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ONE YEAR OF PROGRESS: AN UPDATE ON IMPLEMENTATION OF THE NUCLEAR
ENERGY INNOVATION AND MODERNIZATION ACT

Wednesday, January 15, 2020

United States Senate

Committee on Environment and Public Works

Washington, D.C.

The committee met, pursuant to notice, at 10:03 a.m. in room 406, Dirksen Senate Office Building, the Honorable John Barrasso [chairman of the committee] presiding.

Present: Senators Barrasso, Carper, Braun, Rounds, Sullivan, Ernst, Cardin, Whitehouse, Van Hollen.

STATEMENT OF THE HONORABLE JOHN BARRASSO, A UNITED STATES
SENATOR FROM THE STATE OF WYOMING

Senator Barrasso. Good morning. I call this hearing to order.

Nuclear power is a reliable, clean source of energy. Nuclear power plants generate electricity 24 hours a day, 7 days a week, 365 days a year. Nuclear energy is also resilient. It produces power through cold snaps, through heat waves, and through snowstorms, and it does so without emitting carbon dioxide. Preserving and expanding our use of nuclear energy is necessary to address climate change.

Our Nation's nuclear power plants are operating at historically high levels of safety and performance. Despite this, challenging electricity markets have led to a shrinking nuclear energy. It is time to reverse this trend.

To do so, the committee led efforts to pass the Nuclear Energy Innovation and Modernization Act, or NEIMA. Congress overwhelmingly supported this bipartisan legislation. One year ago, President Trump signed the bill into law.

This morning, we will review the Nuclear Regulatory Commission's implementation of that law. The law provides certainty to assist today's nuclear power plants. The law revises how the Nuclear Regulatory Commission manages its finances.

This is important for a number of reasons. One is to provide predictable regulatory costs for nuclear utilities. The law prioritizes agency spending on activities that directly support its regulatory mission. It establishes performance metrics and milestone schedules to increase accountability and certainty for major licensing actions.

The law also requires the commission to take both short-term and long-term actions to develop and deploy advanced nuclear technologies. Advanced reactors will be designed differently than current nuclear reactor designs. Smaller, safer nuclear technologies should not be subject to the rigid costly requirements imposed on yesterday's designs.

The law requires a modernization of nuclear safety rules. The commission has taken important initial steps to implement the bill. In December, the commission approved a proposed rule for emergency planning for advanced nuclear reactors. The commission also approved a first-of-its-kind permit for the Tennessee Valley Authority to site a small modular reactor. I applaud the commission for the efforts so far. Still a lot of work to do.

The new financial management requirements take effect in the upcoming fiscal year. The commission's forthcoming budget must be in line with the law's intent. American ratepayers and nuclear licensees fund the organization. As a result, budgetary

resources must be responsibly managed.

As nuclear power plants shut down, the agency must make real reductions of staff and resources proportionate with the reduced workload. Within the next year, the commission must establish a strategy to license advanced technologies using the existing regulatory framework. This short-term approach complements the long-term development of a new regulatory framework.

The commission must be smart about developing new safety regulations. America's nuclear innovators and entrepreneurs need confidence that the licensing process is predictable and affordable. The rules should appropriately reflect the increased performance and lower risk of new reactor designs.

As the commission continues to implement the law, other key nuclear energy issues must be addressed. The significant benefits of clean nuclear energy will be limited until Washington keeps its promise to permanently dispose of nuclear waste.

Advanced nuclear technologies can generate less nuclear waste. Some may even produce electricity from previously used nuclear fuel. Advanced nuclear technologies cannot eliminate the need for a permanent nuclear waste program. Legislation that I have introduced will help get our Nation's nuclear waste program back on track.

Another critical issue is the source of our nuclear fuel. America's uranium miners are struggling to stay in business due to Russia's manipulation of the uranium market. Many of those hard-working miners live in my home State of Wyoming.

Six months ago, President Trump recognized the national security implications of relying on foreign countries for uranium. He established a nuclear fuel working group to recommend actions to revive our nuclear fuel cycle. We are still waiting for those recommendations from the working group.

American uranium producers need immediate assistance and certainty. It is time for action. The one-year anniversary of the Nuclear Energy Innovation and Modernization Act becoming law gives us a great opportunity to discuss these important issues facing America's nuclear energy industry. Nuclear power is clean, reliable, and carbon-free. We must continue to support this important energy technology.

I will now turn to Ranking Member Carper for his opening remarks.

[The prepared statement of Senator Barrasso follows:]

STATEMENT OF THE HONORABLE THOMAS R. CARPER, A UNITED STATES
SENATOR FROM THE STATE OF DELAWARE

Senator Carper. Thanks, Mr. Chairman. Thanks so much for bringing us together, for your leadership on this, and that of others on our committee.

Ms. Doane, it is great to see you. Thank you for coming. Mr. Ficks, Ben. It is always nice to see that name. We welcome both of you today.

I have got a statement here. I am going to go ahead and read it, and then I am just going to talk a little bit off-the-cuff, and then we will get started. Mr. Chairman, thanks again for bringing us together to discuss the implementation of the Nuclear Energy Innovation and Modernization Act, known as NEIMA.

Thank you to each of our witnesses, for your service at the Nuclear Regulatory Commission, and for joining us. It is not every day that we have folks like you, who do a lot of the real work. We are thrilled that you were able to come.

From the very start of our Nation, our Country has faced daunting challenges that at first seemed impossible to overcome, but with support from federal, State, and local governments, Americans have always found a way to innovate and find solutions to overcome these challenges.

Not all of those solutions come from Washington. They come from all over, every corner of this land and around the world,

and we welcome that.

Today we face the greatest environmental crisis I think we are likely never to face, certainly in my lifetime, probably in our lifetime, that is climate change, extreme weather. If we are going to meet the challenges of climate change, we must do more to spur zero-emitting technologies here at home and around the world.

Nuclear power is a prime example of how we can combat climate change and provide economic opportunities for Americans. Done responsibly, nuclear power helps our Nation reduce both our reliance on dirtier fuels and air pollution that damages our lungs and our climate. At the same time, we know that when the United States leads on nuclear energy, it opens up good-paying manufacturing, construction, and operating job opportunities for Americans nationwide.

Nuclear energy provides about 20 percent of our Nation's energy. However, our existing reactors cannot run forever. I said 20 percent of our Nation's energy, about 50 percent of our carbon-free energy. That is an important point.

If we are smart about it, we will replace our aging nuclear reactors with new advanced technology developed here at home. Domestic technology that is safer produces less spent fuel, and it is cheaper to build and to operate.

The Chairman, myself, and many other cosponsors of this

bill hope that this legislation will be the catalyst needed for advanced nuclear technology to become a reality for this Country. We look forward to our conversations today with our friends from NRC to discuss its implementation and whether or not our hopes have yet been realized.

I believe that NEIMA was an important step to address climate change, but it is only a drop in the bucket when it comes to climate solutions. If we are going to stem the tide of climate change, so much more needs to be done, and we need to do it fast.

The Federal Government needs to be galvanized to address the climate crisis and move our Country to reach net-zero greenhouse gas emissions, sooner rather than later. What that takes is leadership from our President, and we are just not seeing that today. Instead, we have seen an Administration that promotes policies that undermine climate science and increase our dependence on dirty energy policies that are, quite frankly, sending the wrong message to those who are interested in investing in advanced nuclear and other zero-emitting technologies. These actions send the wrong message that threatens Americans competitiveness in the global clean energy economy and the health of every American.

To put this in context, the country of Australia is on fire. We have been seeing it on television, hearing it on the

media for days; 15.3 million acres have been destroyed. That is larger than, Senator Capito, my native State of West Virginia. Imagine that. We are told that a billion animals and birds have been killed. A lot of species that were endangered are going to be extinct, are extinct now.

This is right in front of us. If that doesn't get somebody's attention and say we need to do something to address this crazy weather and climate change, climate crisis, then we are in the wrong business.

There a lot of different ways to do that. Senator Whitehouse, Senator Sullivan and I were, earlier this morning, at an industry-led gathering that is focusing on recycling of packaging, and finding ways to do that more sustainably, smartly, wisely. There is a role for us. There is a role for the private sector. There is a role for government, too.

I had lunch earlier this week in Salisbury, Maryland, your State, with a fellow who is the CEO of Purdue, the folks who raise a lot of chickens. They have just done a business merger with a company that is involved in using European German technology to be able to take poultry waste, chicken waste, which we have a lot of on the Delmarva Peninsula, and turn it into clean fuel that can create a lot of electricity for folks who need electricity in their homes and their businesses and do so in a way that is sustainable and good for the environment.

Very exciting stuff.

Then we have all kinds of ways we can reduce the climate threat. Nuclear is good. Done badly, done unwisely, not good. There are ways to do this smart, and if we are really smart, we will find ways to do this in a way that protects our safety, find ways to actually recycle or reuse spent fuel rods to derive additional energy from them.

There is a lot of opportunity here. In adversity lies opportunity, and this is one of the opportunities. I am delighted to be able to be with you. All the years I served in the Navy, for 27 years, including my time as a midshipman, has been on ships, on aircraft carriers, nuclear submarines. We are about to launch the U.S.S. Delaware, fast-attack nuclear submarine commissioned Delaware on April 4th deploying to Wilmington.

I have known people who served in the nuclear Navy forever. I don't think there has ever been a life that has been lost in the nuclear Navy in 50 years. In 50 years, all the sailors that have been on the ships, submarines, aircraft carriers, not one life lost because of nuclear initiative.

On this day, in this Country, we are going to see probably dozens of people die because of air pollution, because of breathing air that is, frankly, electricity that is not produced by carbon-free sources like nuclear.

So this is kind of a life-and-death matter for all of us.
I am thrilled that we are here, thank you.

[The prepared statement of Senator Carper follows:]

Senator Barrasso. Thank you very much, Senator Carper.

We will now hear from our two witness. Margie Doane is here, who is the Executive Director of Operations of the U.S. Nuclear Regulatory Commission, and Ben Ficks, who is the Deputy Chief Financial Officer of the U.S. Nuclear Regulatory Commission.

I would like to remind both of you that your full written testimony will be made part of the official record, so please try to keep your statements to five minutes so that we may have time for questions. We look forward to the testimony.

Ms. Doane, would you please begin?

STATEMENT OF MARGARET DOANE, EXECUTIVE DIRECTOR OF OPERATIONS,
U.S. NUCLEAR ENERGY REGULATORY COMMISSION

Ms. Doane. Good morning, Chairman Barrasso, Ranking Member Carper, and distinguished members of the committee.

I appreciate the opportunity to appear this morning with the Deputy Chief Financial Officer, Mr. Ben Ficks, to testify on the U.S. Nuclear Regulatory Commission's progress in implementing the requirements of the Nuclear Energy Innovation and Modernization Act, or NEIMA.

Over the past year, the NRC staff has successfully implemented NEIMA's requirements and met all of NEIMA-related deadlines. I attribute the NRC's success to the unparalleled focus, commitment, and hard work of the NRC staff. It is their expertise, knowledge, and collaborative efforts that allow the NRC to meet all deadline, including timely submitting nine NEIMA-related reports since April 2019 on topics ranging from emergency preparedness, to accident-tolerant fuel, to advanced reactor licensing.

Speaking of advanced reactors, the NRC has been preparing for the licensing of advanced reactors for several years, and is ready to review potential near-term applications, the first of which is anticipated this month. Notably, this past May, the staff issued a draft regulatory guide for a technology-inclusive, risk-informed, and performance-based licensing

approach for advanced reactor licensing. This effort was informed by the NRC's staff interactions with the Licensing Modernization Project, a DOE cost-shared initiative being led by Southern Company and coordinated by the Nuclear Energy Institute. The staff's regulatory guide will serve as a foundation for the rulemaking to establish a technology-inclusive regulatory framework for advanced reactors.

The staff has also made significant progress in implementing risk-informed and performance-based techniques and guidance for the resolution of numerous policy issues regarding new reactors. For instance, the commission recently approved the use of more realistic approaches for estimating the potential radiological consequences of new reactor technologies.

These approaches recognize that nuclear reactor designs of the future may look very different compared to the operating reactors of today. For example, they may be much smaller and have enhanced safety features. NRC remains committed to regulating in a transparent manner to provide reasonable assurance of adequate protection of public health and safety in its review of new reactor technologies.

Other highlights of the staff's activities under NEIMA include our development of staff training on various advanced reactor technologies and the agreements we reached with the Department of Energy to share technical expertise and knowledge.

In addition, we conducted 11 public meetings, more than NEIMA requires, at various locations throughout the Country on best practices for community advisory boards regarding reactor decommissioning.

As a complement to the staff's work under NEIMA, the NRC continues to conduct activities in support of transformation into a modern, risk-informed regulator. For example, in 2019, the NRC completed its merger of the Office of Nuclear Reactor Regulation and the Office of New Reactors. They are now one office under the office of Nuclear Reactor Regulation.

This organizational change is reflective of the broader changes within the nuclear industry, and most importantly, helps ensure the agency is better suited for meeting its safety and security mission in an evolving future. I thank the committee for its continued interest and support as we implement this important piece of legislation.

Chairman Barrasso, Ranking Member Carper, and distinguished members of the committee, this concludes my oral testimony. On behalf of the NRC staff, thank you for this opportunity to appear before you and for your support of our vital mission.

[The prepared statement of Ms. Doane follows:]

Senator Barrasso. Thank you, Ms. Doane.

Mr. Ficks.

STATEMENT OF BEN FICKS, JR., DEPUTY CHIEF FINANCIAL OFFICER,
U.S. NUCLEAR REGULATORY COMMISSION

Mr. Ficks. Good morning, Chairman Barrasso, Ranking Member Carper, and distinguished members of the committee.

I appreciate the opportunity to appear this morning to testify on the U.S. Nuclear Regulatory Commission's activities and progress implementing Sections 101, 102, and 202 of NEIMA, for which the Office of the Chief Financial Officer has the lead.

The NRC is developing the fiscal year 2020 draft fee rule consistent with NEIMA such that the development of the regulatory infrastructure for advanced nuclear reactor technologies, including activities required under Section 103 of NEIMA, is not recovered through fees. Section 102 caps the operating reactor licensee annual fee, caps the NRC corporate costs at 30 percent of the annual budget request for fiscal year 2021, and requires anticipated expenditures for requested activities of the commission to be identified in the annual budget justification.

The budget formulation process and associated systems have been modified to implement these changes, and the fiscal year 2021 Congressional budget justification and the fiscal year 2021 fee rule will reflect the changes. Once the President's budget is released on February the 10th, 2020, the NRC will be able to

provide more specific information regarding the implementation of these provisions.

In partnership with our internal and external stakeholders, we have taken several steps to improve invoice accuracy and transparency consistent with Section 102. We completed a new, monthly, standardized fee validation process starting in July 2019. This new process improves accountability and oversight within the NRC to ensure that fee billing data are correct before appearing on a licensee's quarterly invoice.

Specifically, we added new data elements to our information technology systems to identify the individuals responsible for validating billing charges, and we also created new reports for staff and managers to improve their analysis and provided training to responsible staff so that they were prepared for this change.

In addition, the NRC implemented the new electronic billing, e-billing, system on October 1st, 2019. This system was designed in consultation with a representative group of nine licensees that were involved throughout the development phase. The system includes the following improvements: eliminating mailing of paper invoices, providing licensees with the capability to analyze their invoices online, providing licensees with access to Treasury's payment system to pay their invoices, improving the timeliness of invoices, providing the capability

to export invoice data easily for analysis and verification of charges, and it provides licensees with an efficient method to submit inquiries regarding their invoices by having questions immediately delivered by email to the agency for research or action. Forty-five licensees have been enrolled in e-billing as of December 27th, 2019.

Section 202, Pilot Program for Uranium Recovery. As directed by NEIMA, the NRC provided a report describing the results of the pilot initiative to the committee on January 10th, 2020. As discussed in the report, the NRC staff determined that while it could fairly and equitably establish flat fees for financial reviews and routine inspections for the single remaining uranium recovery NRC licensee in this fee class, the NRC ultimately decided to maintain its current fee billing structure as the current licensee appreciates the level of transparency provided by the current process.

NRC will continue its communication with the remaining licensee and provide estimated costs for uranium recovery activities. In addition, the NRC staff has posted cost estimates for uranium recovery activities on the NRC's public website to give a general sense of what can be expected.

Chairman Barrasso, Ranking Member Carper, distinguished members of the committee, thank you again for the opportunity to appear before you, and I look forward to answering any questions

you may have.

[The prepared statement of Mr. Ficks follows:]

Senator Barrasso. Thank you very much to both of you for your important testimony. We look forward to some questions. I will start, and we will have five-minute rounds of questions.

Ms. Doane, in 2018, the EPA withdrew what was an Obama Administration midnight rule. This midnight rule would have added unnecessary red tape to the principal method of uranium production. The NRC raised substantial jurisdictional concerns to the EPA regarding the proposed rule.

In 2017, I asked the EPA to sign a memorandum of understanding with the NRC to resolve the issue. For over a year, NRC and EPA have worked on this memorandum of understanding. The process, I believe, needs to be completed.

Could you provide an update on the status of the Nuclear Regulatory Commission's engagement on this memorandum?

Ms. Doane. Thank you for that question, Senator.

Yes, the memorandum of understanding is in its final stages. The staff of both agencies have agreed in principle on a document, which I think, in my experience, is sometimes the hardest part of an endeavor like this.

The next step is for us to finalize the documentation. It is formal documentation, because this is an enduring document. We are finalizing the documentation; it will then come to me, and then be moved on to the Chairman, because it is for her signature. So it is in the final stages, and I do not expect it

to be very long.

Senator Barrasso. Thank you. Another question. In December, the commission approved a staff proposal to establish emergency planning requirements for advanced nuclear technologies. The proposal accounts for the reduced risk of smaller and safer reactor designs. The Nuclear Energy Innovation and Modernization Act requires this approach, which we signed last year, but will you summarize the NRC's proposal and the historical basis for your recommendations?

Ms. Doane. The proposal that we made to the staff for this draft proposed rule is based on a scaling, recognizing that larger reactors, the consequences could be very different for larger reactors than smaller reactors. As an example, existing reactors include over 1,000 megawatts, up to 1,400 megawatts, where the reactor I referred to earlier could be one megawatt.

In summary, the approach is a scaling approach that would recognize for these consequences, the communities would be very well-protected, even with a smaller emergency planning zone.

Senator Barrasso. Mr. Ficks, the law limits how much funding the commission can request for overhead activities or corporate support costs. These include funding for human resources, for information technology.

This new requirement is going to prioritize spending on activities that directly support the agency's mission to license

and to oversee the use of nuclear material. What steps are you taking now to meet the new funding limitation and the NRC's 2021 budget proposal?

Mr. Ficks. NRC has taken a lot of steps to reduce its budget. Since fiscal year 2014, we have actually decreased our budget from fiscal year 2014 to fiscal year 2020 by approximately 19 percent. In that same period, corporate support reduction resources have decreased as well by 19 percent. We have decreased our space, our footprint.

We have also re-baselined our activities. We have done careful FTE analysis to ensure that we do not overbudget, and we continuously look at our budget models. We look forward to discussing this more in detail once the budget is released in February 10th.

Senator Barrasso. Thank you on that. Because the law limits the amount that the commission can charge operating nuclear power plants, starting in this upcoming fiscal year, this is going to ensure that the remaining nuclear plants don't pay more to fund the agency to make up for lost revenue because other plants have shut down. I am concerned the commission may shift funding to circumvent the requirement, but what are you doing to reduce the portion of the agency's budget that the nuclear reactors fund?

Mr. Ficks. Again, we have used analytics to look at our

model for when a plant goes from operating to decommissioning, and we have adjusted the model and the budget formulation process. That has yielded very good results. You can see that in the fiscal year 2018 and fiscal year 2019 fee roll rates for operating reactor fee class, which actually are below the level specified in NEIMA, which is tied to the fiscal year 2015 fee rule, which is \$4.8 million before it is adjusted for inflation.

Senator Barrasso. Does this tie in, to say, a broader effort to reduce spending as additional reactors may shut down over time?

Mr. Ficks. Yes.

Senator Barrasso. Thank you. Senator Carper.

Senator Carper. Thanks, Mr. Chairman.

One of the things I love to do back in Delaware when we are not in session, and actually around the Country, when I visit, I visit business, large and small. I call them customer calls.

I ask three questions of those businesses. I ask, how are you doing, how are we doing, the Federal Government, our Congressional delegation, the State of Delaware, and what can we do to help. I hear over and over again, one of the things we can do to help is to focus on workforce. We have a tight labor market, as you know. There are like five million jobs going unfilled today because folks don't have the skills or education or desire to do those jobs.

One of the things I always hear when I visit businesses is a need for certainty and predictability, certainty and predictability. At a time when businesses are having to put up with these changes in tariffs, in tariff laws imposed, not imposed, they want some certainty and predictability.

Let me just ask this question of you, Ms. Doane. Do you believe the changes that we made are helping provide more certainty for the advanced nuclear licensing process? Since its implementation, have you received any more interest in stakeholders that may want to pursue an advanced nuclear license? That is my question. I am sticking with it.

Ms. Doane. Yes, thank you, Senator.

These changes are helping because we have looked at our processes and also our regulations to determine whether they have any obstacles as NEIMA mandates and make sure that we are improving these documents so that the users of these documents will be able to come into our processes. There will be a meeting of the minds, and an understanding of the timetables and the resources, so all of these things are providing predictability in how to use our processes, but also in the length of time that it would take in meeting these time scales.

It is also giving us an understanding of the technology that they are going to be using so that we can get ahead. You were talking about skills, so that we can get ahead on what we

need to know so that we can resolve question earlier in the process, the sooner we know about these issues.

Senator Carper. All right, thank you.

I am going to build on the question raised by the Chairman a few minutes ago, and ask this. When we have multiple nuclear reactors closing, and as a result, additional spent fuel going into dry cask storage, you have proposed a dramatic reduction in dry cask storage inspections. I just wanted to ask if you, Ms. Doane, if you would explain why you think it is necessary to make this change at this time.

Ms. Doane. Thank you, Senator, for that question.

It is not a proposal yet. It is under consideration. There is a working group, and they are considering changes to the inspections for independent spent fuel storage facilities or dry cask storage facilities.

Senator Carper. I hope that working group will just consider the question that I just raised. Thank you. Go ahead and finish your thought.

Ms. Doane. Yes. I think the more interest that we have, the more views that we have, we do consider them. The changes are being made based on a long history of these processes and looking at the other inspection activities that are already going on. So they are looking at redundancy, but they are also looking at how we can do our work smarter.

In any event, the inspection process, I can assure you, will remain adequately protective of public health and safety. We take these issues very seriously.

Senator Carper. Okay, thank you. Another question for you, if you don't mind, then we will pick on Mr. Ficks.

For 60 years, the Halden test reactor in Norway had been used by nuclear fuel developers globally to test fuels. The three leading developers of accident-tolerant fuel wanted to use the Halden test reactor for some critical testing. Unfortunately, the Norwegian government recently closed the Halden test reactor for good.

My question would be Ms. Doane, how is the NRC and industry testing the new accident-tolerant fuel technologies, now that the Halden reactor is closed?

Ms. Doane. I can take this question for the record, because I don't have all of the specifics. But at a very high level, I will tell you that we are relying on the Department of Energy and some of their testing, and they are already working with the fuel vendors, so we will rely on that testing.

To the extent that other testing is done by our vendors, we would then validate that testing. You are right, that the Halden has closed, but we have given a lot of attention to that issue to ensure that there will be an adequate way of testing the fuel to make the safety decisions. More than that, I would

want to take it for the record.

Senator Carper. Okay. Let's take it for the record, and just build on what you just gave me, okay? Thanks so much.

Thanks, Mr. Chairman.

Senator Barrasso. Senator Braun.

Senator Braun. Thank you, Mr. Chairman, and thank you for your testimony. I am on Health, Education, Labor, and Pension. We just appointed a new FDA commissioner, and looking at the comparisons between regulatory bodies and the underlying industry, there is so much room for improvement there. You have got an industry that pushes things like patent thickets, dragging its feet to lower the cost of health care, and you have got an FDA that I think has been very stodgy in trying to help the cause as well.

Recently, I was the first Republican to join the Climate Caucus, and that is going to be, along with the cost of health care --

Senator Carper. Hopefully not the last.

Senator Braun. True. I think it is going to be a discussion for a long time. I see, in the attempt to try to lower CO2, that advanced nuclear technology is the one bird in the bush that could be close to being a bird in the hand. I know our own Purdue University recently became the first nuclear reactor in the U.S. that converted to digital instrumentation.

I think, and I would like your opinion, in a general sense, is the NRC in a position to accommodate, or is it like the FDA has been in my mind, more of an obstructor to moving in the right direction? And do you think that the time frame will be there to where you, as the oversight body, and the industry itself is going to have enough to work with to push advanced nuclear technology to the forefront as maybe being our ace in the hole to address climate issues?

That is kind of a broad, loaded question, and I would like your opinions, generally, on that.

Ms. Doane. So part of the activities that we have been doing, a lot of the work that we have been doing is to ensure that we are not a barrier to new technology. I know you know we are not a promoter, but we also don't want to be a barrier. We understand the importance that the committee places on advanced technology.

We also agree that our licensing has to be predictable, so we are taking steps starting from the bottom of the agency all the way up to the top to transform in a way that we can have our processes perform in a way that are predictable, that we have looked at our regulations to ensure that they aren't a barrier. We have had to do a lot of changes with guidance and process.

Then finally, our people. We are making sure that they are trained. This is technology, that, if it comes in, it will be

technology we have never seen before, so we are working on ensuring that they are trained.

Senator Braun. That is good to hear. You said, if it comes in. What is your opinion of where it is currently?

Ms. Doane. I would tell you that we -- I might sound a little bit, if it comes in based on our experience in previous, about a decade ago, we built up the agency in a way and didn't materialize it as much as we thought it would. So that is probably my hesitancy, but we are told that it will come in. We are told that they are going to be filed and that later this month, or perhaps the very beginning of the next month will be the first non-light-water reactor, or microreactor.

Senator Braun. Mr. Ficks?

Mr. Ficks. I would just point to all the transformation efforts that we have undertaken within the office of the Chief Financial Officer to be more modern and risk-informed. I think the e-billing example that I highlighted in my testimony gives you a sense of that. We also partner very closely with the program offices, including nuclear reactor regulation to ensure that there are adequate resources.

Senator Braun. So, in summarizing, I think it is incumbent on you to be careful, but not create undue barriers. I think that, unlike the healthcare industry, I see an energy industry that is interested in trying to move to the forefront, bringing

new technology to address CO2. It is good to hear that it sounds a lot better than my sense of what is happening in the healthcare arena. Thank you.

Senator Barrasso. Thank you, Senator Braun. Senator Cardin?

Senator Cardin. Thank you, Mr. Chairman.

I want to thank our witnesses. I first want to acknowledge the incredible workforce we have at NRC. We are pretty proud of it, and very proud that it is located in the State of Maryland.

I am concerned that we seem to be losing a lot of the experienced workforce at NRC. The work that you do is the best in the world, as far as nuclear safety is concerned. Are we attracting the bright talent of the future to work at NRC, considering the circumstances of the federal budget and the recruitment issues and the morale issues?

I just raise that because to me, as we talk about the urgency that Senator Carper mentioned on climate change and how nuclear power is friendly toward our greenhouse gas and climate change issues, we also have to recognize that part of this is having the workforce at NRC to be able to properly evaluate new technology, so that we can move aggressively in that direction.

Our existing nuclear energy reactors are old, 1960s and 1970s, most of them. They need attention. As we talk about bringing on new technologies, which are very important, we also

have to recognize that maintaining the existing force in a safe manner to meet the energy needs of our Country without contributing more greenhouse gas emissions is also a challenge.

One of the reasons that I was very excited about the Nuclear Energy Innovation and Modernization Act is to deal with one of those issues that has made nuclear power not as competitive as it needs to be in the current marketplace in order to be able to get the type of investments to maintain our force, as well as to invest in new technologies. The regulatory process is just too costly, and we don't want to compromise safety. But we recognize that the process is too costly.

When we are looking at having a somewhat level playing field on the sources of energy, nuclear is at a disadvantage. It is at a disadvantage because the regulatory cost is much, much higher than any other source of energy, including the fossil fuels.

Then there is a second area that we don't have the level playing field or a competitive playing field, and that is in the tax structure. All energy sources except nuclear get help from the tax code in regard to their improvements and their explorations, et cetera, but nuclear does not.

Senator Cramer and I have introduced legislation that would provide an investment tax credit in regard to the nuclear industry to try to provide some parity here. I know today's

hearing is focused on how we can implement the law we passed a year ago to deal with the regulatory costs and how we can make sure that it is easier in regards to advanced nuclear technology.

But my question is a little bit broader. Don't we have to deal with the economics of energy that is out there, and recognize that today, nuclear is really at a disadvantage, not only from the regulatory point of view, but from the tax point of view? And that if we want to attract the tug of investment that we need, that we have to also take issue with the tax structures.

I say that because three of the four members that are here also serve on the Finance Committee, and I hope that we will have a chance this year to take up an energy tax package. We were shortchanged in the omnibus bill that moved through the Congress. It was not, I think, fair towards the environmentally friendly energy sources. We are making it a priority to bring up that type of legislation in this Congress this year.

I would hope that we would get some support for looking at the economics of fairness in the nuclear industry and take a serious look at Senator Cramer's and my bill that would try to provide some degree of fairness in that regard.

I have 56 seconds left, do either one of you want to comment? Fine. You want to endorse my bill? That is fine.

Perhaps just dealing with the economics of energy sources today. We know that there is a lot of natural gas that is out there and that is affecting the price. We know that we have significant fossil fuel production here in the United States as far as being sources. So we know that it has been a challenge from an economic point of view. Don't we have to deal with that in the reality? Just say yes.

[Laughter.]

Ms. Doane. Our hesitancy really isn't -- it is just because of our role as safety regulators. We really don't play a role there.

Senator Cardin. But you need to have investment by the private sector if this is going to work. Investment depends upon the economic model, and the economic model today is challenged.

Ms. Doane. I understand, Senator Cardin, thank you. I will tell you for our part, what will be essential here is that our process is predictable. And as for making a very hard case on assuring adequate protection of public health and safety and security and the environment, we need to do it in a way that is -- NEIMA mandates us to look at that and make sure that we are focused on the most significant safety issues and not to be distracted and create much more cost increases to things that aren't safety significant.

So I think in some ways, it does feed into the points that you are making.

Senator Cardin. Thank you, I appreciate that relevant response.

Senator Barrasso. Senator Whitehouse.

Senator Whitehouse. Thank you, Chairman.

Before I ask my questions, let me make a point reacting to what you said earlier about nuclear waste and your desire to solve the nuclear waste problem. It is my observation that if our nuclear waste stockpiles were in the hands of private corporations, then the accounting methodology, to which private corporations are subject, would take a look at that as a liability. Whoever was doing their accounting reports or doing their shareholder reports would go, and they would say, wow, you have all this nuclear waste, that is a problem. And then they would do their level best to try to put a price on the problem, so they could be booked as a liability for shareholders and the public to know about.

The instant that you put a number on that on a company's books, let's say the number is \$2 trillion, I don't know what it is, it is a big number, I expect. Then that gives that company a \$2 trillion minus \$1 incentive to spend money to solve the problem. It is, right now, from an accounting perspective, free to have all this nuclear waste simply sit there with no

solution.

The flip side of that is if there is no market incentive, there is no financial reward, to anybody who solves the problem. That puts it on us, as members of Congress, to force that solution. But I hope and expect that there may be a way to bring that market analysis to bear in the solution that you are trying to develop, and I look forward to working with you on that proposition.

We would not have the problem we have if somewhere in the books of the United States of America was an X-billion dollar liability for this that affected our financial reporting. Somebody would be incented to solve the problem.

So my question is to both of you. I just want to make sure that it is clear that a lot of the support for this, the bipartisan support for this, came because people care about some of the goals that we believe there is a chance for these modern nuclear technologies to achieve. There were two of them.

I would ask you to guess what you think our two priorities were in supporting this legislation. What were the two policy goals that you think most drove us?

Ms. Doane. You really want me to guess? Okay.

Senator Whitehouse. I would hope you would know. It was so clear that what our point was in giving you this power. If you don't know, then that is a big signal to me that we need to

make it really clear why we did this.

Ms. Doane. Yes, sir. I think that the most important goals would be to provide an energy source that is carbon-free.

Senator Whitehouse. Bingo. Well said. That is one.

Ms. Doane. Number one, and that in addition, it would address -- so one would be carbon-free because of the climate issues that are being addressed. But the other is energy itself and the need for energy, and that this would be another source. I would say additionally, to keep involved in the national policy interest in staying involved in nuclear. So all of these things I think are rooted together.

Senator Whitehouse. Okay. You are getting a little bit closer with the last two, but I would not give you a passing grade on that. I would say that, you know, maybe good effort.

What I would say one of our clear purposes was was to try to make sure that these new technologies, as they came online, explored the possibility of repurposing our existing nuclear waste stockpile. Some of these technologies have been proposed as promising to turn this massive liability into actually a positive value as a fuel.

I don't know if that is going to pan out. I honestly don't. I am not a technologist. But people who are very smart about this, and who have invested millions and millions of dollars in these new technologies, tell me that that is their

intention, that that is their purpose.

So as you are looking at these new technologies, I very much want, and I think I speak for a considerable number of us who have encouraged, supported, and authorized you to do this, we very much want to see that as this work gets done, it gets done in a way in which we are focused on the possibility of turning all that nuclear waste sitting around now as a health hazard and as an economic drag into something that could be positive.

If, all things being equal, you have two different technologies that you could fund, or that you could pursue, or that you could authorize, I would urge that in every way you can, you lean towards the one that has the better chance of allowing us to repurpose this enormous, poisonous stockpile for which we have no other plan. Clear enough? Is that a yes from both of you? Because we don't have a record.

Ms. Doane. Yes.

Mr. Ficks. Yes.

Senator Whitehouse. Okay, then I have said my piece. Thank you very much for what you are doing to try to implement the law that we passed.

Senator Barrasso. Thank you, Senator Whitehouse, for your continued leadership and thoughtfulness on this issue. Thank you. Senator Carper?

Senator Carper. While Senator Whitehouse is still here, I spoke in my opening statement about the liability that we have on the Delmarva Peninsula that goes from an important industry for us, and the important industry is agriculture, and the important industry within agriculture is poultry. We have just huge numbers of chickens living in the Delmarva Peninsula.

Senator Whitehouse. Rhode Island Reds, I hear.

[Laughter.]

Senator Carper. There you go. Yes and no.

The liability that comes from that is this amount of chicken manure, which has the virtue of being high in phosphorus, high in nitrogen, which is coveted by farmers. But if used to a great extent, it creates runoff, it creates real problems for our friends in Maryland and the Chesapeake Bay and areas to clean up the Chesapeake and not end up with all these dead zones.

I mentioned, I think before you got here, that I had lunch in Salisbury, Maryland, Ben's territory, with folks from Purdue, the big poultry operation and a company that uses European, German technology. They have over 200 facilities around the world where they actually take this liability and they turn it into something that is good, sustainable energy and fertilizer.

We get a lot of it, we have the potential to get so much of this off the peninsula, the Delmarva Peninsula, where we have

way too much to be able to spread it in some other parts of the Country where they could use it. It is like what Einstein used to say, in adversity lies opportunity.

Laura Haynes is sitting right behind me, so my brain is on a bunch of issues, including this one. Several years ago, we were in France, and we visited some French facilities where they were trying to take spent fuel and figure out how to reuse it, repurpose it, recycle it, in order to drive some of the spent fuel, some of the energy that is right there in the spent fuel. I think there is still great potential for that. I think part of our job may be to figure out how to unleash that.

Senator Whitehouse. The equation that waste plus technology can equal value, I think is the equation that we need to pursue, whether we are dealing with nuclear waste, or chicken --

Senator Carper. Chicken litter.

Senator Whitehouse. Thank you.

Senator Carper. We call them "nutrients."

[Laughter.]

Senator Carper. I want to go back and revisit, if I could, with our panel on an issue sort of raised by our Chairman, and I touched on it as well. For our guests, do you believe that the NRC will have the resources needed in the long run? Do you believe the NRC will have the resources needed in the long run

to do its job effectively? If the NRC does not have the needed funding, are there tools in the law to ensure that the NRC is able to inform Congress that additional funding is needed?

And that would be for both of you. Mr. Ficks, why don't you take the first shot at that?

Mr. Ficks. We believe that Congress has given us the support we need to get the resources we need, and we continue looking forward to interacting positively to make sure that that continues.

Senator Carper. All right, thank you. Ms. Doane? Will you use fewer words? I thought he spoke too long.

[Laughter.]

Senator Carper. I am kidding. Mr. Chairman, all of our witnesses are so economical in their use of words for responses. They are probably worse than we were, too.

Ms. Doane. Okay. You know, what I think he says in those few words, it is so meaningful, so it is a good economy of words.

Yes, I agree with Ben that we have had the adequate resources, and we recognize that, for example, there are caps that will come into play in 2021, and we look forward to building our budgets to ensure that we have adequate resources. At this time, we have adequate resources in fiscal year 2020.

Senator Carper. I guess the question is about the long

term in making sure it turns out that you don't have the resources for the long term, do you feel that our law is adequate to ensure that the NRC is able to inform Congress that additional funding is needed?

Ms. Doane. I do, because there are the caps in the legislation, but there is also a provision that says that, to take into consideration if these caps are practical. I think with that two-part process, that it is adequate for us to get the funding that we need.

But I will add that it will be challenging in the future to continue to bring down, I don't want to leave a misimpression, to continue to bring down corporate costs, for example, because we have been bringing this, as Ben had said, we have been bringing down this cost over the years. Since 2014 we have brought these costs down dramatically.

So we have already taken advantage of the most obvious ways of reducing those costs, like space and things like that. In the future, it will get tougher and tougher to find these things. But like I said, the legislation does provide then a provision to say that these caps are applied, and then if it is practical.

Senator Carper. All right, thanks so much. Thanks, Mr. Chairman.

Senator Barrasso. Senator Van Hollen.

Senator Van Hollen. Thank you, Mr. Chairman, Ranking Member. Thank you for your testimony today.

I have a few questions regarding the interaction between this effort to innovate our nuclear reactors and nuclear nonproliferation, because NEIMA was designed primarily to update the NRC's licensing framework for advanced nuclear reactors and technologies. It will help ensure that our domestic regulatory structure evolves in tandem with nuclear technology.

But I think it is also important that as nuclear technologies progress, the international nonproliferation regime evolves as well. Part of the reason that we are trying to advance these new technologies is obviously our domestic industry, but we also hope that with the proper safeguards, this will allow some of these new reactors to be located overseas.

There are some reactor designs that could pose proliferation issues. Specifically, those that would use proliferation-sensitive fuels, like uranium fuel enriched to close to 20 percent HEU, while others would use a closed-fuel cycle that would be capable of producing spent fuel that contains weapons grade plutonium.

Production of those fuels and the spread of reprocessing technologies may run up against longstanding U.S. policy to secure global supplies of fissile material. On top of that, the IAEA has indicated that several advanced reactor designs could

pose safeguard challenges and make monitoring of nuclear facilities more difficult than it is today.

I have a couple question related to that, and I am wondering whether in your licensing criteria and evaluation of advanced nuclear reactors, whether the NRC has taken into account the "safeguards by design" measures that would facilitate the implementation of international IAEA safeguards.

Ms. Doane. Yes. Our reactor licensing process will take into consideration the implementation of the safeguards measures. As you know, our regulations provide for our agency to review the safeguard methods that are used at these reactor facilities to ensure that there is, to reduce the threat or the up-diversion and other issues that this addresses. Our licensing does, yes.

Senator Van Hollen. Have you been in direct communication with the folks at the IAEA to discuss how this will work and how your work here meshes with their international safeguards?

Ms. Doane. I personally have not. For the record, I can get back to you.

Our staff is very active in the area of safeguards and ensuring that the U.S. complies with all of its obligations, but specifically, whether our staff has been discussing this particular issue with the IAEA with safeguards by design, I would request to take that for the record.

Senator Van Hollen. Got it. Okay, if you could get back to us in writing. I also have some other written questions on this topic. Because I do, I think as many of my colleagues do, hope that we will be able to innovate in this area of nuclear technology for a variety of reasons.

At the same time, we need to be very careful in making sure that it doesn't undermine the nuclear nonproliferation regime that we have worked very hard to build over a period of time. I hope that will be done in tandem going forward, in fact, not just hope. We are going to work with you to insist that that be done in order to protect against the risks of nuclear nonproliferation.

Thank you both for being here. I will submit some additional questions for the record.

Senator Barrasso. Thank you, we welcome those. Senator Carper.

Senator Carper. Thanks, Mr. Chairman. As you may know, Senator Whitehouse and I sent a letter to Chairman Svinicki regarding the post-Fukushima rule that was finalized by the commission last January. As you may know, these changes made by the commission were against staff recommendations.

Senator Whitehouse and I expressed concerns that changes to the final rule made by the chairman missed the mark in addressing the lessons learned from the Fukushima Daiichi

nuclear accident.

My question, and I guess this would be to you, Ms. Doane. Our Nation's leading scientists tell us that flooding and storm surges will continue to be the new normal in many parts of the Country, many parts of the world, as we are reminded of in Australia today due to climate change. Do you still believe our Nation's nuclear reactors should be required to be able to meet the new flooding hazards that now exist due to climate change?

Ms. Doane. Yes, I do agree that they should meet the hazards at the facilities. Yes.

Senator Carper. All right. Did the commission miss the mark when they overturned the recommendations from you and your staff?

Ms. Doane. As the staff, we will implement those directions in a way that ensures adequate protection of public health and safety with respect to reevaluated hazards, which is the issue that was raised.

At this time, we are receiving documentation from the licensees on how they are going to meet those reevaluated hazards, and we have the authority to take all measures necessary for adequate protection and also take measures where we can demonstrate a substantial benefit to safety that is justified by the cost of new changes.

So, yes, we have the full authority to ensure adequate

protection, even for the reevaluated hazard.

Senator Carper. Mr. Chairman, can I ask just one more short question?

Senator Barrasso. Go right ahead.

Senator Carper. Sometimes we ask questions of you that you are able to answer, and sometimes you ask to be able to answer for the record. I am going to answer a different kind of question. For each of us, give us one questions that you wish you had been asked. I want each of you to give us one question you wish you had been asked.

Mr. Ficks. Do you like working at NRC?

[Laughter.]

Senator Carper. Do you like working at NRC?

Mr. Ficks. I do, I love it.

[Laughter.]

Senator Carper. That is a good question. Do you want to ask us the same question?

Mr. Ficks. Do you like working at the Senate?

Senator Carper. Almost every day.

[Laughter.]

Senator Carper. One or two days we could probably get by without, but mostly we get a lot more done. We work a lot better together, especially in this committee, than you read about it or hear about it in the media. They like to report bad

news and conflict. We are not very good at conflict.

Ms. Doane, same question. Give us a question that you wish you had been asked. You can't use the same question.

Ms. Doane. Darn it, because it was a really good one, and it was short, again. He has got a good economy with words.

Senator Carper. It is his nature.

Ms. Doane. Yes. So, the question I would want you to ask me is, the staff of the NRC is incredible. They are so well-trained and I would have wanted to be asked, are we doing everything we can to both retain them and recruit staff to meet the needs of the future?

Senator Carper. I would like to ask that question, with your permission. How would you respond?

Ms. Doane. I would respond in that we are very focused on ensuring that we get them what they need. On these, with respect to advanced reactors, our staff is very open-minded, and they are looking forward to this. They actually look at this as a great possibility and good work to be done for the Country. They are very enthusiastic.

So, yes, we are looking our program start to finish, making sure we identify gaps and using staff that is already there. When the number of issues go down, like with a reactor closing, taking staff and moving them over and getting them opportunities for transformational learning.

Also, recruiting good staff, we have put in place a new apprenticeship program. We are going to have our first class this summer, so we are very excited about that. We have gone out to universities, and really ensuring that we are going to retain, bring in new staff, but also retain those really important staff that are there doing such a great job.

Senator Carper. Well, that was a really great question. I thought a pretty good answer, too.

Mr. Ficks, you get one more shot if you have a more serious question.

Mr. Ficks. I guess the question would be, do you really think NRC is becoming more modern.

Senator Carper. Do you?

Mr. Ficks. Yes. I tried to put the success stories in my written testimony, just to make it very clear to you, but these things don't happen overnight. They are a lot of work, and my office, the Chief Financial Officer's office, has invested a lot in fee transformation over the past four years, and I think you are really seeing the yields of all that investment and hard work, like the e-billing. We see that as a capstone, and that fee validation process.

We are excited about the successes, and we want to continue those.

Senator Carper. Great. Thank you both.

Senator Barrasso. If there are no more question from the Senators, or questions of yourself, members may submit follow-up written questions for the record, and if you have additional questions you would like to ask yourself, please include those as well for the record because the hearing record is going to stay open for two weeks.

[Laughter.]

Senator Barrasso. With that, I want to thank you both for your testimony and for your cooperation and for all your help today in understanding some of the complexities that we are facing. Thank you.

With that, the hearing is adjourned.

[Whereupon, at 11:07 a.m., the hearing was adjourned.]