

A LEGISLATIVE HEARING TO EXAMINE S. 2373, THE AMERICAN NUCLEAR
INFRASTRUCTURE ACT OF 2021, AND S. 1290, THE STRANDED ACT OF
2021

Wednesday, February 9, 2022

United States Senate

Committee on Environment and Public Works

Washington, D.C.

The committee, met, pursuant to notice, at 10:05 a.m. in
room G50, Dirksen Senate Office Building, the Honorable Thomas
R. Carper [chairman of the committee] presiding.

Present: Senators Carper, Capito, Whitehouse, Markey,
Duckworth, Kelly, Padilla, Inhofe, Sullivan, Ernst.

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

Senator Carper. Good morning, everyone. I am pleased to call this hearing to order.

Welcome, one and all. Our hearing today is focused, as you know, on two pieces of bipartisan nuclear energy legislation. Senator Capito and I meet almost every week, in person or virtually, with our staff directors, both minority and majority. We talk about, among other things, a hearing schedule, which we hold hearings on. I want to thank Senator Capito for suggesting that we have at least one hearing early this year that focuses on the major source of carbon-free electricity in this Country of ours, and that is nuclear power.

Today we are going to reexamine the American Nuclear Infrastructure Act. This legislation is sponsored by our Ranking Member, Senator Capito, along with Senators Whitehouse, soon to be a grandfather, Senator Crapo, Senator Booker, and our former Chairman, John Barrasso. We are also going to discuss the sensible, timely relief for American's Nuclear Districts Economic Development -- there has to be an acronym in that. Senator Duckworth, what would be a good acronym for a bill like that?

Senator Duckworth. It is called the STRANDED Act.

Senator Carper. Whoever came up with that, I take my hat

off to them. I am not big for acronyms, but this is a good one: Sensible Timely Relief for America's Nuclear Districts Economic Development, the STRANDED Act, for short. It will become clear as we go through this what we mean by stranded. Thank you for introducing legislation, along with Senator Collins and for leading us on this important, important issue.

As we consider the merits of both bills, we are fortunate to have an expert panel of witnesses joining us. We want to thank each of you for your willingness to be part of this discussion.

The numbers don't lie. As I said earlier, nuclear energy is by far the largest source of reliable, clean energy in our Country, generating over half of our Nation's carbon-free electricity. Nuclear power plays a critical role in our efforts to address the climate crisis, while also creating economic opportunity. Right across the Delaware River from us in Delaware are a couple of nuclear power plants. I think each of them employ close to 1,000 people, well-paid, highly trained workforce.

So that in today's hearing is an important opportunity to explore how we can help the U.S. energy industry safely develop the technologies that are necessary to lead our climate goals, while also lowering energy costs and boosting economic development across our Country.

With regard to the American Nuclear Infrastructure Act, my hope is that we can build upon and improve the Nuclear Energy Innovation and Modernization Act which became law in 2019, as you may recall, thanks to bipartisan work of this committee, including people sitting on either side of me. That Act required the Nuclear Regulatory Commission to create a new regulatory infrastructure for the next generation of nuclear power. This new structure is moving us closer to making advanced nuclear power a reality in this Country, and doing so without jeopardizing safety but actually enhancing safety.

The Nuclear Regulatory Commission is not only on time when it comes to meeting its statutory requirements to develop a new framework for licensing advanced reactors, the Commission is currently ahead of schedule. I understand they are ahead of schedule by as much as three years, which is very impressive.

With that thought in mind, I think we ought to be careful not to make unnecessary changes to the regulatory process that could undermine this progress, as long as they continue to make this kind of progress ahead of schedule. Still, it has been difficult for the NRC to operate under the constraints that the Nuclear Energy Innovation and Modernization Act requires.

In December, NRC Chairman Hanson testified before this committee and expressed concerns about the impact of budgetary caps on the agency's ability to hire the workforce of the future

and take on the challenges of licensing advanced reactor technologies. We know that for the NRC to do its job effectively, including processing license applications in a timely manner, the NRC must be adequately resourced.

As we work to improve this legislation, I would like for us to ensure that the NRC has the support it needs to continue its safety message and to hire the best and brightest needed to work on the next generation of nuclear reactors, which I believe we badly need in this Country of ours. I know a number of members of our committee on both sides of the aisle agree with that.

While the next generation of nuclear technology presents opportunities for clean energy and job creation, I am also all too aware of the economic difficulties facing many nuclear facilities today, and the challenges that closing a facility can create for surrounding communities and the families that live in those communities, not unlike auto factors and other advanced manufacturing facilities.

We lost, in our State, about 10, 12 years ago, we lost two auto plants. At one time, they employed as many as 3,000 people in each plant. We lost them both at the bottom of the great recession. We know how devastating that can be for the families, and for the communities and for the State. We have seen that in Delaware first-hand.

The loss of highly skilled, good paying jobs oftentimes

leads to smaller tax bases, to reduced revenues for local businesses, and to depressed housing values. At the same time, these communities are also unfairly burdened with the cost of nuclear waste storage.

Senator Duckworth's STRANDED Act would benefit those communities that are working to move past the legacy of their decommissioned nuclear plants and to create a brighter, more prosperous future for their residents. As my colleagues have oftentimes heard me say, I believe one of the primary roles of government is to help create a nurturing environment for job creation and job preservation. I think everybody on this committee agrees with that.

The STRANDED Act would do just that. I commend Senator Duckworth and her staff for their commitment to these communities, and her work on this bipartisan bill. She will be speaking following Senator Capito's opening remarks.

In closing, I believe we have an opportunity to help our Nation's nuclear energy industry transition into the future, while reducing carbon emissions and creating economic opportunities at home as a result. As we make that transition, it is imperative that we prioritize safety and equity.

We look forward to hearing the unique perspectives of our witnesses today. Before I turn to Senator Capito of an opening statement, let me just close with this thought. There are a

number of the members of the committee, particularly Senator Duckworth, who served our Country in uniform with great courage and great sacrifice. I spent a few years of my life in the Navy, used to chase, from airplanes, nuclear submarines. As a father, I remember taking a Boy Scout troop down to Norfolk Naval Station about every three years. We would visit ships, submarines and aircraft carriers, including the Teddy Roosevelt.

I will never forget, we had about 25 Scouts one weekend, about a decade ago. We met with the captain of the ship up on the bridge. The captain of the ship welcomed the Scouts warmly. We had about 25 Scouts, maybe a half dozen or so Scout leaders.

I will never forget what he said to the Scouts. He said, the Teddy Roosevelt is 1,000 feet long. The boys went, oohh. The Teddy Roosevelt is, I think he said 40 stories high. And the Scouts went, oohh. And he said, and the Teddy Roosevelt has about 5,000 men and women who serve on the ship. And the Scouts went, oohh. And then he said, the Teddy Roosevelt has something like 75 aircraft and helicopters on board. And the Boy Scouts went, oohh. And then he said, the Teddy Roosevelt stops to fuel once every 25 years. And the adults went, oohh.

The last time we lost an American sailor aboard a nuclear-powered ship, submarine, or aircraft carrier, never. We have never lost one. We can do this stuff safely, and we have shown that in the Navy and other ways as well.

Senator Capito, thank you so much for your leadership in this arena, and for letting me be your wingman on what I think is an incredibly important issue.

Senator Duckworth, I will turn to you right after Senator Capito. Thank you.

[The prepared statement of Senator Carper follows:]

STATEMENT OF THE HONORABLE SHELLEY MOORE CAPITO, A UNITED STATES
SENATOR FROM THE STATE OF WEST VIRGINIA

Senator Capito. Thank you, Mr. Chairman. I want to thank the witnesses for being with us here today, both in person and virtually. I am looking forward to this hearing.

We know, as the Chairman has said, that nuclear energy is an integral part of a clean energy system, a reliable one. It generates carbon-free power around the clock for up to two years before you even need to refuel. I guess it is the same with an aircraft carrier, only 25 years is much longer.

Nuclear energy must remain a part of America's diverse energy portfolio now and in the future. State and local governments are realizing the benefits of preserving and expanding the use of nuclear energy.

Last year, Illinois extended its law to keep the State's existing nuclear power plants online. Other States with no existing nuclear reactors, such as Wyoming, Kentucky, and Montana, are opening the door to deploy new nuclear plants. Just last week, the West Virginia legislature voted to allow new nuclear development in our State, and our governor signed that bill into law yesterday.

Nuclear energy can provide a tremendous potential opportunity for economic growth, particularly communities impacted by the closure of coal plants that still have developed

sites and transmission assets that could accommodate new generation. In this way, development of nuclear energy would build on West Virginia's long history of providing baseload energy that fuels our economy.

Congress should build on previous bipartisan legislation to continue to promote safe use and development of nuclear energy nationwide. That is why I introduced the American Nuclear Infrastructure Act with our Democrat lead, Senator Whitehouse, along with Senators Barrasso, Booker, and Crapo. Since introduction, Senators Graham and Manchin have also joined as cosponsors.

The committee passed substantially the same legislative text last year, I believe, with bipartisan support by 16 to 5 in this committee. I thank Senator Whitehouse for his leadership on nuclear issues and his partnership on this legislation.

Current events serve as a reminder of the importance of this bill. International turmoil threatens to disrupt our nuclear fuel supply chain. New England generated a quarter of its electricity by burning fuel oil during a cold snap just last month. That follows the closure of two of New England's three nuclear plants in recent years.

Meanwhile, China continues to build new nuclear reactors. China is poised to overtake France as the world's second largest operator of nuclear power plants. This legislation would

strengthen America's international nuclear energy leadership, supporting deployment at home and making us more competitive in markets abroad.

The bill incentivizes the deployment of advanced nuclear technologies for innovative purposes, it modernizes outdated nuclear restriction, it encourages using advanced manufacturing and construction techniques to build nuclear power plants safer, faster, and cheaper.

I look forward to working with Chairman Carper and other members of this committee to advance this legislation as we have other bipartisan legislation already in this Congress.

On a separate but related note concerning this committee's oversight efforts, in order to realize nuclear energy's economic national security and environmental benefits, the Nuclear Regulatory Commission must be prepared to review and approve advanced nuclear designs and licenses in a timely and collaborative manner to get new generation assets onto the field. EPW members on both sides have extensively supported efforts to develop and deploy these new nuclear technologies.

Signed into law in 2019, the Nuclear Energy Innovation and Modernization Act which this committee developed directed the NRC to review and update the agency's practice to efficiently consider new reactor applications. Over the last few years, members on both sides of the aisle on this committee, myself

included, have repeatedly asked the NRC if the Commission needs any additional authorities or resources for its advanced regulatory work. In December, I asked NRC Chairman Hanson whether the Commission is currently prepared to review license applications under the existing regulatory framework. He assured me that the Commission was ready.

Yet approximately one week later, the NRC staff denied the only application actively under review to construct and operate an advanced reactor. This decision is concerning and clearly does not align with what the chairman told me. I recognize that the licensing process is a two-way street that requires an engaged applicant as well as an engaged NRC staff.

Congress has provided substantial public investment to assist the deployment of these new technologies. Nuclear innovators and entrepreneurs need to be confident that the NRC will review applications in a timely, predictable, efficient, and affordable manner. That is why I asked the GAO to assess NRC's preparedness to review and approve advanced nuclear applications. GAO's review should also consider the Commission and senior NRC staff's process to oversee these licensing reviews.

Additionally, Commission leadership is critically important to successfully managing these important projects. I have said before, leadership is strengthened when the Commission operates

with a full complement of five members. For more than seven months, the Commission has operated with only three members. I again urge President Biden to promptly put forth a bipartisan pairing of qualified individuals to fill these vacancies. Chairman Carper and I have joined in that request.

Thank you, Mr. Chairman, for holding this important hearing. With that, I would yield back.

[The prepared statement of Senator Capito follows:]

Senator Carper. Senator Capito, thank you for that statement, and for your leadership. We like to work across the aisle on all kinds of issues, and this is certainly one that we have and continue to do so. It is important that we do.

Senator Duckworth, my mom raised my sister and me to believe in practicing the Golden Rule, treat other people the way we want to be treated. When I look at the work that you have done on STRANDED in other communities, whether they be coal communities, whether they have lost economic opportunity, we have a moral obligation to help them, put ourselves in their shoes. Your legislation really has built on that premise. Thank you. You are recognized. Thanks for your leadership.

STATEMENT OF THE HONORABLE TAMMY DUCKWORTH, A UNITED STATES
SENATOR FROM THE STATE OF ILLINOIS

Senator Duckworth. Thank you, Mr. Chairman. Thank you to Chairman Carper and Ranking Member Capito for holding this hearing on my bipartisan bill, the STRANDED Act. My cosponsor, Senator Collins, is not on the committee, but she sends her support of the STRANDED Act and our need to get this bill passed and these communities the support that they need.

As this committee will learn today from my constituents in the City of Zion, Illinois, there is a desperate need to pass the STRANDED Act as soon as possible. However, our bipartisan proposal is not a new or radical idea. We are simply seeking to fulfill a promise Congress made 40 years ago, four decades ago, when it passed the Nuclear Waste Policy Act of 1982. I was still in high school.

This law recognized that we need to safely dispose of and store nuclear waste in the interim. The Federal Government has a responsibility to help communities the decommissioning of a nuclear power plant. Specifically, Congress authorized assistance payments to help stranded communities to mitigate the social and economic impacts of being stuck with spent nuclear waste.

Yet to this day, communities like Zion have not received their assistance. Instead, the city of Zion has lost hundreds

of jobs and millions in tax revenue, and has been deprived of the valuable lakefront property that could be the base of future economic growth. That was never the deal.

The Federal Government and nuclear industry promised communities like Zion that in exchange for their patriotic efforts to help our Nation generate zero-emission power, they would not only receive jobs and economic growth, but ultimately, the nuclear plants would be decommissioned, the waste safely removed, and the land returned for future use.

Now, I recognize that a long-term storage solution will not be solved overnight. However, that is no excuse to abandon my constituents in Zion and Americans throughout the Country. The social and economic impacts of having an industry leave overnight are brutal, no matter the industry. But when a company abandons a community and leaves behind 2.2 million pounds of toxic spent nuclear waste sitting on 90 acres of lakefront property on Lake Michigan, the impact is simply devastating.

This situation is not unique to Illinois. I have a chart here. As indicated on this map, the Congressional Research Service has identified 80 sites, that is eight-zero sites, that store nuclear spent fuel around the Country. Additionally, 25 of those sites are geographically distinct nuclear sites that have been furnished by litigation settlements and court

judgments. This is no way to do business.

The U.S. Economic Development Administration's Nuclear Closure Communities, NCC, Initiative, provides some support. But in its current form, the help is only for new construction or development projects. Of course, for stranded communities like Zion, financing new construction is of little use when the very stranded nuclear wastes have resulted in their loss of tax base, jobs and land needed to keep the lights on. It is a downward spiral.

I hope to offer a substitute amendment to the STRANDED Act during a future markup that will build on the EDA's NCC program by improving it to provide the type of support communities like Zion desperately need now. The STRANDED Act contains three pillars. First, the non-competitive economic impact grants will provide financial assistance to local government where a nuclear power plant is located. The affected local governments are eligible to receive amounts valued at up to \$15 per each kilogram of spent nuclear fuel stored in the affected community, a payment framework established under the Nuclear Waste Policy Act of 1982. We are not even using 2022 dollars. We are pegging this at the rate set in 1982 of \$15 per kilogram.

Second, the Innovative Solution Prize Competition will award prizes for proposals for affected communities to carry out alternatives to nuclear generating sites and waste sites, giving

them another chance at economic development through innovative proposals.

Finally, this bill would create a stranded nuclear waste task force to conduct a study on existing public and private resources for these affected communities, and develop immediate and long-term economic adjustment plans tailored to the needs of each of the affected communities. We cannot rely on communities to give us power then leave them to be our active nuclear dumpsters.

The United States Government must help these communities that powered our lives to survive another day. Passing the STRANDED Act would be a first step toward fulfilling a commitment we made to these patriotic communities long ago.

Of course, the inspiration to write the STRANDED Act stemmed from a visit to the city of Zion during my first year in the Senate. I am honored that the Mayor of Zion, Billy McKinney, is here in support of the hearing, and to have David Knabel, the city's administrator and director of accounts and finance, here as our witness to give stranded communities like theirs a voice.

Mr. Knabel was born and raised in Zion, Illinois, and knows first-hand how stranded nuclear waste negatively impacts surrounding communities. After graduating from the University of Wisconsin Parkside in 1999, followed by a CPA certification

in 2008, Mr. Knabel went on to obtain 14 years of experience in public accounting. Throughout his 10 years working for the city of Zion, he has championed several high-profile projects to assist Zion with its financial needs and worked hard to address the impacts of a nuclear power plant closure by working with legislators across the Country, the results of which will be a template for other communities to use for nuclear waste storage, evaluation and redevelopment.

Mr. Knabel and Mayor McKinney, while this is a less than ideal situation, we are so fortunate to have you here today to share your story with us. I look forward to hearing Mr. Knabel's testimony on behalf of the city of Zion. Thank you both for being here.

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

[The prepared statement of Senator Duckworth follows.]

Senator Carper. Senator Duckworth, thanks so much for your leadership on this, and for bringing in one of our witnesses. As an aside to my colleagues, city of Zion, I read that and thought, that could be in Israel. In Delaware, if you get off I-95 in Delaware, take Route 1 and head for our beaches, one of them is Rehoboth, which means room for all. When you go through another little town, it's called Little Heaven. So we could have a panel with somebody from Little Heaven, the city of Zion, and it would be almost like a revival.

Senator Whitehouse asked for a chance to say some words here. I am happy to recognize you, Sheldon. Go ahead.

STATEMENT OF THE HONORABLE SHELDON WHITEHOUSE, A UNITED STATES
SENATOR FROM THE STATE OF RHODE ISLAND

Senator Whitehouse. On a biblical theme, let me just say that Rhode Island has Galilee, where our fishing port is located.

Senator Carper. This just gets better and better. Amen.

[Laughter.]

Senator Whitehouse. Thank you, Chairman.

Our current climate goal of net zero by 2050 may or may not be adequate. But whether it is adequate or not, we are not going to get there without nuclear energy. Advanced nuclear reactors are safer, they can operate longer without refueling, they can run on spent nuclear fuel, very important consideration.

Senator Carper. Would you say that last part again? That is worth emphasizing.

Senator Whitehouse. They can run on spent nuclear fuel. They have a smaller geographical footprint that makes them easier to deploy. They can be standard design for safety. And in some cases, they produce high temperatures that can be used for separate industrial processes.

I support the Nuclear Regulatory Commission in establishing a regulatory framework for advanced reactors by engaging with stakeholders to create a useable and workable final rule.

Putting an advanced reactor through the current licensing process is like putting a Tesla through a regulatory procedure that requires the testing of its carburetor.

I introduced the ANIA bill last July with Senators Capito, Barrasso, Booker, and Crapo. As the Ranking Member, Senator Capito, the Republican lead on this bill mentioned, Senators Manchin and Graham have joined us.

I would also note the positive development that the Bipartisan Infrastructure Law created a program to support existing nuclear generators, which suffer competitive disadvantage because they get no revenue for the carbon-free benefit that they provide.

ANIA further supports investment in our current fleet, and in future technology. I will emphasize again the importance of a focus on repurposing spent fuel. We cannot overlook that potential benefit.

ANIA includes prizes for the first reactors licensed by NRC in three different categories. One of these categories is for a reactor that can productively re-use spent nuclear fuel. ANIA helps local communities affected by nuclear closures and assists with cleaning up legacy abandoned mining sites on tribal lands.

I will close by providing a personal hello and thank you to Armond Cohen, one of our witnesses today, who is coming to us from London. Armond and I worked together back in the 1980s on

the first conservation-based electric rates for an American utility, Rhode Island's own, then-little Narragansett Electric, now lost in the enormous national grid system. We did good work together way back when, and I am delighted that he is here with us today.

Thank you, Chairman.

[The prepared statement of Senator Whitehouse follows:]

Senator Carper. Thank you. Thanks for your steadfast leadership on this. It has been so important.

The 1980s, did you say?

Senator Whitehouse. We were first.

Senator Carper. That was when you were Young Sheldon.

[Laughter.]

Senator Whitehouse. Yes, that would be then.

Senator Carper. Still young.

I think that does it for our members' statements. Now we are going to turn to our witnesses.

Our first one is Mr. Knabel. Do I have that pronounced correctly, Mr. Knabel?

Mr. Knabel. You do have that. Thank you very much for that.

Senator Carper. Today I think Mr. Knabel is joined by Armond Cohen. Armond is the Executive Director of the Clean Air Task Force. Maria Korsnick is the President and Chief Executive Officer of the Nuclear Energy Institute. And Jeremy Harrell is the Chief Strategy Officer at ClearPath Action. We are delighted that you have all joined us, in some cases live and in person, other cases virtually.

Mr. Knabel, if you would lead us off, that would be great. Please proceed with your testimony. Your entire testimony will be made part of the record. Please proceed, thank you.

STATEMENT OF DAVID KNABEL, DIRECTOR OF ACCOUNTS AND FINANCE,
CITY OF ZION, ILLINOIS

Mr. Knabel. Thank you, Chairman Carper, Ranking Member Capito, and distinguished members of the committee. On behalf of Mayor McKinney, our city council, our community and all communities in our situation, I appreciate your time today.

The city of Zion is located on the shores of Lake Michigan in northeast Illinois, just minutes from the Wisconsin border. It is home to 24,655 people. It was also home to the Zion Nuclear Power Station from 1974 to 1998, where it provided power to Chicago and the northern corridor of Illinois. The plant brought thousands of jobs to the community, contributed heftily to the local economy and was crucial to the foundation that helped the city thrive during those years.

Residents of Zion, myself included, grew up with the two cooling towers being in their family photos at the beach and part of the city's skyline. It was just a part of life in Zion. We trusted that those responsible for the plant were monitoring the risks and keeping us safe. We accepted that the plant was part of our landscape, knowing that the jobs kept food on the table of Zion residents and many others. We understood that the plant kept the lights on at tens of thousands of homes extending far beyond our city's borders, and it was for the greater good.

Unfortunately, that came to an abrupt end when ConEd

decided they could not justify the necessary safety upgrades to continue to produce competitively priced power, and decided to permanently close the plant. The community was totally blindsided, as this was well in advance of the slated expiration of the license in 2013.

Almost overnight, the plant closed, the jobs disappeared, and the lakefront and city were permanently blighted. Those who had been part of our city for decades were gone, and we were left wondering if those who had watched out for us would continue to do so, whether those from beyond our borders who had benefited from the risk the city had taken would be there to help us in our time of need. Would anyone care that we were left as a nuclear waste storage site?

Now, over two and a half decades later, with 2.2 million pounds of nuclear waste sitting in our city only 400 yards from the shore of Lake Michigan, we now know that answer. At the time of closure in 1998, the Zion Nuclear Power Station provided almost \$19 million annually in property taxes to support the local schools, city services, and other governmental entities that the public relied upon. The historical value and taxes collected are shown in Attachment 1 provided.

The plant made up over half of our entire tax base. When that foundation disappeared from our tax base, it did nothing to reduce the costs of education of our students, nor did it reduce

the costs of our police, fire, rescue and infrastructure. The service demands of the public remained steady.

Therefore, the tax burden that was largely paid by the plant instead now shifted to the residents and businesses resulting in an immediate 30 percent increase in their tax bills. There was little to no value in the now vacant plant and there was no opportunity to replace that tax base with redevelopment on what would normally be 90 acres of lakefront property as shown in Attachment 2 provided.

This resulted in a cycle, which continues to this day, of property values dropping as a result of taxes significantly increasing. Property values became so depressed that large landlord groups were buying 40 to 50 homes at a time to rent out. Many of these groups failed to maintain these properties while they collected cash flow, and then moved on to the next. At the peak, over 60 percent of our housing stock were rental properties, which is triple that of a healthy community.

The demand on our schools and city services skyrocketed while our resources continued to dwindle. The tax rate over the 20 years since closure almost tripled while the plant was decommissioned and the waste remains on our lakeshore in the heart of our community.

That brings us to where we are today, with over 2.2 million pounds of nuclear waste stranded in our backyard next to the

lake that provides drinking water for over 10 million people, the location of which shown in Attachment 3.

Ours is not an isolated case. There are over 30 reactors that have been or are in the process of decommissioning and another 56 currently operating in 28 States. Many of the Senators on the Committee are or will be facing this exact same issue.

It is clear that a resolution to nuclear waste storage needs to be addressed, but that is not for me to address the solution, nor is it the issue before us today. That answer has been debated for decades, however until a decision is reached, we are the end solution. We have become, against our will, a nuclear storage site, and the community of Zion has been irreparably damaged without recognition and without compensation.

We humbly ask that Congress help us to start to repair those damages with this legislation. This is not a new concept for Congress. As Senator Duckworth mentioned, the Nuclear Waste Policy Act of 1982 was passed with strong bipartisan support and recognized that there should be impact assistance payments to units of local government to "mitigate social or economic impacts occasioned by the establishment and subsequent operation of any interim storage site."

Congress acknowledged again in 2020 that assistance was

essential to nuclear closure communities with the adoption of the EDA Nuclear Closure Communities program. However, that program required us to inflate our budget with matching dollars that we don't have for projects that would not address our inability to compete and recover.

We have become very good at being fiscally responsible and do not want to spend funds unless it would address the crisis we are facing. The STRANDED Act of 2022 fixes these limitations and provides us that opportunity by permitting us to address the inequities in our local tax base and begin to dig out of the hole that the plant closure put us into.

We are not asking for a handout but rather to just be able to survive. We are a prideful city and want to be self-sufficient.

However, over 20 years of fighting this battle alone has left it impossible to do so. Our goal is to utilize this funding to address our tax base issues and make it possible to compete to attract residents and businesses to our community and begin the rebuilding process. All of these plants across the United States produce nearly 20 percent of the Country's electrical needs. We ask that while the people of the nation might not acknowledge us when their lights turn on, that they do remember us before ours turn off forever. It is for the greater good.

Again, I appreciate your time today.

[The prepared statement of Mr. Knabel follows:]

Senator Carper. Mr. Knabel, thanks a million for coming here today, and Senator Duckworth, thank you for inviting him to join us and speak.

Now we are going to turn to Maria Korsnick. Maria is the President and Chief Executive Officer of the Nuclear Energy Institute. Maria, you are recognized. Take it away, thank you.

Ms. Korsnick. I think Armond Cohen is next.

Senator Carper. Okay, thank you. In that case, Maria, we will wait for you for a few minutes.

Armond, Executive Director of the Clean Air Task Force. Please proceed, Armond, thank you.

STATEMENT OF ARMOND COHEN, EXECUTIVE DIRECTOR, CLEAN AIR TASK
FORCE

Mr. Cohen. Thank you, Mr. Chairman, Ranking Member, and thank you, Senator Whitehouse, for the shout-out. You have been a great leader on clean energy issues.

I would note that when we worked together 30 years ago on energy efficiency, climate change wasn't really front and center like it is today. What is so interesting is that even in the 18 months since I testified before this committee last, there has been enormous change in recognition of the problem of climate change. Countries representing about 90 percent of world GDP and CO2 emissions are now committed to varying degrees to a net-zero energy system to be achieved over the next few decades.

Actually, regardless of what happens in Washington, more than half of the U.S. electricity sales taking place today are taking place in States or in utility service territories that have a net-zero missions commitment by mid-century.

So you could say that is the easy part. Now, the hard part is how do we actually achieve those goals in time, and at an affordable cost.

Nuclear energy could be a very significant contributor to the success of meeting those goals. In our view, it could indeed be essential. It can serve as a powerful complement to increasingly inexpensive renewable energy and energy storage, by

providing zero-carbon electricity and heat, with 90 percent plus availability year-round, independent of season and weather.

Nuclear energy also provides energy in a relatively compact land area which is increasingly important in a crowded world.

In addition to providing electricity to power the grid, nuclear can also power high temperature electrolysis to help provide zero-carbon fuels, like hydrogen, which today serves about 80 percent of world energy demand. Interestingly, also in the last 18 months, the value of nuclear energy has become increasingly recognized across the Country by opinion leaders and by the general U.S. public, as is supported by some of the polling and thought leadership pieces that are contained in my testimony.

That said, there are many challenges to a meaningful scale-up of nuclear from tens of gigawatts a year to hundreds of gigawatts a year, which is what we are going to need if it is going to make a meaningful contribution to climate change mitigation. Costs need to come down, deployment has to speed up. Key issues around nuclear waste disposal need to be resolved.

And advanced reactor designs can help on all those fronts. But so can just best practices in manufacturing business model and licensing, as well as novel deployment strategies like utilizing and repurposing existing fossil fuel mining and

electricity production sites as Senator Capito referred to.

Now, also in the last two years, Congress has done enormous good in this area with bipartisan legislation like NIECA, NEIMA, the 2020 Energy Act, Infrastructure Investment and Jobs Act of last year, but more needs to be done.

In my testimony I highlight four areas for improvement in addition to making nuclear a real option. First of all is providing incentives for cost-effective scale-up of multiple units of advanced nuclear energy designs beyond initial demonstration to achieve scale and lower costs. That is important. Demonstrating first of kind is good, but to really get the scale and cost reductions that we need, we are going to really need to build in series. That is what every nation which has had a successful low-cost nuclear energy program has demonstrated.

Second, we support licensing processes that are appropriate for advanced reactor designs, both in the U.S. and activities or licensing activities that will support diffusion of U.S. design reactors globally. Third, we need to fundamentally reset U.S. nuclear spent fuel policy in the direction of community-driven, consent-based siting policies. Recently, Finland and Sweden have demonstrated that you can cite a permanent nuclear waste repository if you take this consent-based approach. We are going to need to take a step back and figure out how to do that

in this Country.

Then finally, we can look at the possibility of using existing retired or retiring fossil fuel sites for siting advanced nuclear.

So those are four immediate areas for attention. I am happy to discuss further in Q&A. Once again, I really appreciate the opportunity to testify remotely. This was a business plan that had been planned some months ago. So I appreciate your accommodation to let me testify by video.

Thank you.

[The prepared statement of Mr. Cohen follows:]

Senator Carper. Mr. Cohen, we are delighted you could join us. Thank you for that enlightening testimony.

Now we are going to turn to Maria Korsnick. Maria is still the President and Chief Executive Officer of the Nuclear Energy Institute. She will be followed by Jeremy Harrell.

Ms. Korsnick, please proceed. Thank you for joining us.

STATEMENT OF MARIA KORSNICK, PRESIDENT AND CHIEF EXECUTIVE
OFFICER, NUCLEAR ENERGY INSTITUTE

Ms. Korsnick. Thank you. Good morning, Chairman Carper, and Ranking Member Capito. My thanks to you and the rest of the committee for the opportunity to testify today. It is really my pleasure to be here.

The Nuclear Energy Institute represents more than 300 companies across the Country, including companies that own or operate nuclear power plants, reactor designers, advanced technology companies, and labor unions. Together, we are working to provide the clean, reliable and affordable electric system of the future.

On behalf of those member companies, I thank this committee for its continued support of nuclear carbon-free energy and the thoughtful legislation that we are here to discuss today. Nuclear technology is American technology. From the first commercial plant built in the 1950s to the new reactor designs that, thanks to Congressional support, are moving from design to demonstration to deployment. The United States has long been the global leader in nuclear technology.

Our innovation and leadership have never been more important. The world is at an inflection point. The climate crisis requires swift action to mitigate the worst impacts of a changing climate. The urgency to act is finally catching up to

the urgency of the climate crisis. We have no shortage of high-level plans. Executing them depends on our choices.

The stakes could not be higher. We need to prepare for a future that demands smarter, more reliable and more efficient energy solutions. Nuclear energy is the key to meeting our clean energy goals while ensuring our electric system remains reliable. We are moving toward alignment in support of nuclear's role in terms of policy, in terms of industry commitments, and in terms of interest from investors and consumers.

Many States, including Illinois, New Jersey, and New York, have taken steps to preserve their existing nuclear generation. Other States, including West Virginia and Wyoming, are taking steps to consider new nuclear for their future energy needs.

Preserving existing reactors offers us many years of additional carbon-free electricity while supporting SMRs and advanced reactors promises to unlock potentially game changing growth in U.S. nuclear new builds both domestically and abroad. This isn't just about reliable carbon-free energy. It is also about creating hundreds of thousands of American jobs.

I appear before you today in support of the American Nuclear Infrastructure Act. The legislation you are considering contains many provisions that will protect current carbon-free generation and maintain U.S. global leadership and a technology

necessary for the decarbonization of economies around the world.

ANIA originally conceived of preserving nuclear by enabling EPA to provide payments to economically challenged nuclear plants. This idea continued to evolve and was included in the Infrastructure Investment and Jobs Act that was passed into law last fall. We are grateful for the committee's leadership on this issue. This program can help to prevent millions of tons of CO2 emissions while supporting cost-effective and reliable electricity for millions of Americans.

Further, ANIA accelerates nuclear energy innovation by providing three prizes to advanced reactor designs that complete the NRC licensing process. Navigating the regulatory process is expensive and time-consuming, and creates additional difficulties in securing financing. This unique approach will help accelerate the development and deployment of new nuclear. By creating incentives that reduce and remove these burdens, nuclear innovation can flourish.

Finally, ANIA takes a different, direct approach to bolstering U.S. leadership in nuclear energy by empowering the NRC to focus on nuclear energy export and innovation activities. This is a major step forward in leveling the playing field for U.S. companies competing with state-sponsored enterprises internationally.

The actions outlined in ANIA are not only a critical step

in decarbonization and enhancing U.S. leadership, but they are also necessary combat climate change and protect our national security interests. The committee is also considering the STRANDED Act, designed to address one of the hurdles that remains to fully realizing the value of nuclear power.

NEI is supportive of federal efforts to satisfy its long overdue obligation to remove the used nuclear fuel from nuclear power plant sites. As Congress explores options to address this community impact, we support action that advances a durable solution for used fuel management.

I thank the committee for its work to preserve America's largest source of carbon-free power and to support the development and deployment of new nuclear technologies. Nuclear energy is critical to achieving a just transition to a clean energy future. Many of the provisions in ANIA are positive toward that future.

NEI, on behalf of our members, pledges to work with you to help us get there. Thank you, and I look forward to your questions.

[The prepared statement of Ms. Korsnick follows:]

Senator Carper. Ms. Korsnick, thank you for your valuable testimony. It was great to see you. Welcome, and thank you, and our best to everyone at the Institute.

Finally, batting cleanup is Jeremy Harrell. Jeremy is the Chief Strategy Officer at ClearPath Action. Jeremy, welcome today, and you are recognized to give us your testimony. Thank you.

STATEMENT OF JEREMY HARRELL, CHIEF STRATEGY OFFICER, CLEARPATH ACTION

Mr. Harrell. Thank you. Good morning, Chairman Carper, Ranking Member Capito, and members of the committee. My name is Jeremy Harrell, and I am the Chief Strategy Officer at ClearPath Action. We advance policies to accelerate breakthrough innovations that reduce emissions in the energy and industrial sectors.

Additionally, I represent the U.S. Nuclear Industry Council as the chairman of its board.

Clean energy and climate is regularly top of mind here in Washington as well as many of your constituents. While there is no silver bullet that will solve the urgent climate challenge, accelerating the global deployment of American advanced nuclear reactors will significantly reduce emissions and meet growing energy needs.

The International Energy Agency projects nuclear generation needs to double by 2050 to meet net-zero emission goals. Dozens of American entrepreneurs developing advanced nuclear technologies are racing toward that cause. The bipartisan American Nuclear Infrastructure Act could help unlock their deployment at scale.

I want to underscore three key points in my testimony today. First, advanced nuclear is here now. The Nuclear

Regulatory Commission could receive roughly 10 new license applications before 2025, all looking to build advanced reactors over the next decade. Today's NRC is not equipped to effectively conduct those reviews.

Second, the world's clean energy future requires nuclear energy, as illustrated by the IEA's projections. The only real question is, will it be American nuclear or will it be Chinese or Russian?

Finally, the American Nuclear Infrastructure Act is the natural next step in a series of big legislative wins spearheaded by leaders of this very committee. ANIA can ensure that advanced nuclear meets its potential, contributing immensely to global security, economic growth, and emissions reductions.

We are truly at an exciting time for the American nuclear industry. Nuclear power has re-emerged as a smart, reliable power source and an integral part of global emission reduction efforts. A flurry of next generation nuclear reactor companies, including Oklo, X-energy, TerraPower, GE, Kairos, and NuScale are all on the cusp of building reactors in the next decade. These technologies provide clean, reliable power and create jobs in local communities, but also offer additional benefits relative to traditional reactors.

Advanced reactors are smaller, which allow them to be sited

in new locations. They can operate flexibly to complement renewable energy, are walk-away safe, and can decarbonize industries beyond the power sector with their high temperature steam and heat.

In other words, these technologies are a new breed of reactor, much different than the fleet the NRC has regulated for nearly 50 years. Many of the NRC's existing requirements are not relevant to these new designs.

Two Congresses ago, this committee wisely enacted the Nuclear Energy Innovation and Modernization Act, otherwise known as NEIMA, directing the NRC to prepare for the licensing of advanced reactors. Advanced reactor companies are ready now, but the NRC is not.

Oklo, for example, the first advanced reactor company to submit a license application the NRC, recently had its application rejected. NuScale, the first small modular reactor, took five years and half a billion dollars to get a design certification. There will always be hiccups for first movers, but that cannot become the norm for the review of new technologies.

The NRC must modernize its processes to unlock the potential of these companies rather than add layers of unnecessary and overly burdensome regulations. Licensing is a necessary step between the development of new designs and

commercialization. If America is not proactive, the U.S. could fail to meet its own clean energy pledges while also losing ground to China and Russia on technological innovation.

Which leads me to my next point on the global picture: climate change is an urgent global challenge that merits significant action at every level of government and the private sector. While the U.S. and a few others have reversed emissions trajectories, much of the rest of the world is growing their emissions as they grow their populations, their industries, and their quality of life. We need an American innovation-focused approach to solve the global climate challenge.

As I mentioned earlier, nuclear generation will need to at least double globally by 2050 to meet carbon neutrality goals, meaning new nuclear capacity additions, in addition to what we already have operating, need to reach 30 gigawatts per year by the early 2030s. That is the annual equivalent of enough electricity for 20 million households.

That is daunting, but is also a huge opportunity. Nearly 50 countries are projected to have markets for advanced nuclear before 2050, a more than \$360 billion market opportunity for the American supply chain. Make no mistake about it: if the U.S. does not seize that opportunity, China and Russia will.

So how does the U.S. seize this moment? Thankfully, Congress has recognized the importance of nuclear energy.

Significant bipartisan legislation has been passed, providing both robust support for the existing civilian fleet and for the R&D of nascent nuclear technologies. Now, Congress must provide the direction needed to ensure there is a clear path for the next generation to be licensed, sited and permitted.

The American Nuclear Infrastructure Act contains several provisions in this very vein. These policies include prizes to offset initial licensing costs for first movers, continued regulatory modernization, preemptive environmental reviews of key federal facilities, and broader international collaboration and investments.

In addition to these important provisions, there are other areas where the bill could be improved. The committee should look to expand the modernization efforts in NEIMA, provide additional financial flexibility to grow the workforce of the future, catalyze the next generation of American nuclear fuels, and further streamline permitting of brownfield sites, like former power plants. ClearPath Action looks forward to offering our support to this effort.

Thank you for the opportunity today. I look forward to answering your questions.

[The prepared statement of Mr. Harrell follows:]

Senator Carper. Mr. Harrell, thank you for joining us. Thank you for your testimony as well.

I am going to lead off the questioning. Next will be Senator Capito. Senator Whitehouse is next in order but he has had to step away for a while. If he doesn't return immediately, then Senator Inhofe, you will follow Senator Capito. Then we will turn to Senator Duckworth, and then depending on who joins us we will take it from there.

In baseball, a pitcher someone in delivering a pitch signals what kind of pitch they are throwing, a fast ball, curve ball, slider. They say the pitcher has telegraphed their pitch. I want to telegraph my pitch to the panel. Probably the last question I will ask you is this. One of the things we are pretty good at, as Senator Capito and Senator Inhofe, who used to be the chairman of this committee, still a valued senior member, but we are pretty good at finding principal compromises. Senator Inhofe and I join together almost every Thursday for half an hour, for a Bible study. You would be amazed at how many Bible studies are prayer breakfasts there are on Capitol Hill, almost all bipartisan.

One of the things we always pray for, Democrats, Republicans, Independents, is wisdom. One of the things I will be asking you right at the end of this hearing is where do you agree, where is there consensus on the key issues before us,

where is the consensus on some of the key sticking points. We look forward to hearing from you on that score.

All right, questions. Mr. Cohen, again, thanks for joining us. When the American Nuclear Infrastructure Act was considered by this committee last Congress, I believe you testified that you had concerns regarding the NRC budget cuts in the Nuclear Energy Innovation and Modernization Act that placed caps on the NRC's corporate support spending. The NRC has also expressed concerns to our committee about their ability to continue to meet these caps and resulting impacts on the NRC's modernization efforts as these limits are set to become more restrictive over time.

Here is my question. This again would be for you, Mr. Cohen. Do you agree with the NRC's assessment that the administrative budget restrictions in the Nuclear Energy Innovation and Modernization Act ties the hands of the NRC from hiring the best and brightest, and could hurt the NRC's ability to keep up with the industry innovations and new technologies? Second half of the question would be, do you still believe we should amend the Nuclear Energy Innovation and Modernization Act corporate support caps? Mr. Cohen?

Mr. Cohen. Thank you for the question, Mr. Chairman. Yes, we do share the concern that you outlined that the current budget caps are constraining the NRC's ability to deal with both

existing safety issues as well as licensing and reviewing new reactor designs.

We have looked at the NRC's submission to this committee, and believe that their analysis is correct. We believe also that this committee should consider legislative modifications to the cap. At a minimum, to provide the NRC with some more flexibility around how the cap is defined with respect to the definition of corporate support, with adjustment for inflation and, for example, removing 2018 as the base year.

So the answer is generally yes, we believe that those caps have been proven to be overly restrictive and could constrain the NRC's ability to be effective.

Senator Carper. All right, thanks. Let me also direct my second question, involving advanced reactor deployment. The Nuclear Energy Innovation and Modernization Act requires the NRC to develop a new technology-inclusive regulatory framework, as you know, capable of accommodating the diversity of advanced reactor design, by the end of 2027. The NRC is expected to finalize this framework, not by 2027, but actually I have learned this last week, by 2024, about three years ahead of the Nuclear Energy Innovation and Modernization Act's deadlines.

Recently, the NRC denied a license application for Oklo Advanced Microreactor. Although this decision does not prohibit the company from resubmitting an application in the future, the

NRC decision has raised doubts among critics about the NRC's capabilities to review license applications before the new framework is put in place.

Would you briefly describe your thoughts on what led to the NRC's denial and comment on the merit of concerns regarding the NRC's capabilities? Do we need further streamlining changes to the regulatory process, or are there other policies the committee should pursue to better support the deployment of advanced nuclear reactors? Mr. Cohen?

Mr. Cohen. Thank you, Mr. Chairman.

I can't claim to be extremely close to the Oklo situation in particular. But my best information suggests the following, that the denial of the application was not linked necessarily to a fatal flaw in the regulatory process or even the way the NRC handled it, but possibly a variety of, I will call them growing pains, in terms of adjusting to these advanced reactor designs and reviews, specifically, communications around the kind of information required.

That said, I think this does suggest the need to get on with the business of implementing NEIMA and in developing a new, separate lane for advanced reactor development. That is the so-called Part 53 discussion that is going on right now. My testimony contains a little hint of our suggestions as to how the future actions by the NRC could more directly and

efficiently accommodate new reactor designs.

So I guess my answer is a little bit split. On the one hand, I don't think the current Part 50 arrangement is fatal or even that the NRC is hobbled. I think this one will work out . I think that the Commission did give Oklo a little bit of a road map to come back.

That said, it is clearly much better to proceed on a fit-for-purpose lane of Part 53, which is being developed. That is what we look forward to seeing happen.

Senator Carper. All right, thanks for your response to that question.

Senator Capito, it is your turn.

Senator Capito. Thank you. I am going to yield my slot to Senator Inhofe to begin his questions.

Senator Carper. All right, Senator Inhofe.

Senator Inhofe. First of all, let me thank both the Chairman and the Vice Chairman for acknowledging the fact that we have a lot of competing committees taking place all the time. This is very important to me, though, and I enjoyed all four of the statements. I thought they were great statements that were made.

Ms. Korsnick, I have long supported nuclear energy and ensuring spent fuel is safely and properly stored in a permanent repository. We have been talking about this issue for so long

now, I keep thinking we are getting closer, and I think we are.

While Senator Duckworth's bill is a good faith effort to help her State, I am concerned that basically it kind of pays the communities to tolerate long-term problems. I know localities shouldn't have stranded nuclear waste, but this is a result of the fact that we have been trying, and we have had opposition over the years to permanently dispose of the sites.

There has been resistance, such as there was for such a long period of time, to Yucca Mountain. Taxpayers nationwide, including Oklahomans, already paid the liability costs of storing spent fuel where it is after the government failed to build a permanent repository.

So instead of sending more Oklahomans' taxpayer dollars to localities with spent fuel, we should work together to secure a permanent solution.

Ms. Korsnick, would you agree that Congress should return its focus to securing a permanent repository for the spent fuel? What ideas do you have along that line?

Ms. Korsnick. Thank you very much, Senator Inhofe. Yes, we very much support a long-term, durable solution for nuclear storage. If I could perhaps step back for a moment, to say we should be very proud of the American nuclear industry for all that it has brought. We are the strongest operating fleet in the world. We bring a lot of American innovation.

That American innovation can be used to help solve this long-term storage issue. We simply need to put our mind to it. When we began the nuclear industry 50 years ago, of course, things were put in place to manage used fuel. We have done that part of it. Money has been collected, over \$40 billion today in the Nuclear Waste Fund. We have promised to operate safely and to store this fuel in a safe manner until the government kept up its end of the bargain to pick up this fuel.

The government has not picked up that end of the bargain. I think it is high time that we focus on that. I applaud the DOE for recently putting out an RFI on a consent-based siting process for interim storage. I think that is a good step. We are happy to work together to make inroads.

But as a Nation, we need a long-term storage repository. If you look across the world, it was mentioned earlier, Sweden is doing this, France is doing this, Finland is doing this, Switzerland is doing this.

Senator Inhofe. Okay.

Ms. Korsnick. So we are behind.

Senator Inhofe. All right. We are behind, and I am getting a little behind also. So let me mention, Mr. Harrell, several people in their opening statements talked about NEIMA and the successes that we have had, and we have had successes. Its core mission is conducting inspections and licensing

reviews, yet only 21 percent of its budget is allocated for that purpose, while corporate support is over 30 percent. Mr. Harrell, do you agree that the NRC needs to streamline its corporate support budget so it does not exceed that of its inspection and licensing reviews?

This is kind of an interesting thing, because we are dealing with government here. Some of this comes out quite accidentally. What do you think?

Mr. Harrell. Yes, that is a great question, Senator Inhofe. Thank you for your strong support for nuclear, and particularly your work at the Armed Services Committee on microreactors and the NEDA. I agree. I think that the resources need to be focused on key areas in modernization. No doubt, we need to inject new talent into the NRC.

As I mentioned in my testimony, 10 new reactor designs could be coming in the next three years. We need to be able to focus and bring the NRC to the 21st century and get them focused on these new technologies, and so making sure that resources that are coming in, whether it is corporate support or off-fee resources, whatever it may be, need to be zeroed in on the key licensing areas to accelerate the licensing and ultimate appointment of those advanced reactors.

Senator Inhofe. I appreciate that very much. Let me also compliment you on the statement that needs to be made all the

time, and that is, if we don't do it, China and Russia are going to do it.

Mr. Harrel. Yes, sir.

Senator Inhofe. Thank you, Mr. Chairman.

Senator Carper. Thanks, Senator Inhofe. Thanks for your leadership over all these years on trying to get us to a place where we have safe, clean nuclear energy and do it in ways that are smart.

Senator Inhofe. I appreciate that. I think each member of this committee will say this is probably the least partisan of the committees dealing with such serious subjects. I think we all have been doing well, you folks included.

Senator Carper. Thanks for saying that. Senator Whitehouse, thanks for rejoining us, and again, for your leadership, too. Thanks.

Senator Whitehouse. Thank you. I would like to ask Mr. Cohen and Ms. Korsnick what we could be doing more of. I know we have a prize in this for nuclear designs that operate off of spent fuel and allow a vehicle for us to go through the spent fuel waste stockpiles that are located mostly at the industrial sites where the power plant was.

What more could we be doing to make sure that this technology that we are encouraging doesn't lose its focus on that aspect of the problem set we are dealing with to make sure

that a focus on repurposing spent fuel stays at the heart of innovation? Mr. Cohen first, then Ms. Korsnick.

Mr. Cohen. Thank you, Senator Whitehouse. I don't consider myself to be an expert on this particular topic, but there is clearly a lot of opportunity to, from my understanding and my staff's research, to look at some advanced technologies for reprocessing that are not the traditional technologies for reuse of spent fuel.

I am well beyond my technical depth in describing those, but what I understand is that there are a number of research areas that really could use more funding. The U.S. is behind on this. There are a lot of good ideas, but there is not much funding in that space.

So I am just going to leave it at that high level that there is a lot that probably could be done with Federal RD and demonstration of this advanced fuel reprocessing, and modes other than the traditional MOX reprocessing, for example. I don't have details to offer, but we could, at the committee's request, come back with some more specific ideas.

Senator Whitehouse. Ms. Korsnick? Mr. Cohen, do that that as a QFR and get back to me, if you would. Ms. Korsnick, please proceed.

Ms. Korsnick. Yes, thank you. I would just offer, in fact, I think there was an announcement this week between

Argonne National Lab and Oklo to explore some reprocessing ideas. That tells you that the wheels are moving in terms of people being interested in reprocessing.

I know there are other private companies that are also interested in exploring reprocessing. I would just add that even if we reprocess, it still requires us to have a long-term repository.

I think, ultimately, we need this broader conversation on the used fuel final solution. I think the reprocessing adds a great element, as you mentioned, in terms of being able to use this. We call it used fuel, but, you know, there is 95 percent good energy still in this thing we call used fuel. It is an excellent opportunity for us to tap into it. As Mr. Cohen said, I am happy to bring back more ideas with some additional QFRs.

Senator Whitehouse. I think that danger here is that the economics get misaligned. Companies that are having to follow what for them is the best economic path will go down wrong paths if we haven't got the economics of this aligned properly, in the same way that safely operating nuclear plants closed to open natural gas facilities that polluted a lot more for economic reasons that would have evaporated if the harm and cost of the natural gas emissions has simply been taken into account, as they should be. It was an economic misfire, but it created bad decisions out in the real world, because companies follow

real dollars, not ideal dollars.

My worry here is that it is going to cost a little bit more and take a little bit more trouble and effort to deal with repurposed fuel than it is to simply start new. If we allow that to happen, then we will have inadvertently choked off the innovation that could provide a way to put what is now dangerous, toxic, expensive waste with no plan for dealing with it into a productive use. I hope we can continue to focus on that and make sure we don't set up an economic system in which we inadvertently steer people away from solving that problem instead of towards solving that problem.

Mr. Cohen, you mentioned hydrogen. Is nuclear power a potential source for what we would call green hydrogen?

Mr. Cohen. Senator, if by that, you mean zero carbon hydrogen, for sure.

Senator Whitehouse. That is what I mean.

Mr. Cohen. Absolutely. There are a number of good studies out on that. Most recently, there was an analysis of the potential even for the Diablo Canyon Nuclear Power Plant in California to coproduce electricity and hydrogen. That report went into great detail on how that could be done.

This is not rocket science. The technology is well understood. Electrolysis has been around for many, many decades, but the particular advantage of nuclear in producing

hydrogen is the potential to couple electricity production with high-temperature heat, which, as I understand it, makes the hydrogen production process much more efficient.

I believe there are now four pilots, maybe even six now underway under previous legislation authorized by Congress to demonstrate this, very small-scale. The next step for the U.S. is to scale those up to a much larger level. In fact, the most recent infrastructure act includes a provision for a hydrogen hub that would be nuclear based.

Yes, absolutely, the technical capability is there. Hydrogen is going to be needed at large-scale to displace gas and oil, and nuclear could definitely be part of that zero-carbon mix.

Senator Whitehouse. Thank you, Chairman. Thank you to all the witnesses.

Senator Carper. Those are great questions. Senator Capito, and then after Senator Capito's questions, we return to Senator Duckworth next, and we have been joined by Senator Kelly. Thanks for joining us, Mark. Ranking Member Capito, it has been a great hearing so far. We are only about halfway through. Go ahead, please.

Senator Capito. Thank you. My first question is going to focus on using the sites of former coal-fired power plants. Obviously, this is an important question for me. One of the

reasons that West Virginia changed their law, I think, was to try to remove the barriers of nuclear energy, but also to couple those two initiatives together. I believe that in Wyoming, this is already moving forward.

Ms. Korsnick, what can we do, either Congress or at the NRC to facilitate the creation of nuclear jobs in these former coal communities?

Ms. Korsnick. Thank you, Senator Capito, for that question.

You are right on the mark. Repurposing coal plants or other fossil plants is extremely attractive for future nuclear plant siting. For one thing, they have the transmission already there. That is a challenging part of the infrastructure, if you will. It is costly to build, so it is a great opportunity to reuse that.

I can say, just a point of note, recently the NRC did revise some guidance, that would actually help coal plant operators to receive some credit for their experience operating fossil plants as part of their review process to become a certified nuclear operator. It is things like that that we can do.

I operated nuclear power plants for many, many years, and when we did refueling outages, we brought the folks down from the coal plants to help us in our refueling outages. Nuclear

and coal, nuclear and fossil have a long history of partnership. Nuclear plants, we boil water differently, perhaps, than a coal plant, but after that, once you have turned it into steam, there are a lot of similarities in the jobs and a high degree of opportunity for us to bring jobs to these former coal plants.

Senator Capito. Thank you.

I want to talk a bit about the expense. Mr. Harrell, I believe you mentioned an application that had cost a half a billion dollars, and I can't remember how long it took. Obviously, this has to be a sticking point of the initial application, but also the innovation that is going to be required. What kinds of ideas would you have in terms of being able to afford to actually move in this direction?

Mr. Harrell. It is a great question, Senator Capito, and thank you for your strong leadership on this bill and other clean energy issues, both at this committee and at the Appropriations Committee.

I think one of the key ideas here, and included in your legislation, is the XPRIZE to offset some of the fees related. I was mentioning NuScale in my testimony, \$500 million over five years to get to design certification, \$70 million of that in fees. That is a huge barrier to entry.

There are a variety of exciting, advanced reactor companies that have technology that can contribute to both our economy and

to emissions reductions that are startups. They are venture capital raised. So that type of financial barrier is providing a barrier for these companies to move forward, and essentially saying you need big backers to move forward.

I think that is squandering an opportunity for American entrepreneurs as a whole. Right-sizing regulations to make sure that they are consistent with the true risk of these reactors, so we are not doing a dilatory review type of thing. Then providing support to some of these advanced reactors, particularly first movers who are doing the heavy lifting here at the onset, I think are really important.

Senator Capito. I appreciate that. I appreciated Mr. Cohen's response on hydrogen to Senator Whitehouse's question. I would like to ask both of you if you have anything to add on the innovators that are developing designs to generate high-temperature heat to be used for manufacturing and industrial purposes. We are requiring the NRC to identify and address potential regulatory barriers to deploying this for other technologies.

Where is the nexus here between creating a hydrogen economy and having nuclear power at the same time? I will go to you, Mr. Harrell, first, and then Ms. Korsnick.

Mr. Harrell. Yes. That is one of the most exciting components of these new designs, a bunch of different

applications. Nuclear can play a huge role in hydrogen production as a 24-7 resource and it contributes to the no-cost [phonetically] paradigm, the ability to use processed heat in manufacturing of hard to abate sectors, like steel and concrete.

Even outside of the climate space, nuclear thermal propulsions is a really exciting opportunity in a way that these new technologies can help expand our space frontiers. We are excited about it, but it is a new frontier for the NRC, and they are used to only electrical applications.

Senator Capito. Ms. Korsnick, did you have anything to add there?

Ms. Korsnick. Yes, thank you.

I would just add that we talk about how long it took to license some of these technologies, but after you license it, there is also a licensing process for the site, in other words, a site selection process. When you asked earlier about what other things we can do, what are the next barriers, I think we need to really look at the NRC process for siting so we can take some of these coal sites and sort of quickly understand that they are suitable for nuclear.

I think it goes to your last question as well. If you are going to use nuclear for other things, you are going to want to site those nuclear plants, in fact, near some of these manufacturing facilities. So there is a nexus around siting and

making the siting process more effective and more efficient.

Senator Capito. Thank you. Thank you, Mr. Chair.

Senator Carper. Thank you so much. Senator Markey has joined us. Senator Markey, I understand under the rules of the committee, you could move ahead of Senator Duckworth and Senator Kelly and ask your questions. If it is not urgent for you to leave, if you could let them go first, I would appreciate it.

Senator Markey. When you phrase it that way, it sounds like an offer I can't refuse. Senator Duckworth, you are recognized.

[Laughter.]

Senator Carper. You are a good man. Thank you.

Senator Duckworth. I thank Senator Markey.

Mr. Knabel, when the City of Zion accepted the economic benefits and the risk of hosting a nuclear facility to generate zero emissions power for itself and surrounding communities, what did Zion expect to happen to the lakeside property once the plant's operating license had expired?

Mr. Knabel. We expected that the property would revert back to unrestricted use, that the site would be cleaned up, and we would have the opportunity to have the community either redevelop for, again, replacement tax base or to be able to use the property for recreation or other purposes to grow our community. We did not expect to have a 90-acre nuclear

footprint buried on-site or be a nuclear storage site indefinitely, for sure.

Senator Duckworth. Thank you. I think this is an important point, because the Senator from Oklahoma mentioned that part of the problem we have here is that we have not come up with a location for disposal or long-term storage of a nuclear site, whether it is Yucca Mountain or where else.

My point is even if we agree today on a site, wherever that is, it will still take 20 years to develop that site. In the meantime, cities like Zion remain a de facto nuclear storage facility, and that is simply not fair to the community. As our Nation debates the permanent solution to safely dispose of and store radioactive nuclear waste, it is my hope that we can find common ground around a simple principle: that until a permanent solution is implemented, the Federal Government should help communities deal with economic and social harms of stranded nuclear waste.

Mr. Knabel, can you explain why the City of Zion needs Congress to pass the STRANDED Act and finally fulfill the Nuclear Waste Policy Act of 1986 original vision of distributing economic impact assistance payments to help stranded communities offset the economic and social harms of temporarily storing nuclear waste, even if that temporary ends up being 40 years?

Mr. Knabel. Sure. It was agreed to in 1982 that there was

a social and economic impact to municipalities that stored waste on an interim basis. This is just reiterating that need.

But during the time that we have been a storage site, that the plant has been decommissioned and closed, we have been operating at an annual deficit, basically have been treading water ever year. Every year, we go a little further beneath the surface.

We don't have the opportunity for redevelopment. Our property tax base has declined significantly. We have been irreparably damaged financially community wide as a result of this. This is crucial to us being able to survive to even get to a point where we can talk about moving the waste or even get to a point where we can talk about reuse.

We are less staffed for police, fire, and public works than we were in 1998, and we are handling three times the calls and service demands from the community. Over 60 percent of infrastructure is 70 years or older, and we don't even have the funds to address those issues. We are just trying to survive and still be in existence.

This will help us to address those deficits, to try and put a plan in place to get a return on that investment so that we can be self-sustaining, we can dig out of that hole, to get to the point where we can even start to address those issues.

Senator Duckworth. Thank you.

I think this is critical to say, passing the STRANDED Act will actually help us make good decisions on where to move the nuclear fuel. I think it will act almost as a pressure valve to take the pressure off making a decision immediately to, say, choose Yucca Mountain or someplace like that, so that we can make good decisions on where this waste will go. Because in the meantime, the waste can remain where it is in a way that the community that is holding the waste can sustain it.

The Economic Development Administration administers the Assistance for Nuclear Closure Communities Program, often referred to as the NCC Initiative. As I noted in my statement, while promising, the NCC initiative suffers from key limitations, which my STRANDED Act seeks to address.

Mr. Knabel, can you explain why the EDA's NCC Initiative falls short in meeting the urgent needs of stranded communities like Zion and address why it is so important to expand the EDA's support, as my STRANDED Act will seek to do?

Mr. Knabel. Absolutely. The program as it is currently written is a nice idea for maybe a step three in our process. As I mentioned, we would be lucky to have the luxury of only having to figure out how to pay for our infrastructure like other municipalities do.

However, we are not at that point. The way I have kind of equated it to others is, when you are worried about trying to

put food on the table for your family, you can't even consider how you are going to fix the leaky roof.

Development projects, first of all, on a site or in a community that cannot attract redevelopment because of tax base or because of blighted property, it is just not feasible, but secondly, it also has matching requirements on there that we simply can't add to our budget that is already hemorrhaging as a result of 20 years of spiraling property values due to the decommissioning.

So there is a limitation on that. It a good step three, but the STRANDED Act addresses the step one needs.

Senator Duckworth. Thank you. I have additional questions, but I will submit those for the record. I yield back.

Senator Carper. Thank you, Senator Duckworth. Senator Kelly, and then Senator Markey.

Senator Kelly. Thank you, Mr. Chairman. I appreciate your having this hearing today on these important pieces of legislation.

I want to start by discussing the American Nuclear Infrastructure Act of 2021, Ranking Member Capito and Senator Whitehouse's bipartisan bill, which I support. Nuclear energy is critical to our shared goal of reducing carbon emissions and fighting the effects of climate change, and this bill would

provide financial support and more regulatory certainty to next generation advanced nuclear reactors, help more Americans get trained for good-paying, high-skilled jobs in the nuclear industry, improve coordination with international nuclear regulators, and support nuclear investments made by our allies, and provide financial support for our aging nuclear fleet.

Important to me, this bill builds upon the work I have done to support the cleanup of abandoned uranium mines in Tribal communities. As a member of the bipartisan group of Senators who negotiated the infrastructure law, I fought to secure \$5 billion for investments for superfund sites and brownfield cleanups, including for more than 500 abandoned uranium mines on the Navajo Nation. I appreciate steps taken in this legislation to further strengthen U.S. global leadership in next-generation nuclear energy technologies to compete with China and Russia.

This brings me to my first question. Ms. Korsnick, can you expand upon your testimony on the ways that China and Russia are threatening to rival U.S. leadership on the international stage, and how the American Nuclear Infrastructure Act's provisions relating to international nuclear reactor export activities and international regulatory competition would help to combat the challenges that are posed by Russia and China?

Ms. Korsnick. Yes, thank you, Senator. If you would, imagine the partnership that grows when two countries work

together on commercial nuclear. It essentially forges a 100-year relationship, from design to build to operate decommissioning. The idea of working together with nuclear forms very strong geopolitical bonds. This is something that we should strategically look at as supportive of United States geopolitical interests.

In that same way, China and Russia are very interested in controlling other countries' energy supply for reasons that you actually have seen play out, even over in Europe over gas lines, for example. There is a lot of power in controlling somebody's electricity supply.

China is going all-in. I think they are building 20 reactors right now, and they have a strategic plan to build a whole lot more. China, right now, looks like the United States in the 1950s. They are building all kinds of different types of reactors. They want to get good at all of them.

Both China and Russia, when they show up in other countries saying, let me help you out, I will operate it, I will build it for you, I will operate it for you, and I will take your used fuel. They make a deal with these other countries that is so attractive, it is very difficult for any of the U.S. companies to compete. We can either do something about that, or we can reap these benefits in 10 to 20 years.

Senator Kelly. When you talk about how the partnership

between two countries is lasting and enduring and sounds like it helps both of them, have you seen, are China and Russia partnering with each other on nuclear technology?

Ms. Korsnick. I don't see as much. I can't say that it is not happening. I can say both of those countries have expressed common interest in certain other countries. For example, they are both interested in places in Africa. They have both expressed interest in Brazil. They are very interested in a longer-term strategic play, where it is their technology that is operating in as many countries as they can make that happen.

Senator Kelly. Thank you, Ms. Korsnick.

Mr. Cohen, I wanted to ask you about the role nuclear energy can play as a clean, firm source of electricity. As you can imagine, as the sunniest State in the Nation, Arizona is a leader in solar energy deployment and development, and there is a lot more growth to come. But reliability is a challenge, especially in Arizona's long hot summer months when air conditioning is non-negotiable.

Mr. Cohen, for States like Arizona, which are prime markets for solar energy deployment, what role does a firm source of energy, like nuclear energy, play in ensuring grid reliability and keeping costs low for customers?

Mr. Cohen. Thank you for the question, Senator Kelly. Yes, all of the studies that I have seen for the Southwest, and

this is true for all the studies actually that we have done for all the geographies I have seen in the U.S., suggest that renewables and nuclear don't really compete. What they do is complement each other. Even in a very sunny State like Arizona, you do have a great solar energy resource, but it is quite variable by season, by a factor of as much as two to one.

What nuclear does is provide an always-on base, if you will. Even if it has to be curtailed at certain times or ramped down on certain days because of very, very high solar production, there are typically still a lot of cost savings in having that always-available source.

It is also true that Palisades in Arizona is a mainstay right now of the western grid and reliability. So renewables are great for reducing costs at the margin, but what nuclear provides is a firm base when the sun isn't shining, when the wind isn't blowing. That is often true for weeks, even months where it isn't blowing at the levels aren't at maximum, nuclear can provide and fill those spaces and ensure a much lower cost grid.

It is often nuclear versus renewable; I think that is a false distinction. They work very well together.

Senator Kelly. I think folks are often unaware that when the demand is the highest is not actually when the sun is shining the brightest and is directly overhead. Demand is

usually in the hottest part of the day, also happens to be the time that people are coming home from work and shortly thereafter, the sun is at a much lower angle and is not generating as much electricity. So this is a good option to fill that demand gap.

Thank you, Mr. Chairman.

Senator Carper. Senator Kelly, thanks so much for joining us.

Senator Markey, you are next. I think Senator Padilla may be trying to join us after you question the witnesses. Thank you for allowing the other two Senators to go ahead of you. Thank you.

Senator Markey. No, of course. Thank you, Mr. Chairman.

We have a moment here where we can just kind of do a review of the nuclear industry as it sits today, including the two nuclear power plants in Georgia, the Vogtle Plants, which were proposed as \$14 billion for the two units to be generating electricity. They have had their problems over the years, let's be honest, and it is up to \$30 billion now for the two units. Still, they are not without their difficulties.

Let's just talk about that as a state-of-the-art for the industry, and there still is no known meltdown for a solar or a wind project in the United States, so the safety issues, obviously, around nuclear, are not small.

In the infrastructure bill, which has already passed, there were \$6 billion for the nuclear industry that was built into the infrastructure bill, which we all voted for. In the Build Back Better Bill, Mr. Chairman, there is, as passed by the House, and hopefully, we could get to it in the Senate, there is actually \$23 billion in production tax credits for the nuclear industry just through the year 2027. I know Senator Manchin is arguing to cover it up to 10 years. That would obviously increase it, but \$23 billion in that bill.

From my perspective, I think that we should just realize that this is an industry that has had difficulty in actually bringing any new plants online. It gets more and more costly as each year goes by.

Yet, we should also be focusing on the wind and solar and other industries. If we are going to do something, we just have to do it together. That is actually what the Build Back Better Bill is. The Build Back Better Bill deals not just with nuclear, \$23 billion in tax credits, but also tax breaks for wind and solar and battery technologies and all electric vehicles, so that we are looking at this from a comprehensive perspective.

Mr. Cohen, do you agree that we should be investing in mass deployment of renewable energy and not just focusing exclusively on nuclear in order to achieve our climate and clean grid

potential?

Mr. Cohen. Yes. Thank you, Senator, for that question. I absolutely agree with that. We have been big supporters of the renewable tax credits and all other kinds of RD&D and deployment. It absolutely has to be a balanced portfolio. That is what all the modeling suggests.

In fact, most of the modeling suggests that the zero-carbon grid of the future is likely to be dominated, actually, by sources like wind and solar. Again, nuclear can play a supporting role, but without that inexpensive wind and solar, at scale, the cost of decarbonization will be much more expensive. Absolutely, both of these policies have to work in tandem.

Senator Markey. So, in addition to nuclear plant bailout, which is in this bill, there is also a doubling down on the infrastructure bill, and it is a \$2.5 billion Advanced Reactor Demonstration Program by making taxpayers foot that bill for additional advanced reactor activities. Supporting that continued nuclear generation also then raises questions about nuclear waste and how our Country is going to handle those issues.

Mr. Cohen, do you agree that a long-term solution for nuclear waste needs to be a principal component of any discussion of additional nuclear generation in our Country?

Mr. Cohen. I think that it is a problem that needs to be

solved. I believe it is a problem we can solve. I think we are going to have to get way out of the box in terms of how we solve it in a way that other industrialized countries like Sweden and Finland have managed to do.

I do not view a permanent solution as an absolute precondition, however, for any additional deployment of nuclear. I believe that these two issues can be pursued in parallel.

Senator Markey. Okay. Well, from my perspective, this is a perfect subject for discussion in the Build Back Better Bill. We clearly are going to be looking at technologies that should be invested in in order to deal with our clean energy programs, and this is a very good hearing to have in order to explore this one part of it.

I will say, again, a part that is unlikely to add, over the next 10 years, a significant amount of electricity, given the Vogtle Plant experience. But if it is coupled with tax breaks for wind and solar, all-electric vehicles, and battery storage technologies, well, that is a good discussion. Then we can just allow the market to work in order to demonstrate, ultimately, which of these technologies is going to be producing electricity between now and 2030.

Again, I hate to say this, but it is unlikely that there will be another new nuclear power plant that will be authorized in that period of time. But I am very open in the Build Back

Better Bill to adding on to what we already voted for in the infrastructure bill for the nuclear industry. But I think it should all be tied together as an all-of-the-above strategy in this clean energy field.

I thank you, Mr. Chairman, very much, and I thank the Ranking Member.

Senator Carper. The Senator from Massachusetts raised an interesting and timely point. In the Clean Energy Tax Credit provisions within Build Back Better, which I have started to call Build Back Slimmer, but there are provisions that actually do, tax provisions provide production tax credits that are, my staff and I and others on this committee were involved in. We have tax provisions for clean hydrogen, green hydrogen that are in that legislation.

My hope is that, as we come back and try to find the portions, significant portions, I hope, of Build Back Better, Build Back Slimmer, that we will be able to include some of the things that we are talking about right here, makes a lot of sense.

Senator Markey. Can I just say?

Senator Carper. Please.

Senator Markey. The beauty of Build Back Better is that the tax that all these incentives are technology neutral. So yes, it is hydrogen and it is nuclear, but it is wind and solar

and battery storage technologies. So it is technology-neutral, and it will all be there. It is just a race to the finish line at that point, so I just think that is important for us to understand.

Senator Carper. Great, thank you so much.

Senator Markey. Thank you.

Senator Carper. Senator Padilla was trying to join us by WebEx. Do we know if he is on or off? If he comes on, let us know.

Senator Capito, would you like to go next?

Senator Capito. I have just a couple quick questions.

I wanted to ask, first of all, before I do that, because I forgot to do this before, I would like to ask unanimous consent to insert two articles into the record. One is an article from Reuters titled California Urged to Keep Nuclear Plant Open to Meet Climate Goals. The other is from Forbes titled NRC's Rejection of Oklo Application, which we have heard about in this hearing, Shows the U.S. is Miles Behind China in Advanced Nuclear Reactors.

[The referenced information follows:]

Senator Capito. I would say to my friend who is leaving from Massachusetts that I am for an all-of-the-above energy plan, myself. You are just leaving several, very significant energy-producing materials out of what you were talking about. You know what I am talking about: natural gas, coal, carbon capture utilization. I will just put that on the record.

You can head out now, that was my comment to you, thank you.

Senator Markey. I just forgot about carbon capture, we are actually marking at \$200 billion for carbon capture, and \$200 billion for carbon capture and sequestration. So again, we are totally open to any negotiation on carbon, hydrogen, all those issues.

Senator Capito. Thank you.

Ms. Korsnick, during COVID, there were lessons learned all around the horn on everything, but certainly some lessons learned in the NRC and the way they did some inspections by greater remote access to plant data. I am wondering if you have any examples of how these plants have improved their operations because of some of the lessons learned during the COVID pandemic.

Ms. Korsnick. Yes, thank you, Senator. We actually had great success during COVID. We were able to run all of the refueling outages and significant work at all of our nuclear

plants during this COVID experience.

As you mentioned, one of those things was to kind of think about more creative ways that the NRC could conduct their oversight of our operations. At the end of the day, it proved, in some cases, more efficient and helpful for them.

We very much look to identify some of those best practices and integrate those lessons learned into permanent processes and procedures of the NRC. For example, they were able to conduct several of their inspections remotely. Not everything avails itself to that kind of inspection, and so we are not saying we don't need NRC inspectors on site by any means, but there were ways we think that they can run their business more efficiently. We allowed them more access remotely to our sites to facilitate it. I think it was a win-win.

Senator Capito. Good, good. Mr. Harrell, final question from me on the STRANDED Act. I didn't know if, obviously, there is a cost to everything, and there is an authorization level, I believe, in the act that Senator Duckworth has brought forward. I didn't know if you at ClearPath had done any kind of estimate as to what the actual cost of something such as the STRANDED Act could cost.

Mr. Harrell. Yes. It is a great question to ask, Senator Capito. If these economic impact grants continued indefinitely towards 2050, we are looking at \$2 trillion. No doubt, the

status quo serves no one well, and I think that includes Zion, Illinois. We need a variety of solutions to the spent fuel problem.

I think innovation can play a major role in that. I think you have included some important provisions in ANIA to get at the support for communities who formerly hosted sites. One of the biggest things we do, and kudos to you and many members on this committee, including the chairman, on the infrastructure bill, one of the biggest things we can do is avoid closing these plants altogether so we don't have this economic story.

Then, advanced reactors can play a role in using spent fuel. There is innovation in storage of fuel. There are exciting companies like Deep Isolation that are looking at storing spent fuel in bore holes, and so I think that is an area where we can wisely spend dollars and get to a solution. Because I do worry if a \$2 trillion program over the next 30 years is established, we are just perpetuating the same problem that exists.

Senator Capito. Right. Well, thank you. Thank you, Mr. Chairman.

Senator Carper. Thank you, Senator Capito. Again, thanks for your leadership on not just this issue, but especially on one of the two bills that we are holding this hearing on today. This has been a great conversation.

I think we have been joined remotely by Senator Padilla by WebEx. Senator Padilla, if you are there, I would be happy to recognize you at this time. Are you there?

Senator Padilla. Great, thank you, Mr. Chairman. I appreciate the flexibility. I was there in person earlier. As you know, multiple committees are meeting, so I am joining virtually.

I want to begin by recognizing that my home State of California has actually three nuclear facilities in various stages of decommissioning: San Onofre, Rancho Seco, and Humboldt Bay, with the most recent action being the NRC's November 18th announcement that it has terminated the license for Humboldt Bay Unit Three, and released a unit site for unrestricted use.

Operating nuclear power plants provides economic opportunities for local communities during the operation. As plants are decommissioned, communities often experience a significant loss of tax revenue and a loss of good-paying jobs.

I know Senator Duckworth already spoke earlier about the STRANDED Act and what it could mean for communities undergoing these sorts of transitions. I wanted to point out another unique element of the decommissioning process and future use of sites. Some of California's decommissioned facilities are connected to or located very near existing electrical transmission infrastructure. Given the stigma around reusing

former nuclear facilities because of cleanup concerns and otherwise, it does beg the question of how we can best put this land to use after facilities are decommissioned, how we best use the area.

Question for Mr. Knabel. Beyond just financial support, are there additional support or services that the government could provide to smooth transitions and maintain local economies following the closure of a nuclear power plant?

Mr. Knabel. Thank you, Senator Padilla. I believe Senator Duckworth's act addresses that, in part with the task force and the creative grant program, or the XPRIIZE program. As you mentioned, there is a stigma associated with a decommissioned plant that you can look at 90 acres of lakefront property and say, that would be fantastic, but who is going to want to build on a prior nuclear footprint?

On a local level, we try and look at ways to reuse that, and we try and attract business, we try and look at, is there potential for a natural gas plant. Again, you have the switchyard there for the electric grid infrastructure.

So anything that can be identified through federal resources to help get us back on track would obviously be appreciated. I think it is necessary to dig out of the hole for our community, for yours, for everyone that is affected by this, ultimately.

As I mentioned earlier, we have to make sure that we are around to be able to benefit from that. Something like that is going to take quite a while to develop and see the benefit of. Step one of the STRANDED Act deals with noncompetitive grants. But there is a hope that, ultimately, there will be some sort of highest and best use for that property, but we know that it will never be what we originally had, what was there, and what was promised, especially while the spent fuel is still on-site.

Senator Padilla. All right, to be continued.

The second question, let me frame it here. Currently, there is roughly 86,000 metric tons of commercial spent fuel sitting in communities, not just across California, but across the Country. That figure is increasing at the rate of about 22 metric tons per year. The waste is currently stored at 121 sites in 35 States, mostly at the very same facilities that produced it.

In the next three years, all of California's nuclear power plants will be shut down or are in the decommissioning process, which will leave the spent nuclear fuel at each power plant site. Again, referencing California specifically, here. As I am sure you all know, despite safety assurances, localized storage garners intense public interest, particularly in California, in light of seismic activity and earthquake risk. know there is increasing dialogue about the consent-based siting

strategy for storage.

I am asking Mr. Cohen this question, if an interim or permanent storage site ever did become operational, spent fuel and waste would have to be transported through countless communities from the current site to that interim or permanent storage site.

How do you balance that transportation need with the alternative of leaving waste where it currently is, from a risk and benefit standpoint?

Mr. Cohen. It is a great question. I will venture a personal opinion, maybe not even an organizational opinion on this, that it has been demonstrated that we can transport nuclear waste safely. It has been done for many decades.

However, and the alternative is to leave everything where it is, so you do have a tradeoff. There is always some risk in transport, but there is also risk, certainly, to future economic development in communities, as you have noted, in leaving things on-site. I think the best thinking is that we really need to move this waste. Again, I don't think it is an impossible task to do that safely.

I can provide a more thoughtful and extended answer in writing, if you prefer. The evidence does support that you can safely transport nuclear spent fuel.

Senator Padilla. A written response would be helpful and

appreciated. Thank you both. Thank you, Mr. Chair.

Senator Carper. Senator Padilla, thanks so much for joining us, and for your patience today. We have a vote underway in the Floor. I think we have about another 10, 12 minutes that I can stay here with you. It may seem longer, but it won't be long, about 10 or 12 minutes, then I have to go on and vote.

A question, I want to ask one question for Mr. Cohen, and I think probably Ms. Korsnick as well. We will let our other witnesses off the hook on this one. Just keep in mind, I telegraphed my picture earlier. The last question I will ask is, where do we have some consensus here, maybe a couple of major points from each of you to share with us.

Before we get to that, Mr. Cohen, Ms. Korsnick, recent advances in nuclear and material science has provided an opportunity to build safer, more efficient alternatives for existing nuclear fuel rod technology. These technology advancements are leading to a safer, more efficient nuclear fuel rod technology called accident tolerant fuels. These new accident tolerant fuels can serve as an important bridge to advanced reactors, while at the same time, allowing current nuclear reactors to be safer and more cost competitive.

Here is my question, again, for Mr. Cohen and Ms. Korsnick. Would each of you take a minute and discuss what you know to be

the status of accident tolerant fuels today, just briefly, and would each of you provide maybe one policy option we should consider to support the next generation of nuclear fuels? Mr. Cohen, then Ms. Korsnick.

Mr. Cohen. I might suggest that Ms. Korsnick, who is more expert on this topic, go first.

Senator Carper. All right, there you go. Ms. Korsnick, would you go first, please?

Ms. Korsnick. Great, thank you. Yes, so your question is on accident tolerant fuels.

Senator Carper. Yes.

Ms. Korsnick. I think this is a wonderful opportunity for the industry. Again, American innovation at play. I think it is going to bring forward a variety of options, whether those options are used in current reactors that we use today or the reactors of tomorrow. I think it is a great opportunity.

It is likely to be more expensive, so I think, as with anything, I think you have to sort of balance the need for that additional expense with the value that it brings. I think there is a good value proposition there.

In terms of a policy option, I would suggest, we have some investment today in accident tolerant fuel. I think we should look at that investment and see if we can bring accident tolerant fuel to the markets even sooner.

Senator Carper. All right, thank you.

Mr. Cohen, anything, very briefly you want to say, and then we will go to the next question?

Mr. Cohen. I would just add, the next step is obviously to think about fuel fabrication and the full supply chain, and that needs further attention.

Senator Carper. Thank you.

I will go back to my original, what I said to you at the beginning of the hearing. The pitch, well-telegraphed, is right here, in the ideas. We always look on this committee, more than probably any committee in the Senate, as much as any committee in the Senate, we look on ways to find consensus, even where there is a lot of adversity.

What I would ask each of you to do is just to take a minute and tell us where you think there is, based on what you have heard today, and said today, where are some good areas for consensus that we ought to definitely, definitely pursue? Thank you. Let me go first with Mr. Knabel. Would you go first?

Mr. Knabel. Thank you, Chairman. As far as common ground, I don't think these two bills are mutually exclusive to each other. ANIA and STRANDED realize that nuclear is part of our future for green energy.

The piece that needs to be included is the end process. The current process, we are an example of the benefit of nuclear

while the plant was operating, regionally benefitting other communities, nationally benefitting. But the current process ended at decommissioning, where everyone kind of washed their hands of it and said we are done. However, we were still left with the mess.

ANIA recognizes that there is a need to figure out what to do with that waste, that that should be part of the process. That should be part of the overall proposal to make sure that we have the entire beginning to end in the process and how to best have everyone benefit from that and nobody left holding the bag.

Senator Carper. Thank you. Thank you, sir.

Mr. Cohen?

Mr. Cohen. Thank you, Mr. Chairman. I would say, just as a preliminary comment, that I feel like there is a great deal of consensus, certainly, among this panel about what the priorities are, dealing with the legacy problems, but also making sure that there is a viable pathway for advanced nuclear through the NRC licensing process, and also dealing with the long-term waste issue.

Just a sort of an observation, which is that more than the consensus within this committee or among this panel is the fact that there is emerging consensus in the society about nuclear. I think that has changed quite a bit. It should make the job of this committee and this Congress easier.

I inserted some polling data, which is quite interesting, which shows a vast majority of Americans support continued use and expanded use of nuclear energy. In particular, the Democrats, which are often thought to have a less favorable view, are also substantially in favor of this technology.

I don't think it is rocket science to figure out what the remaining areas of concern are: waste, safe regulation of advanced nuclear. We still need the kind of legislation you have put forward in recent years to speed these sorts of less expensive, safer, easier to deploy reactors.

So I am heartened that there is an enormous amount of consensus, not just bipartisan consensus in Congress, but in the society at large.

Senator Carper. Thank you, sir.

Ms. Korsnick?

Ms. Korsnick. Yes, thank you.

I agree very much with Armond Cohen. I would say, areas of consensus are the nuclear is a needed partner with wind and solar to create the best solution. I think very much an opportunity as you demonstrate these technologies can pair very well, you also actually lower consumer cost by doing that.

I think another area is that American innovation is bringing forth really fantastic new nuclear options, making it more flexible and more useful, more diverse, whether it is

hydrogen, whether it is high temperature steam, or whether it is electricity. So we must encourage that. We can encourage it through the licensing process. Make that more efficient. Make the site permitting process also more efficient.

I will end with, the United States does, in fact, need a durable waste strategy.

Senator Carper. Thank you.

Mr. Harrell, please?

Mr. Harrell. Thank you, Mr. Chairman.

I think what I heard clearly was, new American nuclear is an economic opportunity, important to global security, and a climate imperative. It needs to be enabled now. Even Senator Markey, who was talking about a little bit of skepticism, is rooted in, nuclear needs to play a significant role on a relevant climate timeframe.

Legislation like ANIA is going to be necessary to bolster licensing both in the short-term, before the NRC completes the part 53 process, which isn't going to be completed for another three to five years at least, direct flexibility on applications because nuclear can play a huge role outside of electrical applications, like in heavy industry, and common sense permitting. Because in the end, if we are going to contribute to reducing emissions, we need to be able to build these things quickly so they can contribute to a 21st century electrical

grid.

Senator Carper. Yes. Thank you, thank you all.

I will do a couple quick comments, if I could. First, thank you. I want to thank your witnesses. I want to thank all our colleagues who have come today. I especially want to thank Senator Capito and Senator Duckworth for their leadership, Senator Whitehouse, and others.

I want to thank your staffs. We have staffs who work very well together. On most Thursdays, when we are in session, Senator Capito and I meet in person, usually with at least one member of our team, Adam and Mary Frances.

I think on this Thursday, I just suggested to Senator Capito when she ran off to vote, that we think of enlarging that conversation, and people who come to that conversation, but really to focus on follow up to this hearing today, what we have learned, where there is consensus, and some areas that we might look forward to working together, really along the line that Senator Markey has suggested.

We have one witness, at least one witness today from Illinois. I am reminded of another son of Illinois, Abraham Lincoln, was once asked a question, what is the role of government. He said, the role of government is to do for the people what they cannot do for themselves. There is a great role here for us to play on this committee. I think we are

well-primed to build on some of a lot of our earlier work, to build on what was in the infrastructure bill, and to build on what could be in a slimmed-down version of the Build Back Better Bill.

I used to be a governor, and I was very much involved in the National Governor's Association. I headed it for a while and headed up something the NGA called the Center for Best Practices. We would look, I would always look, as governor, at other States and see what they are doing well, learn from what they are doing, and to learn what they are doing badly, so we would know what not to do.

When I look around the world with respect to nuclear, people, my father's family is on the German side, his roots are in Germany, I think the German people are smart and capable people. But the idea that they are shutting down their nuclear power plants so that they can buy natural gas from Russia, not a good idea. Maybe we can keep that lesson in mind as we figure out how to avoid shutting down more nuclear power plants and creating even greater threats on the climate side.

Also, my colleagues have heard me say many times, no silver bullets. No silver bullet as we face adversity here, problems to solve. No silver bullet here, but a lot of silver BBs. How about that? A lot of silver BBs. You have helped us identify a bunch of them. We want to act on it, sooner rather than later.

Last, we had a great hearing a week or so ago on recycling. Senator Boozman and I cochair the Recycling Caucus in the Senate. Others on the committee here are very much involved. Senator Capito and I held a hearing on recycling and recycling strategies working hand-in-glove with the private sector, with EPA, and others.

One of the comments that was made, I think was something like, one person's trash is another person's treasure. In this case, spent fuel rods, some people would call that as trash and something to demean, look at with abhorrence. There is a way, and the people in France are kind of leading the effort here and have been for a while, to figure out how to repurpose spent fuel rods.

I think Ms. Korsnick, I think your statement said about 90, 95 percent of the energy is unused within the spent fuel rods. People think of that as waste. Turns out there is actually, within that trash, if you will, there is a lot of treasure. We have to figure out how to harvest that treasure.

Last, I have focused many, many times in this committee as Chairman and before, I am always, I think what I am about, what I my colleagues think about is, how do we save this planet and the threats that we face with climate change, dire threats we face across the planet and climate. How can we do that in a way that creates economic opportunity, a lot of job creation, and

improves the quality of life for our people? We can do it all. We can, and we have to be smart enough.

When Jim Inhofe and I get together with our colleagues for our Bible study tomorrow, say a word of prayer at the end, we will pray for wisdom. We will pray for wisdom for all of our colleagues and folks like you all and others around the Country, that we are smart enough to figure out how to do it all and get this right. I am encouraged with hearings like this, we will do that; we will do that. In adversity, lies opportunity. Thank you, Dr. Einstein.

Before we adjourn, some housekeeping. Senators will be allowed to submit written questions for the record through the close of business on Wednesday, February 23rd. We will compile those questions and send them to our witnesses, who we will ask to respond by March the 9th, if you could do that.

Do we have any unanimous consent requests to close with? No? Okay. I love to ask unanimous consent requests to include stuff in the record when nobody else is here, so I would be the only one who could object, but I don't get to do that today.

With that in mind, this hearing is adjourned. This has been a great day, and again, our thanks to all of you and to our staffs who worked so hard to make this day possible. Thank you.

[Whereupon, at 12:08 p.m., the hearing was adjourned.]