuclear criticality benchmarks. And this is a sort of data analysis to see how will these nuclear materials perform. And to the extent that we can come up with a common set of those benchmark codes that we can use in our enrichment facility, that converters and fabricators can use, and that are also used in transportation packages, gives us a single set of data to focus our attention on and to allow the NRC to focus on that, rather than reviewing multiple different sets of submissions.

Mr. WALBERG. Thank you.

Mr. Irvin, I understand that a research reactor in Norway, known as the Halden Reactor, is currently shut down for maintenance. And the Norwegian Government is discussing the future of the reactor. My question is, what sort of capabilities does that reactor provide for American research needs? And what are the implications for the advanced nuclear community if the reactor is shut down?

Mr. IRVIN. So, my understanding is that reactor is a boiling water reactor. And if I am not mistaken, much of the interest in that reactor has to do with evaluating something called accident tolerant fuels which would be used in the existing fleet.

Certainly, in general, access to research and testing capabilities for the existing fleet as well as for the future fleet is of critical importance. There has been some talk today about a fast neutron source. I am not intimately familiar with the level that the industry is relying on that reactor right now, so I can't comment really any further than that.

Mr. MERRIFIELD. Congressman, if I may?

Mr. WALBERG. Yes.

Mr. MERRIFIELD. I had the opportunity to visit the Halden Reactor when I was a member of the NRC. The NRC actually contributes money toward that program. There are a variety of countries around the world that are members of their research programs there. It is a critical research facility. It is one that has some of the longest fuels in there for some of the longest periods of time in the world. It would be a real loss to the international nuclear community if Norway were to make the choice not to——

Mr. WALBERG. So there is a potential role for the U.S. in that?

Mr. MERRIFIELD. I would, I would say certainly. There certainly is a role. If we don't have—right now we don't have the ability to do a lot of research that we need to do in U.S. fuels. We use the hindsight mind, who I support, if we can't get it done here in the U.S. you have got to look to Russia, you have got to look to China, you have to look elsewhere, and we really shouldn't be in that position.

We, as a country, are the world's inventor, and innovator, and leader in nuclear technologies. We should not lose that leadership. And certainly we are at risk of doing so.

Mr. WALBERG. Thank you. I yield back.

Mr. SHIMKUS. The gentleman's time has expired. The Chair recognizes the ranking member of the subcommittee, Mr. Rush, for 5 minutes.

Mr. RUSH. I want to thank you, Mr. Chairman.

Mr. Merrifield, in your written testimony you state that eliminating the foreign ownership provision, as Section 4 of H.R. 1320 proposes, there could be essentially provide an opportunity to save the messy nuclear facility fuel investment by friendly foreign utility partners. Can you briefly discuss how that would work?

Also, do you have any concern about unintentional consequences that are listed in this provision might cause? And I would like to invite anybody in the panel who would want to have some input. So, Mr. Merrifield, will you answer the question?

Mr. MERRIFIELD. Thank you very much, Congressman.

So, I will start off with the second half of that first, and that is regarding the concerns. As currently written in statute, the foreign ownership provision really has two elements to it, one of which is an absolute prohibition on the foreign entity owning a majority of the U.S. nuclear power plant.

The second half of that requirement is one that imposes a inimicality test where a determination is made whether the own—whether ownership in whole or in part would be inimical to the interests of the United States.

I have testified many times before this committee and before the Congress dating back to when I was on the Commission where we said, as a member of the Commission, we really felt the first half of that question is unnecessary. And the inimicality test, if left in place, would give an appropriate tool to make a determination about whether that ownership was against the interests of the United States.

I used in both my written and my verbal testimony an example where the decision of the United Kingdom to allow Electricité de France to purchase U.K. nuclear units had the beneficial aspect of allowing those reactors to continue to operate. And they have done so effectively and safely since the late 2000s.

In terms of the potential in the United States, I can't, I would be—it would be inaccurate for me to say I have got a list of foreign utilities that today wish to purchase U.S. nuclear power plants. What I was suggesting in my testimony is there are past examples of utilities that I am aware of that have expressed an interest in purchasing U.S. nuclear plants but made the determination not to do so when they found out they couldn't purchase the plants in their totality because they were prohibited from that under U.S. law.

So the suggestion is that perhaps if that provision were to be taken out of law, there may be the emergence of companies currently not on the market who may be interested in owning U.S. generating assets in the nuclear arena.

Mr. RUSH. Does anybody else want to weigh in on that? Mr. Lyman?

Dr. LYMAN. Just briefly. I think I may sound like a hawk here, but from the national security perspective I think removing these requirements and allowing a foreign nation to own, exert control over dominant U.S. nuclear facilities would be an irresponsible move. So we certainly oppose. We opposed that provision in the Senate version. We oppose, we don't think there is any point in reviewing it in the study that is proposed in this committee.

Mr. RUSH. Mr. Lyman, you think a study in this proposal would be dangerous?

Dr. LYMAN. I am sorry, could you repeat the question?

Mr. RUSH. You point out concerns with Section 4 and 5.

Dr. LYMAN. Yes.

Mr. RUSH. Which involved the GAO study on implication of repealing restriction on ownership, control, and domination by a foreign entity of nuclear facilities here in the U.S. And you are not in favor of the study?

Dr. LYMAN. Oh, I am sorry, in the Senate there is a bill, Nuclear Energy Innovation and Modernization Act. In the original version

of that bill, it had a provision to strike the restrictions on foreign ownership, control, and domination. So we opposed that provision in that bill that ended up being stricken from the final version that was passed by the committee.

Mr. RUSH. I am concerned about this GAO study. Is there anything in your opinion that you are opposed to GAO conducting a study on foreign ownership?

Dr. LYMAN. Yes, the draft or the H.R. 1320 calls for a review and calls for a study on elimination of foreign licensing restrictions done by the Comptroller General in consultation with the Secretary of Energy. As we say, you know, generally we don't oppose a study as long as it is done properly, because studies always bring more information. So we wouldn't oppose the study. But we think that the results of that study would probably support strongly the conclusion that those restrictions should be maintained.

Mr. SHIMKUS. The gentleman's time is far expired. The Chair recognizes the gentleman from South Carolina for 5 minutes. We thank him for being very patient.

Mr. DUNCAN. Thank you, Mr. Chairman. Thank you guys for being here and being very patient. It will all be over soon; I am last.

Mr. Merrifield, you talked a lot about the benefits of nuclear energy. And I agree with you, I have long been a proponent of the industry. And being from South Carolina you have talked today about VC Summer and what happened there. I also heard the gentleman from Missouri, Mr. Long, talk about China, and Russia, and others that are leading the United States in nuclear technology, and research and development.

So I have got to ask you, have we lost the ability here in the United States to do big things in the nuclear power sector?

Mr. MERRIFIELD. I don't think so. I mean, I think what we had is we had some first-of-the-kind activities for the United States that we hadn't done in 20 or 30 years. Although it is unfortunate that there was a decision made to, hopefully, temporarily shut down the VC Summer construction, I certainly give credit to Southern Company for moving forward with those AP1000 reactors at the Vogtle site and fully expect to help them celebrate those going online years down the road.

Mr. DUNCAN. So we all know that there is a lot of Government bureaucracy, and the regulatory environment seems to be getting tougher and tougher for these type projects. What steps could be considered potentially for a cumbersome and inflexible regulatory regime from inhibiting new nuclear development. Do you think the gentleman from Illinois Mr. Kinzinger's legislation will help with that?

Mr. MERRIFIELD. I do. I think there is a couple of things here. One is I do think it is appropriate to have time lines for the agency to conduct review of various activities. I think there is nothing wrong with that. We did those kind of things when I was a Commissioner.

I think as well making sure that the agency is the right size and has the appropriate mix of people and dollars is important. They have reduced to a certain extent. I think there is more than can

be done in the areas of the agency, frankly, having gotten the focus it probably should have.

So, I think between the two, the legislation, and then things that NRC can do on its own are going to be important in getting there.

Mr. DUNCAN. And to Mr. Irvin, I am glad to see that Vogtle is moving on there for Southern Company, given what happened in South Carolina.

One of my biggest concerns is continuing private sector investment. I mean if the tens of billions of dollars that are required to build new nuclear reactors in this country and the long regulatory framework that takes place before construction, then starts the long construction period as we see with Vogtle and VC Summer, and then 7 years into the project the construction side of it the rug gets pulled out from under the project and those investors lose that money or the ratepayers are on the hook for something possibly in South Carolina, how are we as a nation going to get the investors and attract the investors to invest in these type projects going forward?

And that has got to be a question Southern is asking itself.

Mr. IRVIN. This is a question I get asked often in terms of our need to try and get more investment in developing technology. I think, I think the answer, maybe because I am an R&D guy, is innovation.

If you look at the work we are doing on advanced reactors, as I said earlier, we believe they have the potential to drive down that cost. And they drive down that cost in multiple ways. But in a very notable way it is shortening construction time lines, it is simplifying plants, it is making the time from concept to delivery much more effective and efficient for the resources.

Mr. DUNCAN. That is a good point. We want to reinvent the wheel every time we do a new nuclear project when we have got proven reactor technology out there, and then design. But we are spending all this money to reinvent.

Mr. IRVIN. Certainly I think one of the reasons we are having to spend time to reinvent the technology space is that the rest of the industry has moved forward. So, if you look at 15 years ago relative to natural gas combined cycle, the technology we have right now, we have today to deploy, we are highly competitive. And with the innovation that happened in that sector, they no longer are.

And so, I think we, as a nuclear industry, are challenged to not reinvent for reinventing's sake, but to seek those technologies that provide the right level of benefit to our customers that can also be deployed in a timely manner and in the right characteristics.

Mr. MERRIFIELD. I was going to say just on that score, I mean these new technologies provide also some different avenues. You know, the traditional technologies, AP1000, 1,000 megawatt baseload power; some of the molten salt reactors, high temperature gas reactors are smaller. They can be used in different ways. They can be used for desalinization. They can be used in remote locations in some circumstances. And they can be used for process technologies to provide very high temperature heat for chemical and industrial processes.

So, in that regard although we are doing something different, it is meeting a series of demands that currently are met.

Mr. DUNCAN. My time has expired.

Mr. Chairman, at any given time we have got over 100 small reactors floating around the seas of the world in the United States Navy. So, I didn't hear small modular reactor technology enough from this group. I don't hear thorium and molten salt technology.

I hope the industry is looking at that because they are safer, they are easier. SMRs may be the future for the cities across America and also, you know, improving the quality of lives of folks on other continents, possibly.

So, thanks for the hearing. Thanks, guys. And I yield back.

Mr. SHIMKUS. The gentleman yields back his time. Seeing there are no further Members wishing to ask questions, I would like to thank all the witnesses for being here today and being very patient as we had to go to vote.

Before we conclude, I would like to ask unanimous consent to submit the following documents for the record: A letter from NuScale Power; an awesome floor speech by Mr. Shimkus on March 28th, 2017, regarding the nuclear power plant in Belarus. You are not objecting to that, are you? Maybe it wasn't that awesome.

[The information appears at the conclusion of the hearing.]

Mr. SHIMKUS. And pursuant to committee rules, I remind Members that they have 10 business days to submit additional questions for the record. And I ask that witnesses submit their response within 10 business days upon receipt of the questions. Without objection.

The subcommittee is adjourned. Thank you for being here.

[Whereupon, at 2:06 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

I

115TH CONGRESS
1ST SESSION

H. R. 1320

To amend the Omnibus Budget Reconciliation Act of 1990 related to Nuclear Regulatory Commission user fees and annual charges, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

MARCH 2, 2017

Mr. KINZINGER (for himself and Mr. MICHAEL F. DOYLE of Pennsylvania) introduced the following bill; which was referred to the Committee on Energy and Commerce

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A BILL

To amend the Omnibus Budget Reconciliation Act of 1990 related to Nuclear Regulatory Commission user fees and annual charges, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Nuclear Utilization of Keynote Energy Act".

SEC. 2. NUCLEAR REGULATORY COMMISSION USER FEES AND ANNUAL CHARGES THROUGH FISCAL YEAR 2019.

(a) IN GENERAL.—Section 6101(c)(2)(A) of the Omnibus Budget Reconciliation Act of 1990 (42 U.S.C. 2214(c)(2)(A)) is amended—

(1) in clause (iii), by striking "and" at the end;

(2) in clause (iv), by striking the period at the end and inserting "; and"; and

(3) by adding at the end the following:

"(v) amounts appropriated to the Commission for the fiscal year for activities related to the development of a regulatory framework for advanced nuclear reactor technologies.".

(b) REPEAL.—Effective October 1, 2019, section 6101 of the Omnibus Budget Reconciliation Act of 1990 (42 U.S.C. 2214) is repealed.

SEC. 3. NUCLEAR REGULATORY COMMISSION USER FEES AND ANNUAL CHARGES FOR FISCAL YEAR 2020 AND EACH FISCAL YEAR THEREAFTER.

(a) ANNUAL BUDGET JUSTIFICATION.—

(1) IN GENERAL.—In the annual budget justification submitted by the Commission to Congress, the Commission shall expressly identify anticipated expenditures necessary for completion of the re-

quested activities of the Commission anticipated to occur during the applicable fiscal year.

(2) RESTRICTION.—Budget authority granted to the Commission for purposes of the requested activities of the Commission shall be used, to the maximum extent practicable, solely for conducting requested activities of the Commission.

(3) LIMITATION ON CORPORATE SUPPORT COSTS.—With respect to the annual budget justification submitted to Congress, corporate support costs, to the maximum extent practicable, shall not exceed the following percentages of the total budget authority of the Commission requested in the annual budget justification:

(A) 30 percent for each of fiscal years 2020 and 2021.

(B) 29 percent for each of fiscal years 2022 and 2023.

(C) 28 percent for fiscal year 2024 and each fiscal year thereafter.

(b) FEES AND CHARGES.—

(1) ANNUAL ASSESSMENT.—

(A) IN GENERAL.—Each fiscal year, the Commission shall assess and collect fees and charges in accordance with paragraphs (2) and

(3) in a manner that ensures that, to the maximum extent practicable, the amount collected is equal to an amount that approximates—

(i) the total budget authority of the Commission for that fiscal year; less

(ii) the budget authority of the Commission for the activities described in subparagraph (B).

(B) EXCLUDED ACTIVITIES DESCRIBED.—The activities referred to in subparagraph (A)(ii) are the following:

(i) An activity not attributable to an existing NRC licensee or class of licensee as identified by the Commission in Table III of the final rule of the Commission entitled "Revision of Fee Schedules; Fee Recovery for Fiscal Year 2016" (81 Fed. Reg. 41171 (June 24, 2016)).

(ii) Amounts appropriated for a fiscal year to the Commission—

(I) from the Nuclear Waste Fund established under section 302(c) of the Nuclear Waste Policy Act of 1982 (42 U.S.C. 10222(c));

(II) for implementation of section 3116 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (50 U.S.C. 2601 note; Public Law 108–375);

(III) for the homeland security activities of the Commission (other than for the costs of fingerprinting and background checks required under section 149 of the Atomic Energy Act of 1954 (42 U.S.C. 2169) and the costs of conducting security inspections);

(IV) for the Inspector General services of the Commission provided to the Defense Nuclear Facilities Safety Board;

(V) for research and development at universities in areas relevant to the mission of the applicable university;

(VI) for a nuclear science and engineering grant program that will support multiyear projects that do not align with programmatic missions but are critical to maintaining the dis-

cipline of nuclear science and engineering; and

(VII) for any other fee-relief activity described in the final rule of the Commission entitled "Revision of Fee Schedules; Fee Recovery for Fiscal Year 2016" (81 Fed. Reg. 41171 (June 24, 2016)).

(iii) Costs for activities related to the development of regulatory infrastructure for advanced nuclear reactor technologies.

(C) EXCEPTION.—The exclusion described in subparagraph (B)(iii) shall cease to be effective on January 1, 2031.

(D) REPORT.—Not later than December 31, 2029, the Commission shall submit to the Committee on Appropriations and the Committee on Environment and Public Works of the Senate and the Committee on Appropriations and the Committee on Energy and Commerce of the House of Representatives a report describing the views of the Commission on the continued appropriateness and necessity of the funding described in subparagraph (B)(iii).

(2) FEES FOR SERVICE OR THING OF VALUE.—In accordance with section 9701 of title 31, United States Code, the Commission shall charge fees to any person who receives a service or thing of value from the Commission to cover the costs to the Commission of providing the service or thing of value.

(3) ANNUAL FEES.—

(A) IN GENERAL.—Subject to subparagraph (B) and except as provided in subparagraph (D), the Commission may charge to any licensee or certificate holder of the Commission an annual fee.

(B) CAP ON ANNUAL FEES OF CERTAIN LICENSEES.—

(i) IN GENERAL.—The annual fee under subparagraph (A) charged to an operating reactor licensee, to the maximum extent practicable, shall not exceed the annual fee amount per operating reactor licensee established in the final rule of the Commission entitled "Revision of Fee Schedules; Fee Recovery for Fiscal Year 2016" (81 Fed. Reg. 41171 (June 24, 2016)), as may be adjusted annually by the Commission to reflect changes in the

Consumer Price Index published by the Bureau of Labor Statistics of the Department of Labor.

(ii) WAIVER.—The Commission may waive, for a period of 1 year, the cap on annual fees described in clause (i) if the Commission submits to the Committee on Appropriations and the Committee on Environment and Public Works of the Senate and the Committee on Appropriations and the Committee on Energy and Commerce of the House of Representatives a written determination that the cap on annual fees may compromise the safety and security mission of the Commission.

(C) AMOUNT PER LICENSEE.—

(i) IN GENERAL.—The Commission shall establish by rule a schedule of fees fairly and equitably allocating the aggregate amount of charges described in subparagraph (A) among licensees and certificate holders.

(ii) REQUIREMENT.—The schedule of fees under clause (i)—

(I) to the maximum extent practicable, shall be based on the cost of providing regulatory services; and

(II) may be based on the allocation of the resources of the Commission among licensees or certificate holders or classes of licensees or certificate holders.

(D) EXEMPTION.—

(i) DEFINITION OF RESEARCH REACTOR.—In this subparagraph, the term "research reactor" means a nuclear reactor that—

(I) is licensed by the Commission under section 104 c. of the Atomic Energy Act of 1954 (42 U.S.C. 2134(c)) for operation at a thermal power level of not more than 10 megawatts; and

(II) if licensed under subclause (I) for operation at a thermal power level of more than 1 megawatt, does not contain—

(aa) a circulating loop through the core in which the licensee conducts fuel experiments;

(bb) a liquid fuel loading; or

(cc) an experimental facility in the core in excess of 16 square inches in cross-section.

(ii) EXEMPTION.—Subparagraph (A) shall not apply to the holder of any license for a federally owned research reactor used primarily for educational training and academic research purposes.

(c) PERFORMANCE AND REPORTING.—

(1) IN GENERAL.—The Commission shall develop for the requested activities of the Commission—

(A) performance metrics; and

(B) on each request, milestone schedules.

(2) DELAYS IN ISSUANCE OF FINAL SAFETY EVALUATION.—The Executive Director for Operations of the Commission shall inform the Commission of a delay in issuance of the final safety evaluation for a requested activity of the Commission by the completion date required by the performance

metrics or milestone schedule under paragraph (1) by not later than 30 days after the completion date.

(3) DELAYS IN ISSUANCE OF FINAL SAFETY EVALUATION EXCEEDING 180 DAYS.—If the final safety evaluation for the requested activity of the Commission described in paragraph (2) is not completed by the date that is 180 days after the completion date required by the performance metrics or milestone schedule under paragraph (1), the Commission shall submit to the appropriate congressional committees a timely report describing the delay, including a detailed explanation accounting for the delay and a plan for timely completion of the final safety evaluation.

(d) ACCURATE INVOICING.—With respect to invoices for fees and charges described in subsection (b)(2), the Commission shall—

(1) ensure appropriate management review and concurrence prior to the issuance of invoices;

(2) develop and implement processes to audit invoices to ensure accuracy, transparency, and fairness; and

(3) modify regulations to ensure fair and appropriate processes to provide licensees and applicants an opportunity to efficiently dispute or otherwise

seek review and correction of errors in invoices for fees and charges.

(e) REPORT.—Not later than September 30, 2021, the Commission shall submit to the Committee on Appropriations and the Committee on Environment and Public Works of the Senate and the Committee on Appropriations and the Committee on Energy and Commerce of the House of Representatives a report describing the implementation of this section, including any impacts and recommendations for improvement.

(f) DEFINITIONS.—In this section:

(1) ADVANCED NUCLEAR REACTOR.—The term "advanced nuclear reactor" means a nuclear fission or fusion reactor, including a prototype plant (as defined in sections 50.2 and 52.1 of title 10, Code of Federal Regulations), with significant improvements compared to commercial nuclear reactors under construction as of the date of enactment of this Act, including improvements such as—

(A) additional inherent safety features;

(B) significantly lower levelized cost of electricity;

(C) lower waste yields;

(D) greater fuel utilization;

(E) enhanced reliability;

(F) increased proliferation resistance;

(G) increased thermal efficiency; or

(H) ability to integrate into electric and nonelectric applications.

(2) APPLICANT.—The term "applicant" means an applicant for a license, certification, permit, or other form of approval from the Commission for a commercial advanced nuclear reactor or a research and test reactor.

(3) APPROPRIATE CONGRESSIONAL COMMITTEES.—The term "appropriate congressional committees" means the Committee on Environment and Public Works of the Senate and the Committee on Energy and Commerce of the House of Representatives.

(4) COMMISSION.—The term "Commission" means the Nuclear Regulatory Commission.

(5) CORPORATE SUPPORT COSTS.—The term "corporate support costs" means expenditures for acquisitions, administrative services, financial management, human resource management, information management, information technology, policy support, outreach, and training, as those categories are described and calculated in Appendix A of the Con-

gressional Budget Justification for Fiscal Year 2017 of the Commission.

(6) REQUESTED ACTIVITY OF THE COMMISSION.—The term "requested activity of the Commission" means—

(A) the processing of applications for—

(i) design certifications or approvals;

(ii) licenses;

(iii) permits;

(iv) license amendments;

(v) license renewals;

(vi) certificates of compliance; and

(vii) power uprates; and

(B) any other activity requested by a licensee or applicant.

(g) EFFECTIVE DATE.—This section takes effect on October 1, 2019.

SEC. 4. STUDY ON ELIMINATION OF FOREIGN LICENSING RESTRICTIONS.

Not later than 18 months after the date of enactment of this Act, the Comptroller General, in consultation with the Secretary of Energy, shall transmit to Congress a report containing the results of a study on the feasibility and implications of repealing restrictions under sections 103d. and 104d. of the Atomic Energy Act of 1954 on

issuing licenses for certain nuclear facilities to an alien or an entity owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government.

SEC. 5. STUDY ON THE IMPACT OF THE ELIMINATION OF MANDATORY HEARING FOR UNCONTESTED LICENSING APPLICATIONS.

Not later than 18 months after the date of enactment of this Act, the Comptroller General, in consultation with the Secretary of Energy, shall transmit to Congress a report containing the results of a study on the impact of the elimination of mandatory hearings for uncontested licensing and construction permit applications under the Atomic Energy Act of 1954.

SEC. 6. INFORMAL HEARING PROCEDURES.

(a) PROCEDURES.—Section 189 a. of the Atomic Energy Act of 1954 (42 U.S.C. 2239(a)) is amended by adding at the end the following:

"(3) Any hearing under this section shall be conducted using informal adjudicatory procedures in accordance with sections 553 and 555 of title 5, United States Code, unless the Commission determines that formal adjudicatory procedures are necessary—

"(A) to develop a sufficient record; or

"(B) to achieve fairness.".

(b) HEARINGS ON LICENSING OF URANIUM ENRICHMENT FACILITIES.—Section 193 b. of the Atomic Energy Act of 1954 (42 U.S.C. 2243(b)) is amended—

(1) in paragraph (1), by striking "on the record" and all that follows through "and 63" and inserting "if a person the interest of whom may be affected by the construction and operation of a uranium enrichment facility under sections 53 and 63 has requested a hearing regarding the licensing of the construction and operation of the facility"; and

(2) in paragraph (2), by striking "Such hearing" and inserting "If a hearing is held under paragraph (1), the hearing".

SEC. 7. APPLICATION REVIEWS FOR NUCLEAR ENERGY PROJECTS.

Section 185 of the Atomic Energy Act of 1954 (42 U.S.C. 2235) is amended by adding at the end the following:

"c. APPLICATION REVIEWS FOR NUCLEAR ENERGY PROJECTS.—

"(1) STREAMLINING LICENSE APPLICATION REVIEW.—With respect to an application that is docketed seeking issuance of a construction permit, operating license, or combined construction permit and operating license for a production or utilization facil-

ity, the Commission shall include the following procedures:

"(A) Undertake an expedited environmental review process and issue any draft environmental impact statement within 24 months after the application is accepted for docketing.

"(B) Complete the technical review process and issue any safety evaluation report and any final environmental impact statement within 42 months after the application is accepted for docketing.

"(2) EARLY SITE PERMIT.—

"(A) SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT.—In a proceeding for a combined construction permit and operating license for a site for which an early site permit has been issued, any environmental impact statement prepared by the Commission and cooperating agencies shall be prepared as a supplement to the environmental impact statement prepared for the early site permit.

"(B) INCORPORATION BY REFERENCE.—The supplemental environmental impact statement shall—

"(i) incorporate by reference the analysis, findings, and conclusions from the environmental impact statement prepared for the early site permit; and

"(ii) include additional discussion, analyses, findings, and conclusions on matters resolved in the early site permit proceeding only to the extent necessary to address information that is new and significant in that the information would materially change the prior findings or conclusions.

"(3) PRODUCTION OR UTILIZATION FACILITY LOCATED AT AN EXISTING SITE.—In reviewing an application for an early site permit, construction permit, operating license, or combined construction permit and operating license for a production or utilization facility located at the site of a licensed production or utilization facility, the Commission shall, to the extent practicable, use information that was part of the licensing basis of the licensed production or utilization facility.

"(4) HEARING ON EARLY SITE PERMIT, CONSTRUCTION PERMIT, AND COMBINED CONSTRUCTION PERMIT AND OPERATING LICENSE.—The Commis-

sion shall issue and make immediately effective an early site permit or construction permit for a production or utilization facility upon finding that the application therefor satisfies the requirements of this Act, notwithstanding the pendency before the Commission of a request for a hearing. Following completion of any required hearing, the Commission shall take any appropriate action with respect to the early site permit, construction permit, or combined construction permit and operating license to the extent necessary to account for the hearing results.

"(5) REGULATIONS.—The Commission shall initiate a rulemaking, to be completed 1 year after the date of enactment of the Nuclear Utilization of Keynote Energy Act, to amend the regulations of the Commission to implement this subsection.

"(6) RELATIONSHIP TO OTHER LAW.—Nothing in this subsection exempts the Commission from any requirement for full compliance with section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)).".

SEC. 8. NUCLEAR REACTOR DECOMMISSIONING.

(a) RULEMAKING.—Chapter 14 of the Atomic Energy Act of 1954 (42 U.S.C. 2201–2210i) is amended by adding at the end the following new section:

"SEC. 170J. DECOMMISSIONING NUCLEAR REACTOR RULEMAKING.—

"The Commission shall, not later than 90 days after the date of enactment of this section, initiate a rulemaking proceeding, including notice and opportunity for public comment, to be completed not later than 48 months after that date, to address the regulatory framework for decommissioning nuclear reactors licensed under section 103 or 104b.".

(b) TABLE OF SECTIONS AMENDMENT.—The table of sections for chapter 14 of the Atomic Energy Act of 1954 is amended by adding at the end the following new item:

"Sec. 170J. Decommissioning nuclear reactor rulemaking.".

○

[DISCUSSION DRAFT]

115TH CONGRESS
2D SESSION

H. R. _____

To amend the Atomic Energy Act of 1954 to improve the process by which the Secretary of Energy authorizes the transfer of civilian nuclear commerce technology and assistance, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

Mr. JOHNSON of Ohio introduced the following bill; which was referred to the Committee on _____

A BILL

To amend the Atomic Energy Act of 1954 to improve the process by which the Secretary of Energy authorizes the transfer of civilian nuclear commerce technology and assistance, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. FINDINGS AND PURPOSE.

(a) FINDINGS.—Congress finds the following:

(1) Section 1 of the Atomic Energy Act of 1954 (42 U.S.C. 2011)—

(A) states that atomic energy "is capable of application for peaceful" purposes; and

(B) declared to be the policy of the United States that—

(i) "the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security"; and

(ii) "the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.".

(2) A predictable and efficient regulatory approval process for nuclear suppliers to participate in domestic and foreign civil nuclear commerce is beneficial to the interests of the United States.

(3) A robust civilian nuclear infrastructure advances the economic and national security interests of the United States.

(b) PURPOSE.—The purpose of this Act is to—

(1) identify regulatory, legal, and other policies affecting civil nuclear commerce;

(2) improve the predictability and efficiency of the authorization for foreign nuclear commerce; and

(3) assess methodology to meet the retrospective risk requirements on the Convention on Supplementary Compensation for Nuclear Damage as required by section 934(c) of the Energy Independence and Security Act of 2007 (42 U.S.C. 17373(e)).

SEC. 2. REVIEW OF CIVIL NUCLEAR COMMERCE.

(a) REPORT.—Not later than 180 days after the date of enactment of this Act, the Secretary of Energy shall submit to the Committee on Energy and Commerce of the House of Representatives and the Committees on Energy and Natural Resources and on Environment and Public Works of the Senate a report on United States civil nuclear commerce.

(b) CONTENTS.—The report required under subsection (a) shall include—

(1) an assessment of—

(A) current legal, regulatory, policy, and commercial practices of the United States with respect to the civilian nuclear industry of the United States; and

(B) the impacts of such practices on such civilian nuclear industry in the United States and in international markets;

(2) a comparison of the practices of the United States described in paragraph (1) to practices of foreign countries with respect to the civilian nuclear industry of such countries;

(3) recommendations to improve the competitiveness of United States civil nuclear commerce; and

(4) options on how to apply section 170 of the Atomic Energy Act of 1954 (42 U.S.C. 2210) (commonly known as the "Price-Anderson Act") with respect to advanced nuclear technologies.

SEC. 3. IMPROVEMENTS TO PART 810 PROCESS.

(a) CLARIFICATION ON PROHIBITION OF DELEGATION.—Section 161n. of the Atomic Energy Act of 1954 (42 U.S.C. 2201(n)) is amended by striking "57 b." and inserting "57 b. (only with respect to enrichment and reprocessing of special nuclear material)".

(b) EXPEDITED PROCEDURES FOR LOW PROLIFERATION RISK REACTOR TECHNOLOGIES.—Section 57d. of such Act (42 U.S.C. 2077(d)) is amended—

(1) by inserting "(1)" before "The Commission is authorized"; and

(2) by adding at the end the following new paragraph:

"(2)(A) In carrying out paragraph (1), the Secretary of Energy shall establish procedures for expedited consideration of requests for authorization under this section regarding the transfer of low proliferation risk reactor technologies designated by the Secretary for purposes of this subparagraph.

"(B) The procedures established under subparagraph (A) shall—

"(i) apply with respect to each application to transfer low proliferation risk reactor technologies described in such subparagraph to foreign countries designated by the Secretary for purposes of such subparagraph (except that the Secretary may not designate a foreign country that is a nuclear-weapon state, as defined by Article IX(3) of the Treaty on the Non-Proliferation of Nuclear Weapons, signed at Washington, London, and Moscow July 1, 1968, other than the United Kingdom or France); and

"(ii) ensure that each such application is approved or denied by not later than 30 days after the date on which the foreign country transmits any required assurances to the Secretary of State.

"(C) The procedures established under subparagraph (A) may not apply to the transfer of fuel fabrication technology or any fuel cycle technology.

"(D) The Secretary of Energy shall establish the procedures under subparagraph (A) with the concurrence of the Secretary of State and in consultation with the Secretary of Defense, the Secretary of Commerce, and the Nuclear Regulatory Commission.".

(c) ASSURANCES.—Section 57b.(2) of such Act (42 U.S.C. 2077(b)(2)) is amended by inserting after "mechanisms." the following new sentence: "To the extent practicable, the Secretary of Energy shall continue to process such requests during such interagency review in a manner that enables the Secretary to make such determination as soon as practicable after the receipt of assurances by a foreign country to the Secretary of State, if any such assurances are required.".

(d) SENSE OF CONGRESS ON E810.—It is the sense of Congress that—

(1) the Secretary of Energy should continue the ongoing Process Improvement Plan for authorizations pursuant to section 57b.(2) of the Atomic Energy Act of 1954 (42 U.S.C. 2077(b)(2)); and

(2) Congress is supportive of the progress made by the Secretary in such process and is especially in-

terested in the continued work for the electronic submissions portal for such applications known as "e810".

SEC. 4. RISK POOLING PROGRAM.

(a) REPORT.—Not later than 1 year after the date of enactment of this Act, the Comptroller General shall carry out a review of, and submit to the Committee on Energy and Commerce of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on, the Secretary of Energy's actions with respect to the program described in section 934(e) of the Energy Independence and Security Act of 2007 (42 U.S.C. 17373(e)).

(b) CONTENTS.—The report described in subsection (a) shall include—

(1) an assessment of the Secretary of Energy's actions to determine the risk-informed assessment formula under section 934(e)(2)(C) of the Energy Independence and Security Act of 2007;

(2) a review of the Secretary of Energy's methodology to collect information to determine and implement the formula; and

(3) an evaluation of the program described in section 934(e) of the Energy Independence and Security Act of 2007 (42 U.S.C. 17373(e)), including

the Secretary of Energy's actions with respect to such program.

[DISCUSSION DRAFT]

115TH CONGRESS
2D SESSION

H. R. _____

To require the Secretary of Energy to establish and carry out a program to support the availability of HA–LEU for commercial use, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

Mr. FLORES introduced the following bill; which was referred to the Committee on _____

A BILL

To require the Secretary of Energy to establish and carry out a program to support the availability of HA–LEU for commercial use, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Advanced Nuclear Fuel Availability Act".

SEC. 2. PROGRAM.

(a) ESTABLISHMENT.—The Secretary shall establish and carry out a program to support the availability of HA–LEU for commercial use.

(b) PROGRAM ELEMENTS.—In carrying out the program under subsection (a), the Secretary—

(1) may make funds available to commercial entities to design transportation packages for HA–LEU, including canisters for metal, gas, and other HA–LEU compositions;

(2) shall, to the extent practicable—

(A) by January 1, 2021, have commercial entities submit such transportation package designs to the Commission for certification by the Commission under part 71 of title 10, Code of Federal Regulations; and

(B) have such transportation package designs so certified by the Commission by January, 1, 2023;

(3) shall submit to Congress a report on the Department's uranium inventory that may be available to be processed to HA–LEU for purposes of such program;

(4) not later than one year after the date of enactment of this Act, and biennially thereafter through September 30, 2025, shall conduct a survey

of stakeholders to estimate the quantity of HA–LEU necessary for commercial use for each of the five subsequent years;

(5) shall assess options available for the Secretary to acquire HA–LEU for such program;

(6) shall establish a consortium of commercial nuclear companies to partner with the Department to support the availability of HA–LEU for commercial use, including by—

(A) providing information to the Secretary for purposes of surveys conducted under paragraph (4); and

(B) purchasing HA–LEU made available to members of the consortium by the Secretary under the program;

(7) shall, prior to acquiring HA–LEU under paragraph (8), in coordination with the consortium established pursuant to paragraph (6), develop a schedule for full cost recovery of HA–LEU made available to members of the consortium pursuant to paragraph (8);

(8) may, not later than 3 years after the establishment of a consortium under paragraph (6), acquire HA–LEU, in order, to the extent practicable,

to make such HA–LEU available to members of the consortium by January 1, 2025; and

(9) shall develop, in consultation with the Commission, criticality benchmark data to assist the Commission in—

(A) the licensing and regulation of category II fuel fabrication and enrichment facilities under part 70 of title 10, Code of Federal Regulations; and

(B) certification of transportation packages under part 71 of title 10, Code of Federal Regulations.

SEC. 3. REPORT TO CONGRESS.

Not later than 12 months after the date of enactment of this Act, the Commission shall submit to Congress a report that includes—

(1) identification of updates to regulations, certifications, and other regulatory policies that the Commission determines are necessary in order for HA–LEU to be commercially available, including certifications relating to transportation packaging, and licensing of enrichment and fuel fabrication facilities, for HA–LEU;

(2) a description of such updates; and

(3) a timeline to complete such updates.

SEC. 4. DEFINITIONS.

In this Act:

(1) COMMISSION.—The "Commission" means the Nuclear Regulatory Commission.

(2) DEPARTMENT.—The term "Department" means Department of Energy.

(3) HA–LEU.—The term "HA–LEU" means high-assay low-enriched uranium.

(4) HIGH-ASSAY LOW-ENRICHED URANIUM.—The term "high-assay low-enriched uranium" means uranium having an assay greater than 5.0 weight percent and less than 20 weight percent of the uranium-235 isotope.

(5) SECRETARY.—The term "Secretary" means the Secretary of Energy.

[DISCUSSION DRAFT]

115TH CONGRESS
2D SESSION

H. R. _____

To require the Secretary of Energy to develop a report on a pilot program to site, construct, and operate micro-reactors at critical national security locations, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

Mr. WILSON of South Carolina (for himself, Mr. NORCROSS, Mr. HUDSON, and Mr. PETERS) introduced the following bill; which was referred to the Committee on _____

A BILL

To require the Secretary of Energy to develop a report on a pilot program to site, construct, and operate micro-reactors at critical national security locations, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. REPORT ON PILOT PROGRAM FOR MICRO-REACTORS.

(a) REPORT REQUIRED.—Not later than 12 months after the date of enactment of this Act, the Secretary shall develop and submit to the Committee on Armed Services

and the Committee on Energy and Commerce in the House of Representatives and the Committee on Armed Services and the Committee on Energy and Natural Resources in the Senate a report describing the requirements for, and components of, a pilot program to provide resilience for critical national security infrastructure at Department of Defense and Department of Energy facilities by contracting with a commercial entity to site, construct, and operate at least one licensed micro-reactor at a facility identified under the report by December 31, 2027.

(b) CONSULTATION.—As necessary to develop the report required under subsection (a), the Secretary shall consult with—

(1) the Secretary of Defense;

(2) the Nuclear Regulatory Commission; and

(3) the Administrator of the General Services Administration.

(c) CONTENTS.—The report required under subsection (a) shall include—

(1) identification of potential locations to site, construct, and operate a micro-reactor at a Department of Defense or Department of Energy facility that contains critical national security infrastructure that the Secretary determines may not be energy resilient;

(2) assessments of different nuclear technologies to provide energy resiliency for critical national security infrastructure;

(3) a survey of potential commercial stakeholders with which to enter into a contract under the pilot program to construct and operate a licensed micro-reactor;

(4) options to enter into long-term contracting, including various financial mechanisms for such purpose;

(5) identification of requirements for micro-reactors to provide energy resilience to mission-critical functions at facilities identified under paragraph (1);

(6) an estimate of the costs of the pilot program;

(7) a timeline with milestones for the pilot program;

(8) an analysis of the existing authority of the Department of Energy and Department of Defense to permit the siting, construction, and operation of a micro-reactor; and

(9) recommendations for any legislative changes to the authorities analyzed under paragraph (8) necessary for the Department of Energy and the De-

partment of Defense to permit the siting, construction, and operation of a micro-reactor.

(d) DEFINITIONS.—In this section:

(1) CRITICAL NATIONAL SECURITY INFRASTRUCTURE.—The term "critical national security infrastructure" means any site or installation that the Secretary of Energy or the Secretary of Defense determines supports critical mission functions of the national security enterprise.

(2) LICENSED.—The term "licensed" means holding a license under section 103 or 104 of the Atomic Energy Act of 1954.

(3) MICRO-REACTOR.—The term "micro-reactor" means a nuclear reactor that has a power production capacity that is not greater than 50 megawatts.

(4) PILOT PROGRAM.—The term "pilot program" means the pilot program described in subsection (a).

(5) SECRETARY.—The term "Secretary" means Secretary of Energy.

(e) FORM.—The report required under subsection (a) shall be submitted in unclassified form, but, if the Secretary determines it necessary, may include a classified appendix.

(f) LIMITATIONS.—This Act does not authorize the Department of Energy or Department of Defense to enter into a contract with respect to the pilot program.

Atlantic Council
GLOBAL ENERGY CENTER

ISSUE BRIEF

US Nuclear-Power Leadership and the Chinese and Russian Challenge

MARCH 2018 DR. ROBERT F. ICHORD, JR.

Despite the ascendancy of natural gas and renewable energy, nuclear power continues to play a significant role in the global energy transition, providing about 10 percent of global electricity production in 2016.[1] Nuclear, besides being a significant carbon-free source of electricity, is also critically important from a strategic and defense standpoint. While the United States has the largest number of nuclear plants in the world, the US global leadership position is declining as efforts to build a new generation of reactors have been plagued by problems, and aging plants have been retired or closed in the face of economic, market, and financial pressures. The situation is not unique to the United States; except for the UK, major US allies are closing (Germany), scaling back (France and South Korea), or debating the reopening (Japan) of their nuclear-power plants.[2] In contrast, China and Russia are continuing to develop their nuclear industries and aggressively pursuing global markets, especially in critical regions such as the Middle East and South Asia.

In the December 2017 National Security Strategy (NSS2017), the Donald Trump administration states its intention to "embrace energy dominance" by pursuing five main actions: reducing barriers to US energy development; promoting exports of energy, technology, and services; ensuring the energy security of the United States and its allies; attaining universal energy access; and furthering the US technological edge in energy.[3] Although there is clearly a strong fossil-fuels orientation behind

A special thanks is extended to Baker Donelson for their support, which made this Issue Brief possible.

The **Global Energy Center** promotes energy security by working alongside government, industry, civil society, and public stakeholders to devise pragmatic solutions to the geopolitical, sustainability, and economic challenges of the changing global energy landscape.

1 *World Nuclear Industry Status Report* (Paris: Mycle Schneider Consulting, 2017), Figure 1, p. 24, https://www.worldnuclearreport.org/.

2 Germany plans to close all its reactors by 2022; France is looking to scale back the role of nuclear from 75 to 50 percent by 2025; South Korea is scaling back its plans for new nuclear, and considering phasing out nuclear; and Japan, which has opened five of forty-eight reactors after the Fukushima accident, is considering opening an additional four of the twenty-one reactors that have submitted applications to reopen.

3 White House, *National Security Strategy of the United States of America* (Washington, DC: White House, 2017), pp. 22-23, https://www.whitehouse.gov/wp-content/

the "energy dominance" theme, it is important to consider whether, and how, nuclear power fits into this strategy, and the implications of developments in the United States for the US competitive position vis-à-vis China and Russia.

This issue brief continues the dialogue initiated at an Atlantic Council November 2017 nuclear-power roundtable, by examining the challenges facing the US nuclear industry and the geopolitical implications for the United States presented by domestic and international nuclear developments in China and Russia. The brief recognizes the strategic nature of nuclear power, and identifies key policy issues ripe for further work.

STATUS AND PROSPECTS FOR NUCLEAR POWER IN THE UNITED STATES

Energy diversification is generally recognized as a central means of increasing energy security, reducing vulnerabilities, and enhancing the resilience of the power system. The NSS2017 states: "The United States will support the diversification of energy sources, supplies, and routes at home and abroad."[4] Furthermore, US Secretary of Energy Rick Perry argues in his September 28, 2017, letter to the Federal Energy Regulatory Commission that "America's greatness depends on a reliable, resilient electric grid powered by an 'all of the above' mix of generation resources." He warns that the United States should guard against the threat of energy outages that could result from the loss of traditional baseload capacity.[5]

Nuclear power is an important component of a diversified US energy mix. There are ninety-nine operational reactors at sixty sites in the United States, amounting to 97,728 megawatts (MW) generating 805,694 megawatt hours (MWh) in 2016, accounting for about 20 percent of US total electricity supply and nearly 60 percent of carbon-free electricity, avoiding an estimated 554 million tons of carbon.[6][7] Forty-seven percent was supplied by independent nuclear-power producers, and the rest by integrated utilities.[8]

These nuclear reactors provide reliable baseload power generation at a reasonable cost.[9] In 2016, average reliability was 92.5 percent, and average generation cost was $33 per MWh. Exelon, which accounts for nearly one-quarter of US nuclear capacity with its twenty-three reactors with 23,300 MW, reported that its plants ran at a record average-capacity factor of 94.6 percent in 2016.[10]

Although US nuclear plants are aging, with 40 percent of the plants more than forty years old, the US Nuclear Regulatory Commission (NRC) since 2000 has extended licenses from forty to sixty years for more than 85 percent of operating US reactors. The industry argues that these plants have many years of useful life remaining, and the first license application for eighty years has been submitted. Generators have invested heavily in upgrading their equipment and safety systems, especially after the 2011 Fukushima accident, and have steadily improved their operating efficiency and capacity utilization.

However, faced with competition from gas and renewables generators, operating companies and utilities have closed reactors and, absent financial relief, announced plans for further closures. Between 2002 and 2016, the United States saw 4,666 MW of nuclear-generating capacity close, while Secretary's Perry letter to the FERC indicates eight reactors with 7,167 NW of capacity have announced plans for retirement, and another seven reactors have only kept operating due to support at the individual state level.[11] Given these developments, the share of nuclear in the US elecricity mix may fall 3-4 percent over the next decade, to around 16-17 percent of US electricity supply, if demand remains level.

Pressured by cheap gas and renewable generation, and beset by continued problems related to financing, nuclear plants are most affected in regions with unbundled, competitive, independent system operators (ISO) and regional transmission system operators (RTO). The industry argues that these markets do not value the clean generation, reliability, security, and diversity of supply that nuclear provides. Even in areas with formal capacity markets, nuclear has had difficulty competing with gas in capacity auctions (e.g., in the PJM Interconnection region auctions, where the clearing price of $76.53 per megawatt day in its May 2017 base residual auction for 2020-21 capacity was too low for Exelon's Three Mile Island and Quad Cities plants to clear).[12][13]

The future of US nuclear power is also clouded by the difficulties and huge cost overruns in completing the four Generation III Westinghouse AP-1000 units in Georgia and South Carolina, and the resulting financial difficulties that pushed Toshiba-Westinghouse into bankruptcy. In 2017, the Georgia regulator approved Georgia Power's proposal to proceed with the completion of the two Georgia Vogtle reactors, but South Carolina decided to cancel the plans to complete its two plants. Westinghouse is coming out of bankruptcy, and has been purchased by a Canadian firm.[14] The Department of Energy also announced its willingness to provide an additional $3.7 billion in loan guarantees for the Vogtle completions, and Congress has approved the extension of the production tax credit (PTC) for advanced nuclear reactors.[15][16]

While these challenges are substantial, the consequences of a dramatic reduction of nuclear power in the United States—or even its end—would be dramatic, and the costs of premature shutdown would be significant. This cautionary tale is playing out in US-allied countries, including Germany and Japan, where there has been a large downgrading in utilities' financial position from closures. In Germany, utilities have sought to recover more than 20 billion euros in lost profits.

> The benefits lost from a decline in domestic nuclear power would be substantial.

While any lost capacity in the United States could likely be covered from a supply standpoint—given the surplus electricity-generation supply conditions in many regions, and the minimal growth of electricity demand—it would cost tens of billions of dollars and, depending on the renewable-energy component of the replacement capacity, could increase emissions levels. Officials at the state level, notably in New York, Illinois, Ohio, Pennsylvania, New Jersey, and Connecticut, have been concerned about these potential economic impacts, as well as the increased emissions implications of nuclear-plant closures. New York and Illinois have approved zero-emissions credit (ZEC) schemes to support nuclear power, which have allowed nuclear generators to extend plant operations. The courts have, thus far, upheld these actions.[17]

The benefits lost from a decline in domestic nuclear power would be substantial. The Nuclear Energy Institute calculates that the ninety-nine US reactors support 475,000 jobs, provide $60 billion in benefits to the US economy, account for $12 billion in federal and state tax revenues, and undertake capital investment of $6.3 billion

uploads/2017/12/NSS-Final-12-18-2017-0905.pdf.

4 Ibid., p. 21.

5 Rick Perry, "Secretary of Energy's Direction that the Federal Energy Regulatory Commission Issue Grid Resiliency Rules Pursuant to the Secretary's Authority Under Section 403 of the Department of Energy Organization Act," September 29, 2017, p. 1, https://energy.gov/sites/prod/files/2017/09/f37/Secretary%20Rick%20Perry%27s%20Letter%20to%20the%20Federal%20Energy%20Regulatory%20Commission.pdf.

6 US Energy Information Administration, "What is US Electricity Generation by Energy Source?" April 18, 2017, https://www.eia.gov/tools/faqs/faq.php?id=427&t=3.

7 Nuclear Energy Institute, "Environment: Emissions Prevented," https://www.nei.org/Knowledge-Center/Nuclear-Statistics/Environment-Emissions-Prevented.

8 US Energy Information Administration, *Electric Power Annual 2016* (Washington, DC: EIA, 2017), Table 1.1, https://www.eia.gov/electricity/annual/pdf/epa.pdf.

9 Baseload power is power from plants that operate on a continuous basis at a high capacity factor, and do not follow changes in the demand curve.

10 Exelon Corporation, *Corporate Sustainability Report 2016* (Chicago: Exelon, 2016), http://www.exeloncorp.com/sustainability/Documents/dwnld_Exelon_CSR%20(1).pdf.

11 Ibid., p. 3.

12 Jeff St. John, "PJM's Latest Capacity Auction: A Tough Market for Nuclear and Demand Response," *Greentech Media*, May 24, 2017, https://www.greentechmedia.com/articles/read/pjms-capacity-auction-a-poor-showing-for-nuclear-and-demand-response#gs.bqRP9A.

13 World Nuclear Association, "Nuclear Power in the USA," http://www.world-nuclear.org/information-library/country-profiles/countries-t-z/usa-nuclear-power.aspx; Rory D. Sweeney and Rich Heidorn Jr., "Updated: Capacity Prices Down in Most PJM in 1st Year of 100% CP," *RTO Insider*, May 23, 2017, https://www.rtoinsider.com/pjm-capacity-auction-capacity-performance-emaac-43440/.

14 Anastaciah Ondieki, "Canadian Firm to Purchase Former Vogtle Lead Contractor Westinghouse," *Atlanta Journal-Constitution*, January 8, 2018, http://www.myajc.com/news/canadian-firm-purchase-former-vogtle-lead-contractor-westinghouse/FU9UtNTW1LjwGWIlUWRVeL/.

15 Darrel Proctor, "DOE Offers Another $3.7 billion in Loan Guarantees for Vogtle Project," *Power*, September 29, 2017, http://www.powermag.com/doe-offers-another-3-7-billion-in-loan-guarantees-for-vogtle-project/.

16 Georgia Power, press release, "Georgia Power Praises Move by US Congress to Extend Production Tax Credits for Vogtle Nuclear Expansion," February 9, 2018, https://www.prnewswire.com/news-releases/georgia-power-praises-move-by-us-congress-to-extend-production-tax-credits-for-vogtle-nuclear-expansion-300596383.html.

17 Adrienne Thompson and Christopher Zentz, "Federal District Court Dismisses Challenges to New York ZEC Program," *Washington Energy Report*, July 31, 2017, https://www.troutmansandersenergyreport.com/2017/07/federal-district-court-dismisses-challenges-new-york-zec-program/.

per year.[18] Nuclear supply and services companies also play significant roles in support to the US military and defense industry, as well as contributing to US exports. The Energy Futures Initiative (EFI), chaired by former US Secretary of Energy Ernest Moniz, has identified more than seven hundred companies in forty-four states that provide products or services in direct support of the US nuclear-energy industry, with Pennsylvania, California, Texas, Illinois, and Ohio leading the way. According to EFI, the US nuclear supply chain has been eroding, and domestic nuclear-equipment manufacturing capability has declined, with limited or no domestic fabrication capacity for reactor pressure vessels, steam generators, pressurizers, main condensers, turbine generators, specialized valves, and passive residual-heat removal.[19]

In September 2017, the Trump administration sought to bolster the finances of existing nuclear plants, as well as coal plants, by proposing to the Federal Energy Regulatory Commission (FERC) a rule that would provide full cost recovery for secure-fuel plants that enhance reliability and resilience. The FERC rejected the proposed rule as discriminatory and inadequately supported. Instead, it directed further consideration of the issues of reliability and resilience in specific markets.[20]

Looking ahead on the technology front, research and development (R&D) funded by the US Department of Energy ($500 million in fiscal year 2017 (FY17)) and some private venture capital sources are proceeding on both Generation IV large reactors and small modular reactors (SMR). Secretary Perry has expressed support for nuclear R&D, and the NSS2017 contains a general reference to support for new nuclear-reactor designs. However, without large-scale US government support, it is unclear whether this work can proceed at a meaningful pace. The Nuclear Regulatory Commission is reviewing a design-certification application from one Energy Department recipient, NuScale, for an SMR design. Based on an initial January 2018 NRC decision on NuScale power supply, a much quicker licensing process for SMRs appears likely.[21] However, there seems to be limited US market interest in these reactors at the moment. Considerable US technical cooperation on new designs is occurring with China, for example with Bill Gates' TerraPower, as discussed below.

CHINESE AND RUSSIAN NUCLEAR-POWER EXPANSION

In sharp contrast to developments in the United States, China and Russia are pushing to expand their nuclear industries, develop complete fuel cycles, and build and commercialize new reactors for both domestic and international markets. The results of these efforts are striking—nearly two-thirds of the new reactors under construction worldwide are estimated to be using designs from China and Russia.[22]

Driven by domestic environmental and energy-supply concerns, and a desire to boost its global commercial and climate leadership, China under President Xi Jinping has charted a path to diversify its energy economy away from coal and reduce its carbon intensity.[23] In December 2017, the State Council approved a nationwide cap-and-trade system, to go into effect in 2019, involving 1,700 power companies accounting for more than three billion tons of carbon dioxide (CO_2) annually, representing one-third of China's total carbon emissions and making it the largest cap-and-trade system in the world.

China is the third-largest generator of nuclear power in the world as of 2016, after the United States and France, with thirty-seven operating reactors and a capacity of 32 gigawatts (GW).[24,25] China has the largest nuclear construction program in the world by far, with twenty (20.5 GW) of the fifty-three total reactors under construction worldwide.[26] However, nuclear power still accounts for only 4 percent of total generation in China. The Thirteenth Five-Year Plan (2016-2020) calls for 58 GW of nuclear capacity online by 2020-2021, and an additional 30 GW under construction at that time—although this target is viewed as ambitious, given delays in construction and fewer new starts, with just two in 2016 and none in the first half of 2017. Given the size and projected growth of the Chinese electricity system, currently 1645 GW, nuclear will remain well below 10 percent of electricity generation in 2020, despite the additions. For comparison, China added 52 GW of solar and wind capacity in 2016; solar additions alone were forecasted to jump from 34 GW to 54 GW in 2017.[27]

> Nearly two-thirds of the new reactors under construction worldwide are estimated to be using designs from China and Russia.

China's nuclear strategy has been to establish joint ventures with Western companies (Toshiba-Westinghouse, Framatome-AREVA, SNC-Lavalin, Energoatom) to build and evaluate different technologies (AP-1000, EPR, Candu, VVER-1000), and to incorporate this experience into its own indigenous designs. Although cost estimates are difficult to obtain, China has seemingly been able to build reactors quicker, and at lower cost, than Europe, the United States, and even South Korea. A 2015 report from the Organisation for Economic Co-operation and Development (OECD) Nuclear Energy Agency (NEA) estimates that (without financing) the average overnight costs for nuclear power in China is about $3,500/kilowatt (kW). This is more than one-third less than the $5,500/kW cost in the European Union, with multiple units at Chinese sites reducing costs by a further 15 percent. While South Korea has had relatively stable costs, which are 25 percent lower than those in the European Union, they are also higher than China's.[28]

Despite the Chinese government's commitment to nuclear, the falling costs of renewables pose an economic challenge for Chinese companies and officials. As Steve Thomas of the University of Greenwich comments: "The challenge for the Chinese nuclear industry is to do what no other nuclear industry worldwide has been able to do: to bring the cost of nuclear generation down to levels at which it can compete with other forms of generation, particularly renewables."[29]

China brings a complete package of design, construction, labor, technology, and financing, which improves the economics compared to industries in the West. However, it is clear that the six imported nuclear plants (four from Toshiba/Westinghouse and two from AREVA) have experienced difficulties. The four AP1000s from Westinghouse have been delayed three to four years, in part due to a national safety reassessment after the Fukushima accident halted construction. Chinese planners are no doubt interested in maintaining a favorable price of electricity to their industries for reasons of global competitiveness. Therefore, whether China's diversification strategy will continue to stress the large increases in nuclear capacity will indicate something about how it views the relative economics of the sector. But, as in many other countries, nuclear-power decisions in China are heavily driven by political considerations and international implications.

China has become an international test bed for advanced nuclear development. State funding for nuclear research, development, and demonstration has supported a wide range of efforts on large and small designs, including high-temperature gas-cooled reactors (HTGR), small modular reactors (SMR), and new Canada Deuterium Uranium (CANDU) designs. One pioneering project involves the construction by the China Nuclear Engineering Construction Corpation of a 2x105-MW, high-temperature, gas-cooled, pebble-bed nuclear plant (HTGR) in Shandong Province, south of Beijing. The plant is nearing completion and, if commercially viable, will be scaled up to 600 MW. An HTGR 600-MW unit is planned for Ruijin city in Jiangzi

18 Nuclear Energy Institute, NEI supplemental material for annual 2017 briefing to financial community, p. 10, https://www.nei.org/Issues-Policy/Economics/Financial-Analyst-Briefings/NEI-2017-Wall-Street-Briefing.

19 Energy Futures Initiative, *The U.S. Nuclear Enterprise: A Key National Security Enabler* (Washington, DC: Energy Futures Initiative, 2017), p. 9, https://static1.squarespace.com/static/58ac123cb3db2bd94e057628/t/5992f7e0b629ad8f9d575ec/1502803938248/EFI+Nuclear+Report+FINAL+08.2017.pdf.

20 US Federal Energy Regulatory Commission, "Order Terminating Rulemaking Proceeding, Initiating New Proceeding, and Establishing Additional Procedures," January 8, 2018, https://www.ferc.gov/CalendarFiles/20180108161614-RM18-1-000.pdf.

21 Nuclear Energy Institute, "NRC Approves NuScale Design Innovation," January 11, 2018, https://www.nei.org/News-Media/News/News-Archives/2018/NRC-Approves-NuScale-Design-Innovation.

22 Maria Korsnick, "Nuclear Power is Critical Infrastructure," 2017 Wall Street briefing, February 9, 2017, https://www.nei.org/News-Media/Speeches/Nuclear-Power-is-Critical-Infrastructure.

23 For a discussion of China's power-sector transition, see Robert F. Ichord, Jr., *Transformation the Power Sector in Developing Countries: The Critical Role of China in Post-Paris Implementation* (Washington, DC: Atlantic Council, 2017), http://www.atlanticcouncil.org/publications/reports/transforming-the-power-sector-in-developing-countries-the-critical-role-of-china-in-post-paris-implementation.

24 World Nuclear Association, "Nuclear Share Figures, 2006-2016," April 2017, http://www.world-nuclear.org/information-library/facts-and-figures/nuclear-generation-by-country.aspx.

25 World Nuclear Industry Status Report, p. 98.

26 Ibid., p. 15.

27 Joshua S. Hill, "BNEF Elevates China 2017 Solar Installation Forecast to 54 Gigawatts," *Clean Technica*, November 22, 2017, https://cleantechnica.com/2017/11/22/bnef-elevates-china-2017-solar-installation-forecast-54-gw/.

28 World Nuclear Association, "The Economics of Nuclear Power," August 2017, http://www.world-nuclear.org/information-library/economic-aspects/economics-of-nuclear-power.aspx.

29 Steve Thomas, "China's Nuclear Power Plans Melting Down," *Diplomat*, October 29, 2016, https://thediplomat.com/2016/10/chinas-nuclear-power-plans-melting-down/.

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Province.[30] The HTGR-type reactors are especially suited to industrial applications with large process-heat needs, such as petrochemical industries.

One of the most publicized efforts is Microsoft founder Bill Gates' establishment of TerraPower, a private company pursuing a traveling-wave reactor (TWR) design that is sodium cooled, uses depleted uranium, eliminates the need for fuel reprocessing, and keeps the fuel in the reactor for up to forty years.[31] It is also evaluating a molten-chloride reactor approach. TerraPower has teamed up with companies from China, India, Russia, and France to develop the approach, and concluded a joint venture with the China National Nuclear Corporation (CNNC) that will demonstrate the TWR design in a project in Hebei Province.[32] In a different approach, the Canadian firm SNC-Lavalin concluded a joint venture with the CNNC and the Shanghai Electric Group in 2016 to develop a new, 700-MW advanced-fuel CANDU reactor (AFCR) that can use recycled fuel from light-water reactors (China has more than thirty-three LWRs).[33]

Chinese nuclear companies are also working on several SMR designs. The CNNC is developing a small, 125-MW ACP100 unit in Hainan Province, which operates at lower temperatures and pressures. China General Nuclear Corporation is also developing a 60-MW APR505 reactor for remote and offshore applications, currently under construction for a floating installation at a drilling platform in the Bohai Sea. This development has been viewed with concern, in the context of tensions with the United States and other countries over Chinese militarization of islands in the South China Sea.[34]

While China's relationship with nuclear power is relatively new—with its first nuclear plant completed in 1991—Russia's long history with nuclear power dates to 1954, when the first reactor was commissioned in Obninsk, followed by larger-scale commercial reactors in 1963–1964. The industry has since grown to thirty-five reactors, totaling 26.9-GW capacity.[35] Nuclear generation reached a record of 196.366 terawatt hours (TWh) in 2016, accounting for 17 percent of domestic electricity generation, and further increased to 202.868 TWh and 19.9 percent in 2017.[36]

Russia has seven reactors under construction, and envisions about 30 GW of new installations by 2030, although reports indicate that Rosatom may delay some plants due to low electricity demand and surplus power capacity in Russia.[37] Financial difficulties have also caused delays, such as with the two new-generation VVER-1200-491s under construction in Saint Petersburg, and reduced oil and gas revenues have led to a drop in the state budget for nuclear—from $2.4 billion in 2013 to $1 billion in 2017, and to $898 million in the proposed September 2017 budget—resulting in construction delays.[38]

Russia is also active in developing nuclear technology, including a third-generation reactor, the VVER-1200, and is close to commissioning the first VVER-1200-V392M unit in Novovoronezh. China is also testing—and nearly ready to commission—its first Toshiba-Westinghouse AP1000, so the race to operate the first third-generation system is very close.

Like China and the United States, Russia is also working on a variety of advanced reactor designs. Russia's vision of the future revolves around the development of fast-breeder reactors and a closed fuel cycle. The Proyv

30 "China Expands Uses and Markets for its HTGRs," *World Nuclear News*, March 16, 2017, https://youtonbytes.com/2017/03/16/china-expands-uses-markets-for-its-htgrs/; Richard Martin, "China Could Have a Meltdown-Proof Nuclear Reactor Next Year," *MIT Technology Review*, February 11, 2016, https://www.technologyreview.com/s/600757/china-could-have-a-meltdown-proof-nuclear-reactor-next-year/.

31 TerraPower, "The Traveling Wave Reactor: Bringing Nuclear Technology to its Fullest Potential," http://terrapower.com/uploads/docs/The_TWR_Bringing_Nuclear_Technology_to_its_Fullest_Potential_030713.pdf.

32 Stephen Stapczynski, "Nuclear Experts Head to China to Test Experimental Reactors," *Bloomberg Technology*, September 21, 2017, https://www.bloomberg.com/news/articles/2017-09-21/nuclear-scientists-head-to-china-to-test-experimental-reactors.

33 SNC Lavalin, press release, "SNC Lavalin signs an agreement in principle for a Joint Venture with China National Nuclear Corporation and Shanghai Electric Company," September 22, 2016, http://www.snclavalin.com/en/news/2016/snc-lavalin-signs-agreement-principle-joint-venture-china-national-nuclear-corporation-shanghai-electric-company.

34 David Stanway, "China Close to Completing First Offshore Nuclear Reactor," *Reuters*, October 30, 2017, https://www.reuters.com/article/us-china-nuclearpower-offshore/china-close-to-completing-first-offshore-nuclear-reactor-idUSKBN1D00A8; Sonal Patel, "China Starts Building SMR-Based Floating Nuclear Plant," *Power*, January 1, 2017, http://www.powermag.com/china-starts-building-smr-based-floating-nuclear-plant/.

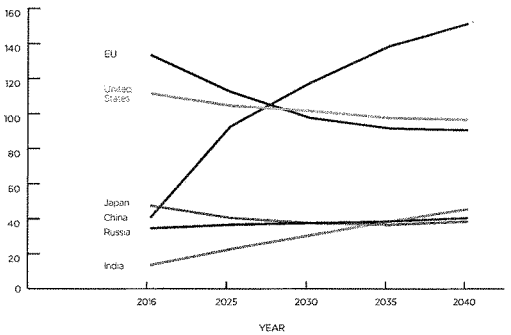
35 World Nuclear Association, "Nuclear Power in Russia," http://www.world-nuclear.org/information-library/country-profiles/countries-o-s/russia-nuclear-power.aspx.

36 Rosatom, press release, "Russia's Nuclear Electricity Share Increased up to 19.9% in 2017," January 12, 2018, http://www.rosatom.ru/en/press-centre/news/russia-s-nuclear-electricity-share-increased-up-to-18-9-in-2017/.

37 "Rosatom Considers Delaying Reactor Commissioning," *Nuclear Engineering International*, October 30, 2017, http://www.neimagazine.com/news/newsrosatom-considers-delaying-reactor-commissioning-5959916.

38 World Nuclear Industry Status Report, p. 235.

Figure 1. Projected Installed Nuclear Generation Capacity (GW) in Selected Countries and EU, 2016–2040



Source: Figure created from data in International Energy Agency, World Energy Outlook 2017, Selected Country Annexes, New Policies Scenario.

(Breakthrough) project is working in nine research centers to develop the BREST-300, BN-1200, SVBR-100, and other fast reactors that can recycle fuel. However, this project has experienced considerable problems, delays, and budget issues. In the context of President Vladimir Putin's aggressive military buildup in the Arctic, it is important to note that Russia is also developing small modular reactors, including floating reactors and barge- or ship-based units, for naval bases, icebreakers, and submarines.[39]

THE GLOBAL NUCLEAR MARKET AND US FOREIGN POLICY

While nuclear development is largely stalled in the United States, there is still a robust interest in nuclear power around the world, driven, in part, by Russian and Chinese externally facing efforts. While new nuclear-plant construction declined globally for the fourth year in a row in 2016, thirty-one countries operated nuclear reactors as of mid-2017.[40]

Whether the United States, or China or Russia, leads on nuclear power is important, as the International Energy Agency's *World Energy Outlook* for 2017 projects that nuclear will continue to maintain at least a 10-percent share of electricity through 2040, with an additional 273 GW in new nuclear capacity, even as 170 GW is forecast to be retired. China, Russia, and India are expected to account for the largest share of additions, while retirements continue in Germany, the United States, Japan, South Korea, and France. (See Figure 1).

Although the rapidly changing international power economics generally favor renewables, natural gas, and, in some cases, coal, nuclear development will be important in several strategic countries. Even in instances when there are more cost-effective alternatives,

39 World Nuclear Association, "Nuclear Power in Russia."

40 Ibid., p. 23.

countries are deciding to proceed with nuclear power, driven by security, diversity of supply, prestige, and environmental factors. Indeed, even Russia's Rosatom has begun promoting the climate benefits of nuclear power under its new head, Alex Likhachev.[41]

In addition to having an active nuclear program at home, China is seeking markets abroad, with financing from the Chinese Export-Import Bank. It has pursued three significant directions: investment and contracting for the construction of existing reactors (e.g., with EDF in the UK); marketing and construction of its indigenous Hualong design (e.g., with Pakistan, Argentina, Turkey, and the UK); collaboration with Candu Energy on new plants (e.g., Argentina and Romania) and in the joint development of an advanced CANDU reactor design.

President Xi's high-visibility "Belt and Road Initiative" involves an estimated $1.1 trillion for infrastructure, including power-plant construction.[42] The Belt and Road also concentrates on nuclear-power development in Pakistan, Turkey, and Romania, and China is looking to commercialize HTGR designs overseas, particularly in countries with large petrochemical and process-heat requirements, such as Saudi Arabia and Indonesia. While the economics of SMRs are currently uncertain, they may become attractive in smaller developing countries.

Meanwhile, Russia has supported nuclear-technology exports using resources from both the Russian budget and the Russia Wealth Fund, which was created when oil prices and revenues were high. However, these resources are declining, and are being stretched thin. While long-standing relations with Iran, Eastern Europe, and former Soviet republics continue to receive priority attention, over the past few years Russia has aggressively pursued deals in the Middle East and South Asia. In South Asia, Russia is building new reactors in India and Bangladesh. In the Middle East, Russia, is focusing on Turkey, Egypt, Jordan, and Saudi Arabia, in addition to its long-standing relationship with Iran.

The Middle East is emerging as an arena of intense nuclear competition and positioning, with the first South Korean nuclear units nearing completion in the United Arab Emirates, Jordan continuing to negotiate on financing for two Russian nuclear reactors, Egypt recently finalizing a deal with Russia, and Saudi Arabia announcing its intention to proceed with two reactors after years of delay. The Chinese, French, Russians, and South Koreans have submitted initial bids in Saudi Arabia, and a US consortium has also submitted a bid on this first phase of the process of shortlisting companies. The bid was approved by the US Department of Energy, even though the United States has not yet concluded a 123 nuclear-framework agreement with the Saudis, which would be necessary before a US export deal could be finalized. Although 123 agreements do not necessarily require that a country refrain from fuel-enrichment development or reprocessing of spent fuel, 123 agreements with the United Arab Emirates and Taiwan prohibit such development. During his December 2017 visit to Saudi Arabia, Secretary of Energy Perry held private discussions on nuclear cooperation, and formal discussions are expected to start in a couple of months, amid concerns in the United States about the Trump administration's possible willingness to lessen nuclear-proliferation safeguards.[43]

The Russians have actively pursued nuclear deals in the Middle East to advance their position in the region. In addition to its long-standing cooperation with Iran in building the Bushehr 1 nuclear plant and beginning a second unit, Russia is working to finalize a preliminary 2015 agreement with Egypt to build four nuclear units at Dabaa, on the Mediterranean.[44] Just days after President Trump's controversial December 6, 2017, announcement recognizing Jerusalem as Israel's capital, Putin visited Egypt and signed the final agreement for the $25 billion, 4800-MW nuclear-power project.[45]

Russia's support for Turkey's first nuclear plant at Akkuyu, as well as the Turkish Stream gas pipeline, is part of its strategic engagement with Turkey. Although work on the plant was momentarily halted following Turkey's downing of a Russian jet, Rosatom resumed construction, and the first unit is expected to be operational in 2023.[46] Looking to increase its security cooperation with Turkey at a time of tensions in the US-Turkey relationship, Russia achieved a major strategic advance in late 2017 when NATO member Turkey agreed to buy a S-400 surface-to-air missile-defense system from Russia in a deal reportedly worth $2.5 billion.[47]

Russia has also pushed for nuclear deals elsewhere, including in South Africa. However, the future of these plans appears in doubt, due to domestic politics in the country. Russia has also been pursuing nuclear agreements in Nigeria and Ghana. Elsewhere, Russia is continuing construction of two new VVER-1200 units in Belarus, and began construction of two similar units in Rooppur, Bangladesh in November 2017. In 2018, Russia is hoping to start construction of the Paks-II plant in Hungary, also a 2x VVER-1200 design.[48]

> The Russians have actively pursued nuclear deals in the Middle East to advance their position in the region.

India—a central country in many ongoing debates about the future of energy demand—is an important arena for nuclear-power competition among Westinghouse, France's AREVA, and Russia's Rosatom; in June 2017, Indian Prime Minister Narendra Modi and Putin signed an agreement to proceed with two new reactors at Kudankulam.[49] Putin's nuclear diplomacy in India is especially interesting considering the Trump administration's effort to enhance bilateral trade and defense relationships with the Modi government. Although India had never signed the Nuclear Non-Proliferation Treaty, the United States concluded a 123 agreement with India (US-India Civil Nuclear Agreement) in 2006, which opened the way for Toshiba-Westinghouse and Hitachi-GE to pursue nuclear-power cooperation. In 2016—following years of obtaining international approvals from the IAEA and the Nuclear Suppliers Group, enactment of a law from Congress, and discussions on liability and other issues—Westinghouse announced a project for construction of six nuclear reactors at Kovvada in Andra Pradesh. The July 2017 communique from Prime Minister Modi's visit with President Trump cites the interests of the two leaders in seeing the conclusion of the agreements for the project.[50] Recent reports indicate that Westinghouse, after emerging from bankruptcy, is still interested in the project.[51]

The Chinese and Russian use of nuclear-power financing and technology as a means of expanding their overseas physical presence, and their foreign-policy influence in key countries, has important implications for the United States. On one hand, US companies are collaborating with China on building, developing, and demonstrating new reactors; GE has won tenders for the supply of turbine generators for new Russian-supplied units in Hungary and Turkey.[52] On the other hand, Russia and China are vying for expanded influence in countries critical to US diplomacy, namely Iran, Saudi Arabia, Turkey, Jordan, Egypt, and Pakistan. Although it is often difficult to know where President Trump stands on China and Russia, the recent NSS2017 is quite specific:

"China and Russia challenge American power, influence and interests, attempting to erode American security and prosperity. They are determined to make economies less free and less fair, to grow their militaries, and to control information and data to repress their societies and expand their influence."[53]

The two countries' overseas nuclear push challenges the post-World War II nuclear-safety and nonproliferation policy and legal framework, which were put in place through the combined efforts of the US government

41 Vladimir Slivyak, "Russia's Rosatom: Climate's New Best Friend," *openDemocracy*, June 29, 2017, https://www.opendemocracy.net/od-russia/vladimir-slivyak/rosatom-climate-s-new-best-friend.

42 HSBC, "Belt and Road," http://www.business.hsbc.com/belt-and-road/infrastructure.

43 Michael R. Gordon, Timothy Puko, and Summer Said, "U.S. Chases a Saudi Nuclear Deal," *Wall Street Journal*, February 21, 2018, https://www.wsj.com/articles/saudi-resistance-to-nuclear-standards-could-roil-u-s-reactor-deal-1519122600?tesla=y.

44 "Iran Begins Building Second Nuclear Plant - With Russian Help," *Associated Press*, September 10, 2017, https://www.nbcnews.com/news/world/iran-begins-building-second-nuclear-plant-russian-help-n646036.

45 Hamza Hendawi and Vladimir Isachenkov, "Putin Visits Egypt in Sign of Closer Ties," *Associated Press*, December 11, 2017, https://www.washingtontimes.com/news/2017/dec/11/russias-putin-lands-in-egypt-in-sign-of-growing-tl/.

46 Olgu Okumus, "How Turkey's Nuclear Plants Could Curb KRG Ambitions," *Al-Monitor*, October 10, 2017, https://www.al-monitor.com/pulse/originals/2017/10/turkey-russia-akkuyu-nuclear-plant-can-prevent-mistakes.html.

47 Tuvan Gumrukcu and Ece Toksabay, "Turkey, Russia Sign Deal on Supply of S-400 Missiles," *Reuters*, December 29, 2017, https://www.reuters.com/article/us-russia-turkey-missiles/turkey-russia-sign-deal-on-supply-of-s-400-missiles-idUSKBN1EN0T5.

48 Sara Stefanini and Nicholas Hirst, "Hungary's Russian Build Nuclear Plant Powered by Politics in Brussels," *Politico*, November 22, 2017, https://www.politico.eu/article/hungarys-russian-built-nuclear-plant-powered-by-politics-in-brussels/.

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50 Douglas Busvine, "Washington Tells India Westinghouse Could be Sold by Year End: Sources," *Reuters*, July 2, 2017, https://www.reuters.com/article/us-usa-india-westinghouse/washington-tells-india-westinghouse-could-be-sold-by-year-end-sources-idUSKBN19N0Y1.

51 Kiran Stacey, "Westinghouse Recovery Boosts India Nuclear Power Programme," *Financial Times*, November 6, 2017, https://www.ft.com/content/d5ca519a-bf9d-11e7-b8a3-38a6e068f464.

52 "General Electric Wins Turbine Contract for Paks II," *World Nuclear News*, January 17, 2018, http://www.world-nuclear-news.org/C-General-Electric-wins-turbine-contract-for-Paks-II-17011801.html.

53 White House, *National Security Strategy of the United States of America*, p. 2.

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and industry, as well as US leadership in international organizations like the IAEA, the Nuclear Suppliers Group, the Group of Seven (G7) Nuclear Safety and Security Group, and the World Association of Nuclear Operators. The strict standards for nuclear exports established in US 123 agreements, mandated by the Atomic Energy Act of 1954, and other regulations are key components of this framework. There are twenty-three agreements with countries that want to receive US nuclear technology, as well as other NRC and DOE export-licensing provisions. As a report by the EFI concludes: "Since building the world's first reactor, the global nuclear industry and the international regimes for safe, secure and proliferation-resistant peaceful uses of nuclear rested in US leadership."[54]

CONCLUSION AND ISSUES FOR FURTHER DISCUSSION

This paper describes an important policy problem facing the United States: the decline of the US nuclear-power industry and the challenge to US global nuclear leadership from China and Russia.

It postulates that nuclear power is an important strategic sector, and that US global leadership and engagement in nuclear power are vital to US national security and foreign-policy interests. US global nuclear engagement is critical—not only because it supports military needs and advances commercial interests, but also because it brings with it a culture that promotes safety, security of nuclear materials, and nonproliferation. It also represents a model of professional regulatory development and government-industry collaboration that is lacking in the state-monopoly and authoritarian systems in Russia and China. US nuclear engagement with countries forges a long-term relationship with counterpart governments and industries in a high-visibility and critical sector of the economy.

Nuclear power should be elevated in the Trump administration's US National Security Strategy, including its "energy dominance," defense-industry capacity development, and international partnership efforts with allies.

Given the strategic importance of the industry and the challenges at stake, the Atlantic Council should pursue the question of what should be the US government response to this challenge, and examine the costs and benefits of different strategies and actions.

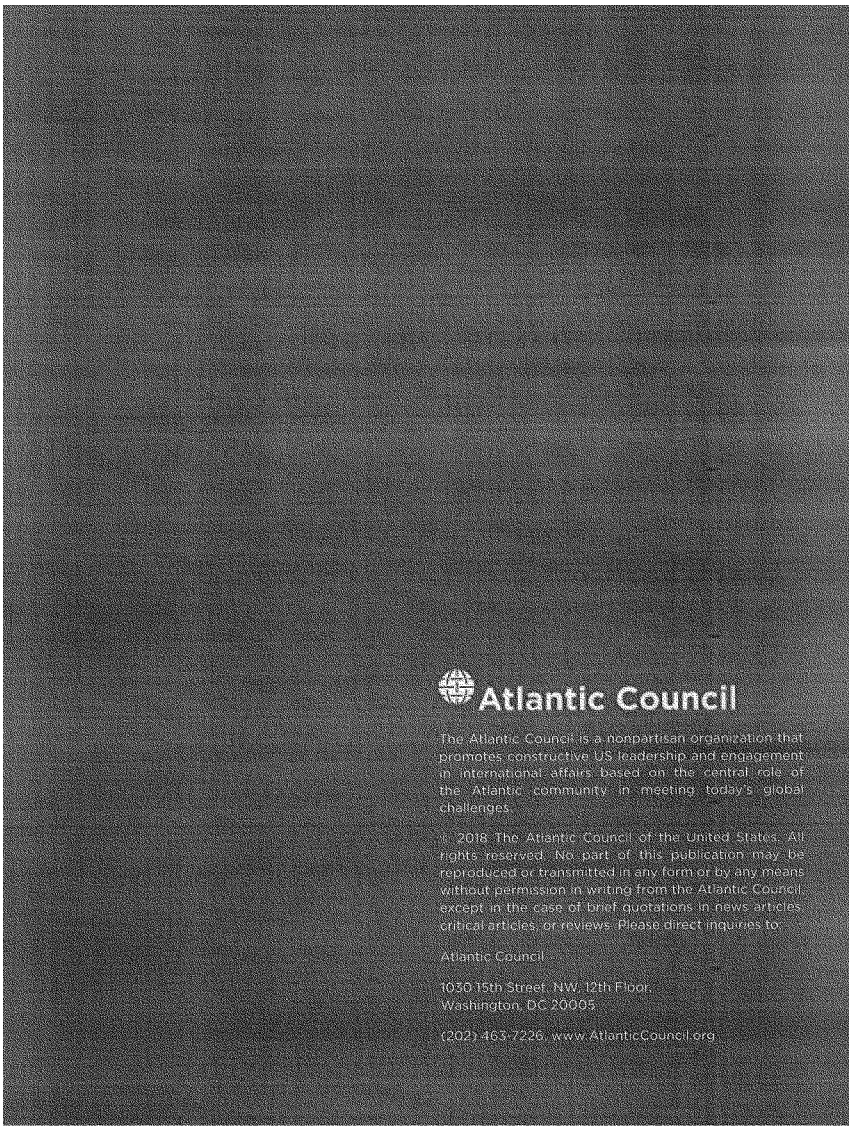
Key issues that should be addressed include the following:

1. What actions, if any, should the government take to avoid the premature closure of US nuclear-power plants, reform electricity markets to better value nuclear attributes, and protect the domestic nuclear-industry supply chain?
2. What government budgetary resources and public-private partnerships are needed to accelerate research, development, and demonstration of advanced reactor designs? And, what international collaborative efforts are necessary to realize a new generation of commercially viable reactors?
3. Should new US government funding sources be developed to promote US technology exports and bolster US industry competition with Chinese and Russian companies? And, what should be the role of the Export-Import Bank?
4. Should the United States strengthen or modify its involvement in key international bodies dealing with nuclear-power exports, nuclear safety, physical security, and protection of nuclear materials?
5. Should the United States expand its efforts to help new nuclear-generating countries with the development of professional nuclear-regulatory agencies and frameworks?
6. Should the United States reduce its reliance on foreign uranium supplies and fuel-enrichment services for its nuclear-power plants?

A constructive dialogue bringing together industry leaders, policymakers, researchers, and other key stakeholders is urgently needed to address these, and other, issues.

Dr. Robert F. Ichord, Jr. is a senior fellow at the Atlantic Council Global Energy Center, where he focuses on policy issues in the transformation of electric power sectors, especially in developing countries. Dr. Ichord has had a distinguished career in the US government, working on international energy security, development, and climate change issues. From 2011 to 2015 he served as deputy assistance secretary for energy transformation in the State Department's Energy Resources Bureau. Previously, he managed energy programs in the Asia, Near East and Europe and Eurasia regions at the US Agency for International Development, including programs related to nuclear safety in Eastern Europe and Eurasia and was involved in the G-7 process to close the Chernobyl nuclear units.

54 Energy Futures Initiative, *The U.S. Nuclear Enterprise: A Key National Security Enabler*, p. 19.



The Atlantic Council is a nonpartisan organization that promotes constructive US leadership and engagement in international affairs based on the central role of the Atlantic community in meeting today's global challenges.

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NuScale Power™

May 21, 2018

The Honorable Fred Upton
Chairman, Subcommittee on Energy
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515

The Honorable Bobby Rush
Ranking Member, Subcommittee on Energy
2125 Rayburn House Office Building
Washington, DC 20515

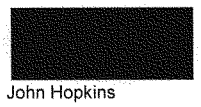
Dear Chairman Upton and Ranking Member Rush:

On behalf of NuScale Power, I am writing to express our support for the legislative efforts of the Committee on Energy and Commerce to address the development, regulation, and competitiveness of advanced nuclear energy technologies. Specifically, legislation offered by Rep. Joe Wilson to require the Department of Energy (DOE) to develop a pilot program to site, construct, and operate microreactors at DOE and Department of Defense (DOD) facilities is an important step forward to realizing the potential of advanced nuclear technologies.

NuScale Power's small modular reactor (SMR) design application recently completed the first and most intensive phase of review by the Nuclear Regulatory Commission (NRC). This major achievement brings NuSclale Power closer to introducing the country's first SMR to market, putting the US on a path to beat foreign competitors like Russia and China at a global SMR race.

Our reactor is small, and within the definition of a "microreactor" contained in Rep. Wilson's legislative proposal. The application of microreactors at DOE and DOD facilities can provide resilience for critical national security infrastructure, and we applaud your efforts to address this matter.

Sincerely,



John Hopkins
Chairman and CEO

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The Nuclear Power Plant in Astrava, Belarus

M_. Speaker, I rise to address concerns brewing in Lithuania and other Baltic states about the construction of a nuclear power plant. This plant is 12½ miles from the Lithuanian border and in sight of Vilnius, Lithuania's capital and largest city. I speak here not only as a friend of the Baltic peoples and as a descendant of Lithuanian immigrants, but also as Co-chair of the Baltic Caucus and Chairman of the Subcommittee on the Environment. And like all of my colleagues here, I am concerned about ensuring the security, integrity, and safety of nuclear projects in Europe and around the world.

Background

- It was not long ago that we were concerned about the effects of other nuclear power plants in Belarus. It was the planned site of a Soviet nuclear power plant until the Chernobyl disaster in 1986, which contaminated a quarter of Belarus.
- But by 2019, Belarus is supposed to house a different Moscow-run nuclear power plant, this one run by the Russian state-owned company Rosatom.
- This project is very environmentally sensitive. Both Lithuania and Belarus have agreed to discuss such environmentally sensitive projects near shared borders as part of the Espoo Convention.
- Building a nuclear power plant is hard, especially when it's a country's first. That's why the International Atomic Energy Agency's recommended a six-step review process meant to prevent disasters like Chernobyl's and the more recent one in Fukushima, Japan.

Problems

- But Belarus has chosen to skip four of the six steps, including crucial steps that ignore the people and land of Lithuania.
- There is real concern that the main purpose behind the project is to grow Russian influence and power, especially over energy in the European Union.
    - The president of Belarus said that the Astrava plant and another Russian plant are "a fishbone in the throat of the European Union and the Baltic States."
- Nuclear power plants in sensitive areas should be the discussed within the Espoo Convention.
    - Nearly all of Lithuania is within 300 kilometers of the plant, which means that if disaster were to strike, long-term food consumption in the country could be severely affected.
    - The country's drinking water could also be affected, since the plant is supposed to draw rivers from a river that supplies drinking water to Lithuania.
- But incidents are occurring that cast doubt on Belarus's commitment to working with neighbors and ensuring the plant is safe.
    - In 2016, six serious incidents occurred, and Belarus has failed to be upfront with Lithuania about any of them.
    - A 330-ton nuclear reactor shell was allegedly dropped from about 13 feet last summer.

        - Belarus did not reveal anything about the incident until independent media reported it, and then downplayed it.
    - Earlier, a structural frame at the site collapsed after workers, apparently under time pressure, filled it too quickly.

Points of Concern

- Building a nuclear power plant requires care in construction, according to the most stringent standards, with the utmost transparency, and for the best reasons.
- This plant fails all four counts.
    - It is in the *wrong location.*
    - It has been *irresponsibly handled.*
    - Instead of transparency, we have *stonewalling* and *obfuscation.*
    - Instead of making the most economic sense, this plant seems to make good geopolitical sense, and for Russia, not for Belarus.

Let me be clear, M_. Speaker. No one here objects to the safe, secure design, construction, and running of nuclear power plants. But the people of Lithuania are firmly opposed to irresponsible attitudes towards nuclear power, particularly so close to their most populous city. This concern makes sense. As chairman of the House Subcommittee on the Environment and a longtime observer of Eastern Europe, M_. Speaker, I can assure you that the people of the United States have no better friend than the people of Lithuania. Lithuanians have the right and the responsibility to ensure their and their children's environmental security. They should not be expected to accept inadequate or misleading information about a serious, environmentally sensitive project

right on their borders. The government of Belarus should respect the commitments it has made, including with its neighbors. Until these issues are resolved, M_. Speaker, I cannot fault the Lithuanian people for their concern about the Astrava nuclear power plant. I share their concerns. I hope Belarusian will calm their fears by allowing in international experts and representatives. Belarus should also comply with the International Atomic Energy Agency's recommendations for the design, construction, and running of safe nuclear power plants. Thank you, M_. Speaker, and I yield back the balance of my time.

Background materials

- https://www.iaea.org/newscenter/pressreleases/iaea-mission-concludes-site-and-external-events-design-seed-review-in-belarus
- http://gizmodo.com/the-first-nuclear-power-plant-in-belarus-is-a-dangerous-1785024428
- http://voices.nationalgeographic.com/2017/02/23/a-preventable-nuclear-threat-you-most-likely-dont-know-about/
- *Materials from Lithuanian Ambassador*

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

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Majority (202) 225–2927
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June 19, 2018

The Honorable Brent Park
Deputy Administrator, Defense Nuclear Proliferation
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Dr. Park:

Thank you for appearing before the Subcommittee on Energy on Tuesday, May 22, 2018, to testify at the hearing entitled "DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. Also attached are Member requests made during the hearing. To facilitate the printing of the hearing record, please respond to these questions and requests with a transmittal letter by the close of business on Tuesday, July 3, 2018. Your responses should be mailed to Kelly Collins, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Kelly.Collins@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachments

QUESTION FROM CHAIRMAN UPTON

NNSA RFI on High-Assay LEU

Q1. Please describe the current status of the NNSA's Request for Information DE-SOL-0008552 for Supply of Enriched Uranium and what NNSA's next steps are as it relates to information received under this solicitation.

A1. NNSA released its Request for Information (RFI) for Supply of Enriched Uranium in January of 2017. The RFI complies with DOE Order 413.3B and allowed NNSA to conduct market research on any commercial entities with an interest in meeting the Department's various enriched uranium needs (Low Enriched Uranium (LEU) for tritium production; High Assay LEU for research reactors, advanced commercial reactors, and medical isotope production; and Highly Enriched Uranium for naval propulsion).

NNSA received responses to the RFI in March 2017 and held an industry day in November 2017 to meet with interested parties. Information gathered through this RFI and at the subsequent Industry Day will inform an NNSA acquisition strategy in accordance with DOE Order 413.3B. The Department approved the mission need critical decision – 0 (CD-0) for a domestic uranium enrichment capability in December 2016, and is currently executing an Analysis of Alternatives (AoA). The AoA is estimated to be completed at the end of calendar year 2019, as stated in the Fiscal Year 2019 Stockpile Stewardship and Management Plan (SSMP), pages 2-33 to 2-34.

QUESTION FROM CHAIRMAN UPTON

Atomic Energy Act and International Nuclear Markets

Q2. The purpose of the Atomic Energy Act is to provide: "a program of international cooperation to promote the common defense and security and to make available to cooperating nations the benefits of peaceful applications of atomic energy as widely as expanding technology and considerations of the common defense and security will permit." However, the statute was enacted when the U.S. was one of only a small handful of countries that had access to atomic energy.

a. Would you agree that the purpose of the Atomic Energy Act to provide for international peaceful use of atomic energy remains important for the nation, even while the global nuclear landscape has changed?

b. Would you consider it beneficial for Congress to modernize the Atomic Energy Act to reflect the current reality, to ensure continued U.S. participation in the global nuclear power development and use?

A2. Pursuant to Section 1 of the Atomic Energy Act of 1954, as amended (AEA), it is the policy of the United States that the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security. Providing for international peaceful use of atomic energy, as called for in the AEA, remains important for the nation despite changes in the global nuclear landscape. If Congress proposes to amend the Atomic Energy Act, the Administration would review such legislation for consistency with the President's program.

QUESTION FROM CHAIRMAN UPTON

Nuclear Export Requirements

Q3. For US persons to directly or indirectly provide assistance for the production of special nuclear material pursuant to 10 CFR Part 810 it currently requires the Secretary of Energy's approval and the concurrence of the State Department. What other nuclear export control regulations require the Secretary or equivalent cabinet-level approval?

A3. 10 CFR Part 810 is the only U.S. nuclear export control regulation that uniformly requires approval by the Secretary or an equivalent cabinet-level official. The FY 2019 National Defense Authorization Act permits the Secretary to delegate approval of certain applications, and DOE is in the process of implementing this new legal direction.

QUESTION FROM CHAIRMAN UPTON

Secretarial Approval for 810 Authorization Requests

Q4. Is the Secretary's approval required for extension or minor-amendments such as the changing of an applicant's name of authorizations already in force? If so, how long does it typically take obtain the Secretary's approval for these minor amendments?

A4. When a specific authorization under 10 CFR Part 810 is issued, the approver signs a formal determination that describes the scope of the authorization and its duration. Extension of a specific authorization beyond its original duration requires further approval by DOE. Substantive changes to the scope of a specific authorization, such as transferring a new type of technology, also require further approval by DOE. However, non-substantive changes, such as changes in an applicant's name, do not require further approval by DOE.

Obtaining approval for renewals of and amendments to existing specific authorizations takes approximately the same amount of time as requesting a new authorization, because DOE must obtain the same government-to-government nonproliferation assurances and must complete the same interagency concurrences and consultations. Pursuant to the Administrative Procedure Act, U.S. companies that file timely requests for the renewal of existing specific authorizations are permitted to continue ongoing activities until a final decision is made on the renewal request.

QUESTION FROM CHAIRMAN UPTON

AEA Secretary Actions

Q5. Do all of the Department's civil nuclear regulatory obligations in the Atomic Energy Act require the Secretary of Energy's approval to allow normal transactions to take place?

A5. No, DOE has other statutory civil nuclear obligations under the Atomic Energy Act, as amended (AEA), that may be delegated to officials subordinate to the Secretary. For example, as authorized under Section 161n. of the AEA, the Secretary has delegated his authority under Section 131 of the AEA to enter into subsequent arrangements under an agreement for peaceful nuclear cooperation. These arrangements are used to convey U.S. consent for retransfers and other activities associated with U.S.-obligated nuclear material. Additionally, the FY 2019 NDAA authorizes the Secretary to delegate approval authority for certain Part 810 applications.

QUESTION FROM REPRESENTATIVE BUSCHON

Q1. Has your office discussed how the isotope consortium could apply to an advanced fuel program?

A1. No, we have not yet explored how the National Isotope Development Center, a program within the Department of Energy Office of Science, could apply to an advanced fuel program.

QUESTION FROM REPRESENTATIVE JOHNSON

Q1. Do you know if there were any delegations to your knowledge that involved unacceptable proliferation risk or created an unacceptable lack of visibility by the secretary's office over the proposed exports?

A1. The authority to approve requests to directly or indirectly engage or participate in the development or production of any special nuclear material outside of the United States has never been delegated, because, until recently, Section 161n of the AEA prohibited delegation. However, as discussed above, other authorities under the AEA related to civil nuclear cooperation have been delegated, as allowed by law. I am aware of no instance where such delegations involved unacceptable proliferation risk or created an unacceptable lack of visibility for the Secretary's office.

QUESTION FROM REPRESENTATIVE DOYLE

Q1. How is the NNSA working with other agencies to ensure that trade can continue to support American jobs without violating the NDAA review requirements and without posing a threat to national security? And more specifically, can you provide more information on the agency's overall strategy with regards to exports to China?

A1. The U.S. Government increasingly is concerned with the attempted illicit appropriation of U.S. technology by China.

The 2015 Agreement for Cooperation with China Regarding the Peaceful Uses of Nuclear Energy (123 Agreement) included unique nonproliferation controls meant to address this nonproliferation challenge. The 123 Agreement includes unclassified peaceful nuclear technology exports within the scope of its terms, as well as a provision in the Agreed Minute that mandates the United States and China to create a joint training program to help exporters in both countries understand the legally binding terms and obligations in the agreement.

The 123 Agreement received a great deal of Congressional attention over concerns about China's potential for improperly diverting or retransferring items or technology subject to the agreement. In response, Congress included provisions in the FY 2016 National Defense Authorization Act that require review of potential transfers of nuclear technology by the Office of the Director of National Intelligence, in order to provide the Department of Energy (DOE) and other interested Departments and Agencies with greater insight into China's activities in this area.

The Administration has built upon the prior improvements to the nonproliferation architecture to address this continually evolving threat. As noted in the 2017 U.S. National Security Strategy (NSS), China wants to shape a world antithetical to U.S. values and interests and is building the most capable and well-funded military in the world, after our own. Part of China's military modernization and economic expansion is due to its access to the U.S. innovation economy, and competitors such as China steal U.S. intellectual property valued at hundreds of billions of dollars each year. The NSS identifies a number of steps that the United States will take to address this threat, including to protect intellectual property through counterintelligence and law enforcement activities, tighten visa procedures, and protect data and underlying infrastructure. The policy direction in the NSS guides the Administration's regulation of exports of U.S. nuclear technology and assistance.

In January 2017, Allen Ho, a naturalized U.S. citizen born in China, pled guilty to conspiring to unlawfully engage or participate in the production or development of special nuclear material outside the United States, without the required authorization from DOE, in violation of the Atomic Energy Act (AEA) of 1954, as amended, and 10 CFR Part 810 (Part 810) regulations. Subsequently sentenced to two years in prison, Ho's prosecution constitutes the first criminal prosecution for violations of Part 810 regulations. China General Nuclear (CGN), a major Chinese state-owned nuclear power company, also was indicted. CGN has failed to respond to the indictment, and the FBI's investigation into "un-named co-conspirators" in the indictment is ongoing. The United States continues to deliberate how to handle exports involving CGN given this

information, but understands that other countries (United Kingdom, France, South Korea, and Saudi Arabia) are cooperating with CGN on their nuclear programs.

For these reasons, DOE applications for export of nuclear-related technology and Nuclear Regulatory Commission applications for export of equipment to China are backlogged, as we have been unable to obtain required concurrence from the Department of State or positive reviews from the other agencies involved. No particular company or particular proposed transfer has been singled out; this applies to all potential transfers to China. The Administration has initiated a policy review of the overall U.S. approach to civil nuclear cooperation with China and is considering economic value to U.S. companies as part of the on-going dialogue on this issue.

QUESTIONS FROM REPRESENTATIVE TONKO

Q1. Currently, would those Part 810 reviews qualify as low proliferation risks?

A1. Section 4(b) of the Advancing U.S. Nuclear Competitiveness and Jobs Act directs the Secretary to establish procedures for expedited consideration of requests for authorizations regarding the transfer of low-proliferation risk reactor technologies to certain designated foreign countries. The bill authorizes the Secretary to designate which technologies and foreign countries are eligible, with certain limitations. Should this bill become law, DOE will work with the U.S. interagency to develop recommendations for the Secretary as to which reactor technologies and destinations should be designated as eligible for the expedited procedures.

Until that process is completed, I cannot provide a specific estimate of the proportion of Part 810 applications that would be eligible for the expedited procedures for low proliferation risk reactor technologies. However, China and Russia are ineligible for the expedited procedures pursuant to the bill's draft text, and they are two of the destinations with the highest volume of requests for specific authorization under Part 810. As such, I expect that the expedited procedures would apply to less than half of the applications for specific authorizations submitted under Part 810.

QUESTIONS FROM REPRESENTATIVE TONKO

Q2. Does the Part 810 process look just at the technology or also the conditions within the potential partner country? That is to say, is the current review process the same for each potential partner country?

A2. In considering whether to approve an application for specific authorization under Part 810, the process takes into account an analysis of the technology to be transferred as well as the foreign company and government that would be receiving the technology. The specific factors to be considered are documented in 10 CFR 810.9, *Grant of Specific Authorization,* and include the significance of the transferred technology relative to the existing nuclear capabilities of the recipient country, whether the recipient country is in good standing with its acknowledged nonproliferation commitments, whether the country has accepted IAEA safeguards obligations on all nuclear materials used for peaceful purposes and has them in force, and seven other factors.

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June 19, 2018

Mr. Ed McGinnis
Principal Deputy Assistant Secretary
Office of Nuclear Energy
Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Mr. McGinnis:

Thank you for appearing before the Subcommittee on Energy on Tuesday, May 22, 2018, to testify at the hearing entitled "DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. Also attached are Member requests made during the hearing. To facilitate the printing of the hearing record, please respond to these questions and requests with a transmittal letter by the close of business on Tuesday, July 3, 2018. Your responses should be mailed to Kelly Collins, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Kelly.Collins@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachments

COMMITTEE ON ENERGY AND COMMERCE
DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies

Tuesday, May 22, 2018

QUESTIONS FROM CHAIRMAN UPTON

Halden Reactor

Q1. The Halden Reactor in Norway provides critical research capabilities that are utilized by the U.S. commercial nuclear industry. Are DOE and the Nuclear Regulatory Commission aware of the potential loss of the reactor?

Q1a. Is DOE examining what specific steps the U.S. government can undertake to assure this reactor is maintained for use by the international research community?

A1a. The Department of Energy (DOE) understands that the Institute for Energy Technology (IFE) in Norway has decided to permanently shut down the Halden Reactor. DOE is moving quickly to develop a mitigation plan to ensure that the capabilities of the reactor are identical or re-established at other facilities and laboratories in the United States and abroad. We have initiated discussions, and are receiving information from the U.S. Nuclear Regulatory Commission (NRC), Nuclear Energy Institute, Electric Power Research Institute, and the Organisation for Economic Co-operation and Development/Nuclear Energy Agency.

Representatives from all of these organizations met at the Idaho National Laboratory (INL) in July to seek consensus on these capabilities and begin to develop credible pathways to re-establish these capabilities. Of immediate need is to ensure that capabilities that are unique to Halden and that are critical for accident tolerant fuel development and qualification are addressed in order to meet the schedules that the nuclear industry requires.

Q1b. Has DOE discussed the potential loss of this facility with the NRC and is there as mutual recognition of the Halden Reactor's capabilities?

A1b. Yes, DOE has initiated discussion. Both DOE and NRC have a history of collaborations at the Halden Reactor, and are well aware of the capabilities of the reactor and the technical experts associated with the reactor project. The NRC has provided the

Department with Halden capabilities that are important to them, and NRC participated in the July meeting at INL.

Atomic Energy Act and International Nuclear Markets

Q2. The purpose of the Atomic Energy Act is to provide "a program of international cooperation to promote the common defense and security and to make available to cooperating nations the benefits of peaceful applications of atomic energy as widely as expanding technology and considerations of the common defense and security will permit." However, the statute was enacted when the United States was one of only a small handful of countries that had access to atomic energy.

Q2a. Would you agree that the purpose of the Atomic Energy Act to provide for international peaceful use of atomic energy remains important for the nation, even while the global nuclear landscape has changed?

A2a. Yes, the Atomic Energy Act has long served as the legal basis by which the United States achieves its objective of fostering the development, use, and control of atomic energy in such a way as to maximize the common defense and security.

Q2b. Would you consider it beneficial for Congress to modernize the Atomic Energy Act to reflect the current reality, to ensure continued U.S. participation in the global nuclear power development and use?

A2b. If Congress proposes to amend the Atomic Energy Act, the Administration would review such legislation for consistency with the President's program.

Nuclear Fuel Cycle Competition

Q3. During the hearing, Congressman Shimkus asked about the Office of Nuclear Energy's plans relating to developing an enrichment facility to serve commercial markets. Mr. McGinnis noted his support for competition and pointed to fuel fabrication facilities. However, there exists a lack of demand for enriched uranium and additional nuclear reactors ceasing operation in the next 7 years.

Q3a. What are the market risks of subsidizing commercial competition in enrichment facilities that result over supply of enriched uranium?

A3a. The nuclear industry has identified the critical need for high-assay low-enriched uranium (HALEU) for development of advanced reactors. There is only one commercial enrichment facility operating in the United States and it does not have HALEU capability. This capability needs to be developed due to limited supplies of highly enriched uranium that can be processed or recovered.

Q3b. Has the Department requested any funding for the Office of Nuclear Energy to develop or build an enrichment facility for commercial HALEU production?

A3b. DOE did not request funding in FY 2019 to develop or build an enrichment facility for commercial HALEU production.

Q3c. Will you commit to notifying the Committee prior to providing any such financial assistance?

A3c. Any funding request for enrichment or other options for HALEU would be made through the annual budget process.

Russian Uranium Imports

Q4. What steps is the Department taking to review the pending expiration of the limitation on uranium imports from Russia that will expire in 2020?

Q4a. The U.S is now importing 93% of our nation's need for uranium. What is DOE doing to revive the U.S. domestic uranium production industry? For example, has anyone from the Department discussed revised regulation of U.S. mining facilities by the Environmental Protection Agency?

A4a. The Department of Commerce (DOC) is responsible for the Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation (Russian Suspension Agreement). DOC initiated an Administrative Review of the Russian Suspension Agreement in December 2017; we understand that the Administrative Review is ongoing. In addition, on July 18, 2018, the Secretary of Commerce initiated an

investigation under section 232 of the Trade Expansion Act of 1962 (19 U.S.C. 1862) to determine the effects on the national security of imports of uranium.

DOE recognizes the vital role that nuclear energy plays in support of our economic and environmental goals, as well as our national security missions. We are aware that the U.S. Energy Information Administration reported recently that 93% of the uranium purchased by owners and operators of U.S civilian nuclear power reactors, and 87% of the uranium in fuel assemblies loaded into our reactors in 2017, was foreign-origin uranium. A White House-led review of U.S. nuclear energy policy is underway. We are confident that the outcomes of that review will inform our approach to revitalization of the U.S. nuclear energy sector.

Recycling Navy Spent Fuel

Q5. Has the Department conducted a cost estimate to reprocess spent nuclear fuel from the U.S. Navy for high-assay LEU?

Q5. Prior to conducting any demonstration or large scale project to reprocess Navy spent nuclear fuel, will the Department commit to conducting such a cost estimate?

A5. DOE has assembled a ¼ scale pilot plant, using unirradiated materials (cold tests), at the Idaho National Laboratory to conduct research on the feasibility of reprocessing Navy spent fuel for HALEU production. As part of this R&D effort, the Department is currently conducting a cost estimate for a potential full scale facility as one option for consideration. Results of the current research, potential costs and other policy considerations would inform any decision whether or not to move forward beyond the current feasibility tests, to be evaluated through future budget requests.

Need for Underlying Benchmark Data

Q6. Criticality benchmark data are key to develop the underlying information for the regulatory framework to help provide advanced nuclear fuels. Please describe the nature of this information, why it is necessary and what government or non-government

facilities are available to gather the data.

A6. Criticality benchmark data are obtained from criticality experiments that are designed to have configurations with nuclear and geometric similarities representative of, for example, nuclear materials in fuel manufacturing facilities or of nuclear fuels used in reactors or being stored and transported. The data are used by criticality safety organizations worldwide, including DOE laboratories, along with the NRC and its licensees, to assess criticality safety margins associated with the uses and disposition of nuclear materials. The data is often used to assess the validity of (or benchmark) nuclear safety computer code models.

Consortium and Cost Recovery for HA-LEU

Q7. The Advanced Nuclear Fuel Availability Act would establish a public-private consortium to provide material for advanced nuclear fuels and sets up a structure by which consortium members would have access to the material, provided the private entities covered the cost of the nuclear material.

Q7a. If DOE sets up this cost recovery structure, could such a program be carried out with limited budgetary impacts on DOE's overall mission needs?

A7a. If such a structure were established, the Department would evaluate how to implement it most efficiently, and apply its resources in a way that minimizes any potential effects on other priority missions.

Q7b. DOE currently provides some high-assay LEU for research needs. How is the cost structure set up for those recipients of HALEU?

A7b. The DOE Office of Nuclear Energy (NE) manages the Research Reactor Infrastructure (RRI) program that provides HALEU fuel at no cost to 23 university research reactors for use at their on-campus reactor facilities. The title of the fuel remains with the U.S. Government, and when these universities no longer require the fuel, the RRI program is responsible for managing the return and disposition of the used nuclear fuel. Typically, other research uses of HALEU, such as fuels development, involve small quantities of

HALEU, and the research is conducted at DOE's Idaho National Laboratory. In this case, the HALEU is never transferred to an external entity and there is no cost recovered for the material itself.

National Nuclear Waste Transportation Program Funding

Q8. On April 16, 2018, the Nuclear Waste Strategy Coalition wrote the Department expressing concern about the decrease in the Department's support for State Regional Groups and Tribal Radioactive Materials Transportation Committee.

Q8a. Does DOE remain committed to continuing to provide the same level of funding and engagement for these programs?

A8a. DOE is committed to ensuring that spent nuclear fuel and high-level radioactive waste are transported and disposed of safely and in a manner that protects both human health and the environment. Part of that commitment is to work cooperatively with state and tribal governments that are likely to be impacted. Our level of engagement and funding is commensurate with both Congressional direction for nuclear waste program activities and Congressional appropriations.

Q8b. Please describe why the Department curtailed the activities identified by the letter.

A8b. DOE is focusing appropriations and available staff resources on activities that serve both disposal and long-term fuel storage. These activities include generic transportation analyses and planning, and supporting state and tribal engagement with the Department. The DOE Office of Nuclear Energy (NE) continues to fund the four State Regional Groups mentioned in the Nuclear Waste Strategy Coalition letter and the Tribal Radioactive Materials Transportation Committee to support the operation of their regional meetings and projects. In addition, NE staff continue to participate in DOE's National Transportation Stakeholders Forum (NTSF, led by DOE's Office of Environmental Management), including attending the NTSF Annual Meeting in June 2018.

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Q8c. Please provide list of meetings conducted with those organizations beginning in fiscal year 2015 through now.

A8c. Below is a list of in-person meetings DOE's NE staff conducted with State Regional Groups, the Tribal Radioactive Materials Transportation Committee (formerly the Tribal Caucus) and the National Transportation Stakeholders Forum and its Working Groups from FY 2015 to the present. Staff from other DOE radioactive materials transportation programs participated in some of these meetings, in addition to others specific to their own shipping programs.

Council of State Governments Eastern Regional Conference - Northeast High-Level Radioactive Materials Transportation Task Force

- November 2014, Port Jefferson, NY
- October 2015, Portsmouth, NH
- November 2016, Atlantic City, NJ
- November 2017, Portland, ME

Council of State Governments Midwest - Midwestern Radioactive Materials Transportation Committee

- November 2014, Traverse City, MI
- November 2015, Des Moines, IA
- November 2016, St. Louis, MO

Western Interstate Energy Board – High-Level Radioactive Waste Committee

- October 2014, Lake Tahoe, CA
- November 2015, Spokane, WA
- December 2016, Phoenix, AZ
- October 2017, San Diego, CA

Southern States Energy Board - Radioactive Materials Transportation Committee

- December 2014, Charlotte, NC

- December 2015, New Orleans, LA
- December 2016, Myrtle Beach, SC

Tribal Radioactive Materials Transportation Committee

- January 2015, San Diego, CA
- January 2016, Palm Springs, CA
- January 2017, Charlotte, NC

DOE NTSF Annual Meeting

- May 2015, Albuquerque, NM
- June 2016, Orlando, FL
- June 2017, Pittsburgh, PA
- June 2018, Omaha, NE

NTSF Spent Nuclear Fuel Rail/Routing Ad Hoc Working Group Meeting

- May 2015, Albuquerque, NM
- November 2015, Des Moines, IA
- April 2016, Fort Worth, TX
- June 2016, Orlando, FL
- November 2016, St. Louis, MO
- June 2017, Pittsburgh, PA
- August 2017, Colorado Springs, CO

NTSF Section 180(c) Ad Hoc Working Group Meeting

- October 2014, Atlanta, GA
- May 2015, Albuquerque, NM
- August 2015, Boston, MA
- March 2016, Washington, DC
- June 2016, Orlando, FL
- June 2017, Pittsburgh, PA

DOE-NE Transportation Core Group Meeting

- March 2015, Washington, DC
- August 2015, Boston, MA
- March 2016, Washington, DC
- August 2016, Chicago, IL
- March 2017, Washington, DC
- August 2017, Colorado Springs, CO

Q8d. Please provide a breakdown of funding provided under this program beginning in fiscal year 2015 through now.

A8d. From FY 2015 to now, NE has provided $2.9 million in total funding through cooperative agreements with four State Regional Groups, and $815,000 in total funding to the National Conference of State Legislatures to support the Tribal Radioactive Materials Transportation Committee.

USEC Restrictions on Enrichment Services

Q9. How does the Department of Energy reconcile its statements noting interest to develop uranium enrichment capability for high-assay low enriched uranium against the prohibition to provide enrichment services under Section 3112 of the USEC Privatization Act (42 USC 2297h-10)?

A9. DOE is considering a number of options to ensure the availability of high-assay low-enriched uranium for advanced reactor development. Any option pursued would be done in a manner consistent with Section 3112 of the USEC Privatization Act.

Isotope Consortium and HA-LEU Applicability

Q10. The Department created the National Isotope Development Center to interface with the user community and manage the coordination of isotope production across the Department's facilities and business operations involved in the sale and distribution of isotopes. Would a similar organization or DOE-led consortium within the Department

provide the stability and guidance to the commercial HA-LEU production and user community?

A10. The DOE Isotope Program, managed by the Office of Nuclear Physics within the Office of Science, established the National Isotope Development Center (NIDC) to primarily interface with the stakeholder community and implement the business aspects of the sales and distributions of isotopes. The Department could certainly explore whether the NIDC model and mission would be applicable to coordination across entities engaged in the commercial production of HALEU.

Report on Price Anderson

Q11. The NRC has previously reported that advanced nuclear technologies would likely have differing requirements under what is known as "Price Anderson Act." The Price Anderson insurance requirements are based on the risk and generation output of the existing fleet of commercial nuclear power plants. Has DOE had any discussions yet on how the liability requirements under the existing Price Anderson framework would be applied to safer and smaller advanced nuclear designs?

A11. DOE agrees with NRC that advanced nuclear reactors may require different treatment under the Price-Anderson Act (PAA) than existing commercial nuclear power plants but has not begun any detailed consideration of this issue.

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QUESTION FROM REPRESENTATIVE BILL FLORES

Q1. Will you outline for us the number of different regulatory approvals, facility updates, transportation issues, and other milestones that will have to be accomplished to have the advanced fuels available in time for the first movers?

A1. While long-term supply of high-assay low-enriched uranium (HALEU) for advanced reactors will involve industry-driven solutions, industry has identified specific challenges for which government support is needed to enable the deployment of advanced reactors in the United States by the early 2030s.

DOE is exploring options for making HALEU available for early start-up fuel including from existing stocks of enriched uranium.

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Tuesday, May 22, 2018

QUESTION FROM REPRESENTATIVE JOHN SHIMKUS

Q1. Are you aware of a recent GAO report that found DOE's cost estimate to develop new enrichment options lacked credibility because it was not well documented or accurate?

A1. The National Nuclear Security Administration's (NNSA) response to the GAO report notes that the preliminary cost estimate does not include the full lifecycle cost of constructing a uranium enrichment facility that could meet the range of enriched uranium needs. The rough order of magnitude estimates prepared by NNSA were for the purpose of determining Critical Decision (CD) authority under DOE Order 413.3B. NNSA determined that it is not required or cost beneficial to include the life-cycle costs of a potential facility at this early stage. NNSA will produce higher fidelity estimates of the final alternatives including appropriate life cycle cost estimates of potential facilities as it continues through the process leading to selection of an alternative. DOE's Office of Program Management Oversight and Analysis conducted an Independent Cost Review of the preliminary estimates and deemed them appropriate for the intended purpose.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE
2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6115
Majority (202) 225-2927
Minority (202) 225-3641

June 19, 2018

The Honorable Jeffrey S. Merrifield
Partner
Pillsbury Winthrop Shaw Pittman LLP
1200 Seventeenth Street, N.W.
Washington, DC 20036

Dear Mr. Merrifield:

Thank you for appearing before the Subcommittee on Energy on Tuesday, May 22, 2018, to testify at the hearing entitled "DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. Also attached are Member requests made during the hearing. To facilitate the printing of the hearing record, please respond to these questions and requests with a transmittal letter by the close of business on Tuesday, July 3, 2018. Your responses should be mailed to Kelly Collins, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Kelly.Collins@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachments

pillsbury

Pillsbury Winthrop Shaw Pittman LLP
1200 Seventeenth Street, NW | Washington, DC 20036 | tel 202.663.8000 | fax 202.663.8007

Jeffrey S. Merrifield
[redacted]

July 31, 2018

The Honorable Fred Upton, Chairman
House Energy and Commerce Committee
Subcommittee on Energy
2125 Rayburn House Office Building
Washington, D.C. 20515-6115

Re: DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies

Dear Chairman Upton:

Thank you for the honor of allowing me to appear before the Subcommittee on Energy on Tuesday, May 22, 2018, to discuss legislation addressing the modernization of the Department of Energy, the Nuclear Regulatory Commission and Advanced Nuclear Energy Technologies.

As you have requested, I have enclosed responses to several questions that were raised regarding my testimony. I hope these answers provide you the information that you and the other Members of the Committee were requesting.

Sincerely,

[redacted]

Jeffrey S. Merrifield
Partner and Energy Section Leader

cc: The Honorable Bobby L. Rush
Ranking Member, Subcommittee on Energy

Attachment (1)

Prepared Answers of the Honorable Jeffrey S. Merrifield to the Additional Questions for the Record for the Subcommittee on Energy Hearing Dated Tuesday, May 22, 2018

Question 1 from the Honorable Bill Flores

The recommendations contained in the paper you authored on high-assay LEU helped inform many of the provisions in the discussion draft, and your thoughtful input is appreciated. The focus of this discussion draft is to provide a targeted and limited program to address the challenges to overcome these hurdles for the first movers, not to create a permanent government program. What would be the appropriate date to sunset this program?

Merrifield Answer to Question 1

First, thank you very much for considering the recommendations I made on behalf of ClearPath. It was an honor to testify before the Subcommittee and I appreciate the bi-partisan spirit with which you and your fellow Members are attempting to support this exciting new opportunity for American nuclear power.

Given the interactions I have had with various developers of advanced nuclear technologies, I believe these technologies will be rolled out beginning in the late 2020's through the middle of the 2030's. For this reason, I believe that an appropriate sunset time for this program would be calendar year 2035.

Question 2 from the Honorable Paul Tonko

Are any activities exempted under H.R. 1320 currently recoverable by the NRC?

Merrifield Answer to Question 2

While I have not been able to make an exhaustive review of the legislation, the principal area included in H.R. 1320 which is currently recoverable is Section (3)(b)(1)(B)(iii) pertaining to "costs for activities related to the development of regulatory infrastructure for advanced nuclear technologies." As I discussed in my testimony, I believe this is an appropriate item to be taken off the fee base as the current NRC fee structure could serve as a further impediment for the development of these promising advanced reactor technologies. Additionally, eliminating this fee for advanced reactors would provide better alignment with the current fleet of nuclear units, most of which were licensed and built prior to the passage of OBRA 1990 which created the NRC fee structure.

Section 3(b)(2) and (3) appear to serve as a means to cap the annual fees of certain current licensees to "cover the costs to the Commission of providing the service or things of value." While the authors of the legislation are better placed to explain precisely how this legislation is intended to work, to the extent it places a cap on the fees that the Commission can charge a specific licensee, any additional costs, by their very nature, would need to be covered by some other source. Typically, this would occur through recovery in another fee structure, or by recovery in general revenues.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6115
Majority (202) 225-2927
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June 19, 2018

Ms. Melissa Mann
President
URENCO USA, Incorporated
1560 Wilson Boulevard; Suite 300
Arlington, VA 22209

Dear Ms. Mann:

Thank you for appearing before the Subcommittee on Energy on Tuesday, May 22, 2018, to testify at the hearing entitled "DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Tuesday, July 3, 2018. Your responses should be mailed to Kelly Collins, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Kelly.Collins@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment

urenco

July 2, 2018

Congressman Fred Upton
Chairman, Subcommittee on Energy
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515-6115

Dear Congressman Upton:

On behalf of URENCO USA and the US Nuclear Industry Council (USNIC) I would like to express my appreciation for the opportunity to appear before the Subcommittee on Energy on Tuesday, May 22, 2018 to testify at the hearing entitled "DOE Modernization: Legislation Addressing Development, Regulation, and Competiveness of Advanced Nuclear Energy Technologies."

Please find enclosed our responses to additional questions for the record that we received from the Subcommittee on June 19, 2018. I appreciate the opportunity to clarify for the Subcommittee the importance of identifying how existing commercial nuclear assets in the U.S. can be best used to advance our nuclear industry, thereby limiting the amount of time and funds necessary to stand up this critical capability.

Should the Subcommittee have any further questions or briefing needs, we would be pleased to support those requests as best as we can.

I would also like to take this opportunity to invite you and the members of the Subcommittee to tour our uranium enrichment plant in Eunice, NM to provide a first-hand understanding of the need to protect and take advantage of these critical national facilities.

Thank you again for the opportunity to testify before the Subcommittee.

Sincerely,

[redacted]

Melissa Mann
President
URENCO USA, Inc.

URENCO USA Inc.
1560 Wilson Boulevard Suite 300, Arlington, Virginia 22209 - 2463, USA T: +1 703 682 5208 F: +1 703 465 2784
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July 2, 2018

RESPONSE TO CONGRESSMAN FLORES' QUESTIONS FOR THE RECORD

1. **Your testimony notes the many different steps that are required to advance in a concurrent fashion to align the timeframe to deploy advanced reactors with the material availability. What is the expected length of time to do the following:**

   a. About how long would it take to develop the criticality benchmark data to inform the different regulatory requirements?

   Nuclear criticality control is a key requirement for nuclear facility operations and the industry and national laboratory system have a good supply of qualified criticality experts. A focused program should be able to yield solid criticality analyses within a 24-month period. Ideally, such a program would be developed on a consortium basis with backing from the U.S. Department of Energy (DOE).

   The value of such an undertaking is to provide a consistent set of data that can be utilized by reactor and fuel designers, fuel cycle facilities, and transportation package designers alike. This approach would also mean that the U.S. Nuclear Regulatory Commission (NRC) would not have to independently verify multiple, bespoke benchmarking codes.

   b. About how long would it take to design, test, certify, and construct the transportation packages?

   Packages designed for the transport of fissile nuclear materials on public roads must meet rigorous performance standards. There are additional requirements imposed on packaging HA-LEU materials in the form of uranium hexafluoride (UF_6). Industry experience shows that the process of designing, testing, licensing and manufacturing such packages is a multi-year process, likely to require four to seven years on average.

   An alternative approach for managing UF_6 packaging needs would be to consider the co-location of HA-LEU enrichment and conversion facilities. Such co-location would allow consolidation of HA-LEU processing at fewer sites and would obviate the need to transport HA-LEU as UF_6 on public roadways, thus reducing the expenses and time associated with the development, licensing and manufacture of new packages for this transport segment.

   c. What is the expected time for you to go through the process to modify URENCO USA's NRC license to be a Category-2 facility?

   The NRC reviewed, approved and issued the initial combined construction and operating license for the URENCO USA uranium enrichment facility in Eunice, New Mexico in just over 30

months. This was a first-of-a-kind approval for use of advanced gas centrifuge enrichment technology in the United States.

The URENCO USA facility currently produces low enriched uranium at an enrichment level of less than 5.0% ^{235}U. At this enrichment level, the facility is licensed to Category III physical protection requirements.

The full gamut of HA-LEU enrichments (up to ~19.75% ^{235}U) falls into Category II physical protection requirements. Licensing of a HA-LEU enrichment capability at the URENCO USA site would require either that the entire facility be upgraded to Category II physical protection requirements or that a small HA-LEU capability be separately licensed on site as a Category II facility. In either scenario, URENCO USA is able to rely on existing site characterization data, utilities, plant processes, safety control systems, etc. – all of which are already familiar to the NRC - while ensuring that additional requirements for Category II operations are met in full.

Assuming that the NRC has clearly defined requirements for Category II facilities, review and approval of a HA-LEU capability at the URENCO USA site should be feasible within a 24 to 30-month period.

d. About how long would it take to construct the new enrichment capabilities at your facility?

We estimate that if detailed design, site permitting and contractor selection were undertaken during the NRC application review process, URENCO USA could construct, commission and start up a HA-LEU production module within 24 months of NRC license approval. This estimate reflects our actual construction experience for the most recent construction phases at the URENCO USA facility.

e. About how long do you expect it might take to do the similar work at the fuel fabrication facilities?

While URENCO USA and fuel fabrication facilities are held to similar regulatory requirements, URENCO USA is not in a position to speak directly for the fabrication community. The answer will likely largely depend on whether existing fabrication facilities can be utilized or whether greenfield sites are proposed, but our hope is that the NRC would be able to review, approve and issue other fuel cycle licenses in a relatively similar time frame as for enrichment activities.

One means of reducing the time and burden associated with new licensing reviews (as well as reducing the number of transportation steps and packaging requirements) is to consider co-locating a HA-LEU enrichment capability with conversion and fabrication capabilities. As stated during the May 22, 2018 hearing, URENCO USA is willing to consider hosting such capabilities at its New Mexico site.

f. Are there other items that have not been mentioned that need to be addressed, such as uranium mining facilities or conversion facilities?

A complete and sustainable HA-LEU fuel cycle would include three fundamental capabilities: (1) a uranium enrichment facility producing HA-LEU enrichments in the form of uranium hexafluoride (UF_6); (2) a conversion facility to convert HA-LEU UF_6 into metal or oxide as appropriate for different reactor designs and fuel types: and (3) one or more fabrication facilities that can manufacture the specific fuel types required by the various reactor and fuel designs. As such, a conversion capability is as important as the enrichment and fabrication steps.

g. Based on your experience in the fuel cycle, when do all the steps described above have to be completed by to provide the fuel for deployment?

DOE is already seeking a HA-LEU capability for research and test reactor use in the relative near term. Additionally, advanced reactor and advanced fuel designers are seeking supply of test quantities of material to demonstrate viability in the mid-2020s, and seeking commercial supply shortly thereafter.

URENCO USA is interested in and capable of serving a broad community of users who stand to benefit from HA-LEU supply. This includes: (1) research and test reactors, including reactors fueled by DOE in the U.S. and abroad; (2) advanced reactors; (3) advanced fuel designs including Accident Tolerant Fuels; (4) producers of targets for medical isotope production; and (5) operators of existing light water reactors seeking improvements in fuel reliability and costs through high fuel burnup and extended operating cycles.

2. Based on that description, it is clear there is a sense of urgency to initiate this program now?

Absolutely, there is a sense of urgency to pass the draft legislation and initiate this program. Near-term action in developing a viable HA-LEU fuel cycle - including availability of appropriate packaging - is required to ensure that lack of fuel does not hinder operation of existing research and test reactors or the ability to benefit from the development and possible broad-scale deployment of advanced reactors and advanced fuel types.