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Committee on Environment
and Public Works

Washington, D.C.

EXAMINING THE DEVELOPMENT OF PROJECTS AND IMPLEMENTATION OF POLICIES THAT SUPPORT CARBON CAPTURE, UTILIZATION, AND STORAGE (CCUS) TECHNOLOGIES

Wednesday, July 27, 2022

United States Senate

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The committee, met, pursuant to notice, at 10:02 a.m. in room G50, Dirksen Senate Office Building, the Honorable Thomas R. Carper [chairman of the committee] presiding.

Present: Senators Carper, Capito, Cardin, Whitehouse, Merkley, Kelly, Padilla, Cramer, Lummis, Boozman, Ernst.

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

Senator Carper. Let us now proceed with this morning's hearing.

Again, I want to thank everybody who has made it, enabling us to do that much business, thank you. Let us turn now to today's hearing.

We are here today to discuss the potential for carbon capture and storage to help us address climate change, create American jobs, and support economic growth. My sincere thanks to our Ranking Member, Senator Capito, and her staff for requesting this hearing. It is a good idea and a timely hearing. We are grateful for her suggestion and participation in the hearing itself.

As all of us know, this committee has a history of coming together to advance solutions to some of our biggest environmental and infrastructure challenges. I can think of no greater challenge that we face today, as a planet and as a Nation, than the climate crisis. We are reminded of that every day.

The crisis is here now, and we are increasingly feeling its impacts, especially in the form of extreme weather events like heat waves. Last weekend, roughly 85 million Americans from the Southern Plains to the Northeast, 85 million, were under

excessive heat warnings and heat advisories. Just yesterday, St. Louis broke its previous single-day record for rainfall from 1915. Today, much of the Pacific Northwest continues to experience record-breaking high temperatures, putting lives at risk.

It is worth noting that extreme heat is the leading case of weather-related deaths in our Country. The 20 most costly extreme weather events last year alone resulted in the deaths of almost 700 people in our Country, according to data from the National Oceanic and Atmospheric Administration, or NOAA.

Extreme heat is also exacerbating drought conditions across much of the Western United States, threatening critical sectors of our economy like never before. This includes the agricultural sector, which is important to all of our States, and certainly to my State of Delaware.

According to the American Farm Bureau Federation, severe drought in the West forced 40 percent of farmers to sell off part of their cattle herds last year, 40 percent. This year, farmers in California have been forced to cut back production on produce such as cherries and almonds amidst the worst drought in 1,200 years. That is years, not weeks, not months, 1,200 years.

The science is clear: climate change is here, and these costly extreme weather events are continuing to worsen. If we fail to act now and support a clean energy transition, we do so

at our own peril. That is why it is incumbent upon us to comprehensively address this issue, using all of the tools in our toolbox.

Carbon capture, utilization, and storage, or CCUS, are critical tools in reducing the amount of planet-warming greenhouse gases in our atmosphere and keeping global warming below 1.5 degrees Celsius. Don't just take my word for it. Analysis by the International Energy Agency, the United Nations Intergovernmental Panel on Climate Change, and other respected organizations say as much.

Last Congress, thanks to the leadership of our former chair, Senator John Barrasso, along with Senator Capito, Senator Whitehouse, myself, and others on the committee, we enacted the Utilizing Significant Emissions with Innovative Technologies Act. As you know, there is an acronym that goes with that. It is called USE IT Act. We worked together on passing this bipartisan legislation to lower the regulatory barriers preventing the widespread development and deployment of carbon capture.

Today, the Biden Administration's ongoing implementation of the USE IT Act, coupled with new funding for carbon management projects and federal programs through the Bipartisan Infrastructure Law, continues to support CCUS research and deployment throughout our Country. Just today, the Council on

Environmental Quality, known as CEQ, announced that it is seeking nominations to head two new task forces required by the USE IT Act. These task forces will provide input to inform the responsible deployment of carbon capture, utilization, and storage on Federal lands, the Outer Continental Shelf, as well as non-federal lands.

When we talk about responsible deployment of CCUS projects, it is important to emphasize the key role that equity must play here. I have been pleased to see that CEQ's guidance for carbon capture projects has reiterated the need to develop robust tribal consultation and stakeholder engagement plans, while also encouraging agencies to prioritize environmental justice in the development of best practices for CCUS efforts. Doing so protects overburdened communities from the potential negative impacts of these projects and, ultimately, helps ensure that those most vulnerable to climate change benefit from our clean energy investments.

Investing in carbon capture is necessary if we are going to meet our climate goals and create economic opportunity at the same time. Still, carbon capture alone is not enough to avoid a future plagued by deadly heat waves, devastating storms, and other extreme, climate-related events like those that we are experiencing right now.

We must also facilitate the widespread deployment of wind,

solar, nuclear, advanced nuclear, modular nuclear, hydrogen, clean hydrogen, and other forms of clean energy. Together, these technologies hold the key to saving our planet and creating good-paying jobs across our Nation. I hope more of our colleagues engage in policy debates on how best to do so before it is too late.

With that, let me thank our panel of witnesses for joining us today. We look forward to hearing from you as part of today's discussions. Before doing so, let me turn to our Ranking Member, Senator Capito, for her opening statement, and say once again, thank you for suggesting that we have this idea. This is a great idea. Thank you. Senator Capito?

[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, Chairman Carper, and thank you for calling today's hearing. I think it will be very interesting. This is a topic I am very passionate about, and I am glad our committee is having this hearing on carbon capture, utilization, and storage, better known as CCUS.

I also want to thank our witnesses, and I see our fellow Senator down there, all the way down there, in preparation for introductions.

Despite what headlines suggest, climate change is an area where we have found bipartisan solutions. Over the last few years, the committee has developed bipartisan legislation that protects the interests and livelihoods of our constituents, no matter where they live or where they work.

The EPW Committee has led the way in developing climate win after climate win. From the Nuclear Energy Innovation and Modernization Act in 2018 to the USE IT Act and AIM Act in 2020, to the climate title of the surface transportation bill that was signed into law as part of the IIJA last year, we have performed well here at EPW, both on the legislation in our committee and outside our jurisdiction. I want to recognize the leadership of Chairman Carper and Senator Whitehouse in those achievements.

When it comes to CCUS, we have secured passage of the

FUTURE Act that significantly expands the 45Q tax credit for CCUS, enacted the previously mentioned USE IT Act to require the Council on Environmental Quality to expedite the permitting and development of projects, and enacted the SCALE Act to support the transportation of carbon dioxide through additional financing tools. These are all important pieces of legislation now signed into law that are helping to enable a build-out of carbon capture technologies.

Groups from the Intergovernmental Panel, and the chairman quoted from them as well, Intergovernmental Panel on Climate Change at the U.N. to the United States Department of Energy have recognized that CCUS is an essential tool in reducing carbon dioxide emissions. CCUS and other technologies, like hydrogen and advanced nuclear, afford us an opportunity to leverage private sector innovation in the next phase of de-carbonization. Significant further reductions in emission will come from private sector innovation, not top-down government mandates.

The Biden Administration's support for CCUS us crucial to deploying these technologies. In particular, I am encouraged that the Administration has been actively working to implement the USE IT Act. I commend CEQ for taking the recent step of issuing draft guidance, along with a report issued last year, but there is still so much more to do.

I wrote a letter, joined by several colleagues, to Chair Brenda Mallory, asking that any final guidance issued by CEQ be more explicit and detailed. While my staff has been informed the interim guidance will not be updated based on comments submitted, I urge CEQ to reconsider this decision. This CCUS guidance needs to provide direction to federal agencies that will actually expedite project delivery, which was the intent of Congress.

I also understand CEQ is finally starting the process to convene the task forces that were established in the bipartisan bill. I urge CEQ to move quickly to get a range of perspectives on these task forces in order to provide needed feedback on challenges and successes faced by these projects and on ways to improve the permitting process.

In addition to the USE IT Act, I have been closely following the implementation of CCUS provisions in the IIJA. IIJA included the SCALE Act, a bill to support the buildout of infrastructure to transport carbon dioxide to locations where it can be used in manufacturing or stored safely and securely underground. Pipeline infrastructure is essential to decarbonizing industrial clusters all around this Country and moving the carbon to where it can be safely stored or used in products.

The Infrastructure Bill also includes important funding for

Class 6 wells, which is part of a program called the Underground Injection Control Program at EPA. These wells are used to inject carbon dioxide into deep rock formations for permanent storage. The Class 6 permitting program can be administered by EPA or by a State, once EPA has granted primacy to the State.

Part of the IIJA funding for Class 6 wells was included to help the agency process applications from States for primacy and enable States to administer their own programs. Right now, only two States have Class 6 carbon sequestration wells: North Dakota and Wyoming. Other States are following suit.

Primacy is something that the State of West Virginia is working on and something the State of Louisiana has been working on as well, and I look forward to hearing more about their experience.

In many States across the Country, CCUS is on the cusp of a revolutionary leap in deployment; however, I want to clarify that the progress we are beginning to see should not be the basis for more regulations or mandates. Practically speaking, a heavy hand will stifle this nascent technology in the crib and prevent the emissions reductions we have already see are possible when the American economic engine is brought to bear on a problem, even one as big as climate change. Requiring CCUS also would not be lawful under the Clean Air Act's standard-setting provisions.

I look forward to hearing from our panel, again, thank you, about what specific actions are being taken at the private, State government, and federal levels to advance deployment of CCUS as well as what issues Congress should be focused on to reduce and maximize the opportunities of this exciting technology.

Thank you, Mr. Chairman. I look forward to the panel.

[The prepared statement of Senator Capito follows:]

Senator Carper. Thank you, and thanks again, Senator Capito, for suggesting we hold this hearing today.

I was thinking earlier today that this is not a new idea. I came here in 2021, after stepping down as Governor of Delaware, and I remember well a conversation I had with another Senator from West Virginia, who was actually born in North Carolina. At the time, I was the only native West Virginian serving in the Senate.

Robert Byrd, one of the things he mentioned to me when he was trying to teach me how to preside over the Senate, one of the things he mentioned was working on the ability to really capture and sequester carbon dioxide. You have all heard the old saying, somebody who has passed away, they are rolling over in their grave. Well, Robert Byrd today is not rolling over in his grave. He is cheering. He is cheering your good work and recommendations.

Now I am turning over to our esteemed panel of witnesses. We are going to hear from them in a minute in this order: first will be Jason Albritton, the Director of Climate and Energy Policy at the Nature Conservancy. Welcome. Second, we are going to hear from Brad Townsend, Vice President for Policy and Outreach for the Center for Climate and Energy Solutions, and third, we will hear from Jason Lanclos. Jason Lanclos is the Director of the Technology Assessment Division of the State

Energy Office of the Louisiana Department of Natural Resources.

Last but not least, we will hear from John Harju. He is Vice President for Strategic Partnerships at the Energy and Environmental Research Center at the University of North Dakota.

Again, to our witnesses, thank you all for your willingness to appear before our committee today. Before our witnesses begin their testimony, we are going to turn it over to our colleague, Senator Cramer, to introduce one of our witnesses. Senator Cramer, thanks so much for bringing in a good witness for us. We look forward to hearing from John.

Senator Cramer. Thank you, Chairman Carper, Ranking Member Capito, for having this important hearing on a topic that we are all interested in. It is one of the times Senator Whitehouse and I really get to dig in on the same side of something.

CCUS is clearly a topic near and dear to North Dakota, as is obvious by one of our witnesses. We have been at this for a couple of decades. I was an economic development director when a regional organization called PCOR was formed, and John Harju was at the forefront then at EERC, and it is starting to bear some fruit.

North Dakota has been implementing carbon capture, utilization, and storage now for a while. Just last month, Retro Energy, an ethanol-producing company in Western North Dakota, started injecting CO2 in Western North Dakota, deep into

our geology, removing nearly all of the associated carbon emissions involved in the production of ethanol at the plant.

Recently, Denbury Resources, you talked about the two States, Senator Capito, that have Class 6 primacy, there is a gas producing facility in Wyoming that pipes CO2 to North Dakota for utilization for tertiary oil recovery.

Critical to helping all of this, of course, achieve their accomplishments, is our witness today, John Harju, and the rest of his team at the Energy and Environmental Resource Center at the University of North Dakota, otherwise known as the EERC. They are a premier research entity on all fossil fuels, as well as renewable and alternative fuels, and have become a world leader in the field of CCUS, consulting on projects, not only in North Dakota, but throughout the Country.

I want to reiterate a point and brag about them a little bit. John and his team are not just consultants. They are engineers who build and test components, they analyze core samples, perform modeling, advocate for public policy at the local, State, and federal level, and help projects navigate the bureaucracies. They do it all. Colleagues, whatever curiosities you may have, you will not find a better resource than the EERC.

John, in particular, is a familiar face from North Dakota and has been an excellent resource and an important friend to me

and to my office. He serves as the Vice President for Strategic Partnerships at the EERC and leads the Center's efforts to build working relationships with industry, government, and research entities globally in support of EERC's missions to provide solutions to the world's energy and environmental challenges.

I am just really grateful for his willingness to be here today and for his good work and look forward to his testimony and answering our difficult questions.

Senator Carper. Thanks so much for the introduction of John Harju.

I am now pleased to welcome and to recognize Senator Cassidy, who is joining us today to introduce another one of our witnesses that he knows from his home State of Louisiana. Senator Cassidy, please proceed.

STATEMENT OF THE HONORABLE BILL CASSIDY, M.D., A UNITED STATES SENATOR FROM THE STATE OF LOUISIANA

Senator Cassidy. Thank you, Mr. Chairman. Thank you, Madam Ranking Member.

I am pleased to introduce Jason Lanclos. He serves as the Director of the Louisiana Energy Office, Technology Assessment Division within the Louisiana Department of Natural Resources. He serves on the State's Climate Task Force. He is with the Carbon Capture Coalition and an Executive Board Member for the National Association of State Energy Officials.

He will be discussing the implementation of policies related to Class 6 primacy for carbon sequestration wells and other policies to support carbon capture utilization and storage.

The theme of your hearing is the balancing of economic development with how we address climate. For Louisiana, this is an existential issue. The Chairman will relate to this. Louisiana has lost the equivalent of the land mass of Delaware to relative sea level rise. At the same time, we are America's energy coast, providing the chemicals, the plastics, and the fuels that allow modernity to exist. Along the way, these industries employ thousands of Louisianians, providing them with a better living and a better future.

The relative sea level rise and the need to continue to

power our economy and to power the families that are creating that economy is in balance in Louisiana, and no one can speak to that tension and how to balance it better than Mr. Lanclos.

Thank you very much for having him. Thank you for allowing me to speak. With that, I yield.

[The prepared statement of Senator Cassidy follows:]

Senator Carper. Thank you so much. You mentioned the size of land lost in Louisiana the size of Delaware. It is huge. I think my recollection is, for every 100 minutes, Louisiana loses another piece of land to the ocean the size of a football field. Serious stuff, serious stuff. Thank you so much for joining us and for introducing Jason.

Now, we are going to start our witness testimony. Mr. Albritton, I am going to ask you, if you will, to please proceed with your statement when you are ready. Mr. Albritton?

STATEMENT OF JASON ALBRITTON, DIRECTOR OF CLIMATE AND ENERGY POLICY, THE NATURE CONSERVANCY

Mr. Albritton. Good morning, Chairman Carper, Ranking Member Capito, and members of the committee. Thank you for the opportunity to speak to you today.

As you said in the introduction, I work for The Nature Conservancy, which is a global conservation organization. We have chapters in all 50 U.S. States and 79 countries and territories around the world. We are an organization that relies on a science-based approach and a collaborative approach, and we believe that climate change poses a significant threat to our communities, our economy, and to nature itself.

Our best chance to limit the worst impacts of climate change is to ensure that, by 2050, we have reached net zero carbon emissions both in the United States and around the world. This will require significant decarbonization of our global economy in less than 30 years.

In the United States, the transition to cleaner technologies and a cleaner economy is already underway, yet we need to significantly increase the pace of this transition. Carbon management technologies, like carbon capture and storage and direct air capture are important tools and can play a critical role alongside reducing emissions and harnessing the power of nature to capture carbon.

As both of you said in your opening statements, analysis by the Intergovernmental Panel on Climate Change, the IPCC, demonstrates the important role that carbon capture technology can play in meeting climate goals. In the IPCC's most recent report, six of the seven scenarios they evaluated required carbon capture in order to limit warming to less than two degrees Celsius.

Carbon capture is particularly important for reducing emissions from the industrial sector, where it can contribute nearly one-fifth of the emissions reductions needed to meet targets under the Paris Agreement. Industrial processes, such as the production of cement and steel, are central to modern life, but often lack options to reduce their carbon emissions, which is why carbon capture technologies can play such an important role.

Direct air capture must also be a priority for development. Even as we reduce our greenhouse gas emissions, we will likely need large-scale removal of carbon dioxide from the atmosphere to limit global temperature rises to safe levels. This technology, when combined with proven natural solutions offers a way to address legacy carbon pollution that has been building in the atmosphere for more than a century.

The good news, as has already been mentioned, is that Congress has taken important actions in recent years to spur

carbon management technologies. The USE IT Act, which this committee developed and advanced, passed, along with other carbon capture provisions in the omnibus spending bill in 2020, and then last year, the Bipartisan Infrastructure Investment and Jobs Act doubled down by investing over $12 billion in carbon management technologies and related infrastructure. These investments really lay the foundation for rapid scaling of carbon capture, utilization, and storage and direct air capture. Quickly investing these funds and implementing the new authorities that Congress has provided is absolutely essential.

We will also need additional economic incentives, such as the 45Q tax credit that will play a key role in the widespread commercialization and deployment of these technologies. A long-term extension of 45Q, coupled with enhancements such as increased credit values for direct air capture and direct pay options, are critical for building on the momentum that we are already seeing. We urge Congress to pass these critical changes to the 45Q credit.

Moving forward, increased attention should be placed on delivering carbon capture projects and carbon utilization and direct air capture projects on the ground and ensuring that deployment is done in a quick, yet thoughtful and careful way. To achieve this, there are a couple of actions that we can take.

One is what we would refer to as "smart from the start"

land use planning, really considering the impacts upfront to expedite deployment. This will help ensure that CCUS is deployed with as little impact as possible to natural lands, cultural resources, recreation, and other conservation values.

Early engagement of communities is also essential to help avoid unexpected conflicts that will lead to delays and project delivery. Finally, improved coordination among permitting authorities will also enable more efficient approvals. Together, these steps are critical for rapid and responsible deployment.

We must also seriously consider the concerns and potential impacts to communities that have historically experienced the worst impacts of pollution. Community input will help avoid repeating the mistakes of the past and build the local support that is absolutely essential to rapidly deploy these technologies.

Finally, federal agencies responsible for approving carbon management projects will need adequate, sustained funding, staffing, and resourcing for doing this community engagement and permitting.

To wrap up, time is of the essence when it comes to climate change. We must act now, using all of the solutions at our disposal, including carbon capture, utilization, and storage and direct air capture. Federal support, coupled with agency

coordination, thoughtful planning, and early, effective stakeholder engagement will help ensure these solutions are available at the scale and within the timeframe that we need.

We appreciate the bipartisan leadership on this issue in this committee and look forward to continuing to work with you to advance these and other important climate solutions.

Thank you, and I look forward to your questions.

[The prepared statement of Mr. Albritton follows:]

Senator Carper. Mr. Albritton, thank you very much for joining us and for your testimony. We look forward to asking you some questions in just a couple of minutes.

Let us now turn to Mr. Townsend. Mr. Townsend, please proceed. I think you are joining us remotely. Is that correct?

Mr. Townsend. That is correct, sir.

Senator Carper. Where are you today?

Mr. Townsend. I am in Columbus, Ohio.

Senator Carper. Glad you could join us from Columbus, Ohio. We would ask you to please proceed.

STATEMENT OF BRAD TOWNSEND, VICE PRESIDENT FOR POLICY AND OUTREACH, CENTER FOR CLIMATE AND ENERGY SOLUTIONS

Mr. Townsend. Good morning, Chairman Carper, Ranking Member Capito, honorable members of the committee. Thank you for the opportunity to speak with you today about the critical importance of carbon capture, utilization, and storage, or CCUS, in carbon dioxide removal technologies.

My name is Brad Townsend, and I am the Vice President for Policy and Outreach at the Center for Climate and Energy Solutions, or C2ES. We are a nonpartisan, nonprofit think tank based in Arlington, Virginia whose mission is to secure a safe and stable climate by accelerating the global transition to net-zero greenhouse gas emissions and a thriving, just, and resilient economy.

As the impacts of climate change continue to mount, with extreme weather events affecting every region of the Country, we believe a technology-inclusive approach that draws on all available means to accelerate this transition will be needed to avoid the worst impacts of a changing climate.

There are three key points I would like to make during the course of this testimony. First, carbon capture, utilization, and storage, as well as carbon removal technologies must play a crucial role in helping to decarbonize the global economy. It is important to emphasize at the outset that these technologies

are not silver bullets. CCUS is a vital tool to mitigate emissions, and carbon removal technologies hold considerable promise for balancing emissions from particularly hard to abate sectors. Neither technology will allow us to continue with business as usual.

The deployment of these technologies will only succeed if we rapidly reduce our dependence on fossil fuels and accelerate the transition to zero-carbon forms of energy. Still, in a recent report, the International Energy Agency wrote "Reaching net-zero will be virtually impossible without CCUS."

These technologies can cost-effectively address emissions from existing power and industrial facilities, help maintain power sector reliability, and tackle hard to abate subsectors. These technologies also provide a foundation for the development of carbon removal technologies, which can help lower long-lived greenhouse gas concentrations.

Indeed, the National Academy of Sciences has estimated that the U.S. will need to remove one gigaton of carbon dioxide per year by 2050, equivalent to the energy-related CO2 emissions from Texas and California combined. The work of the Intergovernmental Panel on Climate Change, or IPCC, similarly suggests that most pathways to limit global warming to 1.5 degrees Celsius will include the use of carbon dioxide removal.

Secondly, the United States can lead the world in the

development and deployment of these technologies, which would support the competitiveness of domestic sectors like cement, steel, and chemicals while creating opportunities to export new technologies that can help the rest of the world decarbonize.

CCUS and carbon removal projects must build on a foundation of early and continuous community engagement and meaningfully address stakeholder concerns. Doing so can provide significant economic benefits for communities, including job creation and tax revenues.

A recent study estimated that carbon capture retrofits at existing industrial and power facilities could create up to 64,000 jobs by 2035, and as many as 78,000 additional jobs by 2050. Large-scale deployment of direct air capture could create at least 300,000 new jobs nationwide across construction, engineering, and equipment manufacturing sectors, while supporting communities that have helped build the Country and developed skills in fossil fuel production to leverage those competencies in a net-zero future.

Thirdly, we will need a comprehensive policy framework that builds on recent legislative investments to support the entire innovation ecosystem for CCUS and carbon removal. There are three primary areas that Congress can focus on to support these technologies.

First, make further upstream investments in innovation,

including research, development, and demonstration. Second, enact downstream policies like the extension and expansion of 45Q that can help to create and grow markets for these technologies. Third, facilitate enabling policies and infrastructure that can provide a bridge to market for promising technologies. All three areas of policy are necessary.

Supporting technological innovations through RD&D spending without creating market demand will strand new technologies in the labs or at the demonstration phase, while providing market incentives without the necessary enabling policies risks letting deployment stall below its potential as projects run up against non-market barriers.

Robust policy support across the entire innovation ecosystem can help accelerate the development and deployment of CCUS and carbon removal technologies and help the United States meet both climate and economic objectives.

Thank you, Chairman Carper and Ranking Member Capito, for hosting this hearing and for the opportunity to speak with you today. I look forward to your questions.

[The prepared statement of Mr. Townsend follows:]

Senator Carper. Thanks so much. Are you familiar with the facility at Ohio State University, I think it used to be called the Polar Research Center? I want to say there are two renowned Ph.D.s, I think, from West Virginia. I call them the Thompson twins. They have led excursions to some of the highest mountains on the planet, along the equator. Does that ring a bell with you?

Mr. Townsend. It does not, off the top of my head.

Senator Carper. Yes, I just received, earlier this year, a publication, like a regular publication from Ohio State University, where I was a Navy ROTC midshipman, and they had their pictures on the front of it. Just a great story. A love story, but also a great story about their courage and roots in West Virginia and how they found their fame and fortune in Columbus, Ohio. Okay, thank you.

Senator Whitehouse. Mr. Chairman, I have visited their lab.

Senator Carper. Have you really? Oh, good.

Senator Whitehouse. They have core samples from glaciers that no longer exist.

Senator Carper. They are able to look back in time, like, hundreds of thousands of years to see what the carbon levels were all those years ago. It is amazing stuff. They did these trips down to these mountains in their 80s. Just extraordinary

stuff, amazing people.

Mr. Lanclos is next. I am told you pronounce your name Lan-close. Is that true?

Mr. Lanclos. Yes, sir. Actually, the "s" is silent, so it is Lan-clo, but you did a fantastic job. I have heard many different variations of it.

Senator Carper. I am half-right, good. Thank you, Mr. Lanclos. Welcome.

STATEMENT OF M. JASON LANCLOS, P.E., DIRECTOR, LOUISIANA DEPARTMENT OF NATURAL RESOURCES, TECHNOLOGY ASSESSMENT DIVISION, LOUISIANA STATE ENERGY OFFICE

Mr. Lanclos. Chairman Carper, thank you so much for having me today, and Ranking Member Capito, and members. This is just an unbelievable opportunity to tell you a little bit about Louisiana. I am thrilled to be here today.

I feel like a lot of the coastal talking points, Senator Cassidy and Senator Carper, have a very good appreciation for really, what we are facing in Louisiana, and you hit the nail on the head. That was something I was going to say this morning. We are losing land in Louisiana, and that statistic, 100 minutes, a football field size, it is astronomical what Louisiana has lost in the last 20, 30, 40, 50 years. You look at the maps, and we have seen significant changes.

I had the benefit of being able to work for the Coastal Protection Restoration Authority prior to coming over to Energy and really being at the forefront of what I would call big changes happening in Louisiana. It gave me just an unbelievable appreciation for climate and for looking for solutions of things that we needed to do to move Louisiana in the right direction.

As Senator Cassidy mentioned, we have an unbelievable manufacturing and refining base in Louisiana. We refine about a fifth of the Nation's oil capacity, so these industries are

super important. They are weaved into the mix, but they are also located along the coast, so it is very much of a working coast. We have a lot of people who live in these areas that have been impacted directly by climate change.

So when I came over in 2018 and sat down with Secretary Harris, we had some very, very, what I would call, just in-depth discussions about things that we could do to move our department forward, but also to start looking for solutions.

One of the things that we were working on when I was at CPRA was called the verifiable carbon standard, more on the ecological side of carbon management, and we took a step back, and we said, there is really an opportunity for us to be able to apply this to industry and to look at our emission profile.

What I mean by that is, when you look at our emission profile, we have a very difficult emission profile to decarbonize. For us, we quickly realized that we needed to work with industry to look for solutions.

So, CCUS has been something that we have put a lot of time and energy into. We recognized that we had the staff in-house. When you look at our Office of Conservation, we have about 38 folks in that office. We have applied for regulatory primacy with the Environmental Protection Agency. We are very close, we feel, to getting primacy.

We will be the third State in the Nation to get regulatory

primacy. The reason that that is so important is that our staff, we have a great group of geologists and engineers who are very, very excited about working in carbon management. We have actually hired an additional six people just to focus on carbon management who are going to be working with these industry and industrial operators to get their permits out of the door. We prioritize resources, and we have made this something as a major focus of our long-term management of emissions.

The thing that really put this in perspective and really illustrated to us that it would be an unbelievable solution for Louisiana is our Governor signed an executive order in August of 2020 to create the Climate Initiatives Task Force. So you can imagine, in a Gulf Coast State such as Louisiana, a climate plan is something that was very innovative at the time.

I was the designee for our department on that task force. Those conversations, as you can imagine, were not always easy. You are meeting with a lot of stakeholders across the board who have very different opinions on what the best solutions for our long-term management of emissions are.

For us, we felt comfortable as a department that the things that we were pursuing, like hydrogen production and trying to rapidly scale up hydrogen production, carbon management through CCUS, offshore wind and solar, all of those things have to work together.

At the end of the day, there is not a singular solution that is going to solve all of our problems. We continue to go back to looking at long-term management of emissions.

CCUS has shown unbelievable promise. I am here today to tell you that over the last several years, the first meeting that we did, what we call our industry days, when we talked about CCUS, we actually had to get some of our friends to come to the meeting, because there wasn't a lot of interest.

Over the last three years, the interest is unprecedented. The companies who want to do this and who want to look at this as a long-term solution, they are here, and they are telling us that basically, the FUTURE Act that a lot of your members of this committee put forward and a lot of staff have worked so hard on has really been a complete game-changer to making this something that is going to be a viable technology and solution in the future.

I am here today to tell you that we are extremely excited about the opportunities for CCUS in Louisiana. There is tremendous opportunity for us to work together.

I will leave you with the thought that the USE IT Act and the other things that have been put forth by this committee that are actually getting federal agencies to work together on solutions have been instrumental in moving the needle forward. The more that we do that, and the more that we come up with

common solutions to move this forward and to handle our emissions, I think that we are all going to win at the end of the day.

Thank you so much for giving me the opportunity to tell you a little bit about Louisiana, and I really appreciate being here today and having that opportunity.

[The prepared statement of Mr. Lanclos follows:]

Senator Carper. Good. Mr. Lanclos, thanks so much.

That is a very sobering thought. We are going to be in this hearing today for about 100 minutes. During that period of time, another piece of land the size of a football field is lost by the State of Louisiana. Very sobering. Thank you. We can do something about it, and that is what we are here to discuss today.

Finally, we are going to ask for Mr. Harju to deliver his testimony. Mr. Harju, great to see you, and thank you for joining us.

STATEMENT OF JOHN HARJU, VICE PRESIDENT FOR STRATEGIC PARTNERSHIPS, ENERGY AND ENVIRONMENTAL RESEARCH CENTER, UNIVERSITY OF NORTH DAKOTA

Mr. Harju. Thank you, Chairman Carper, Ranking Member Capito, and members of the committee, and Senator Cramer for the kind words and introduction.

My name is John Harju. I am the Vice President for Strategic Partnerships at the University of North Dakota's Energy and Environmental Research Center. Thank you for the invitation to provide testimony concerning current challenges and opportunities in deploying carbon capture, utilization, and storage technology, or CCUS.

The EERC is a business unit of the University of North Dakota, and we are focused on practical solutions to the world's vexing energy and environmental challenges. The EERC was initially founded in 1951 as the Robertson Lignite Research Laboratory under then-President Truman and the United States Bureau of Mines. With the creation of the United States Department of Energy in 1977, we became one of the Nation's five energy technology centers, and we have been part of the University of North Dakota since 1983.

Our mission has evolved considerably over that time, from one focused exclusively on the utilization of the low-rank coals that predominate our Nation's resources west of the Mississippi

River to one that focuses on all fossil fuels, as well as renewables and alternatives and on the attendant environmental challenges associated with development and utilization of energy technology.

As global population continues to grow and nations with underdeveloped economies strive to improve their citizens' quality of life, the need for reliable, affordable energy only grows. Given the limited ability of renewables alone to meet growing energy demand in these coming decades, the continued use of fossil fuels will be needed to maintain our standard of living. The only way to meet the demand for more energy and lower carbon intensity is with an all-of-the-above energy strategy, with a mix of resources, including oil, gas, coal, nuclear, and renewables, such as wind and solar.

CCUS is a critical and versatile technology, and any meaningful attempt to mitigate carbon accumulation in the atmosphere and to reduce the carbon intensity of the American and, in turn, the global economy.

In the arena of CCUS, the EERC has had the privilege of serving not only the Department of Energy, but also more than 200 non-federal partners across the entire CCUS value chain. Our field experiments and commercial-scale operations have added to the wealth of knowledge regarding the full life cycle of CCUS projects, from permitting to construction to operation, and

ultimately, to site closure. These projects were made possible because of ongoing, robust financial support via the Department of Energy's Fossil Energy, now Fossil Energy and Carbon Management Program, and our more than 200 partners and the States that we work with.

The DOE selected the EERC as one of the original seven regional carbon sequestration partnerships in a region that ultimately spans all or part of ten U.S. States and four Canadian provinces. We call this the Plains CO2 Reduction Partnerships, or the PCOR Partnership. Our current goal is to use the knowledge and experience gained over these previous decades to address the current challenges and to accelerate commercial deployment.

Each of these areas within the PCOR Partnership has an economic engine, and each of these economic engines represents the primary emission of CO2. It was apparent, by engaging our stakeholders, that with each of these economic bases, there is significant opportunity to accelerate deployment of CCUS technology and deploy it commercially.

To further the opportunity, we needed to develop economically motivated carbon management strategies. Even though we have economic drivers such as 45Q and low carbon fuel standards, there are business cases and unprecedented interests here in the United States and globally.

The economic drivers are really only one factor. Comprehensive rules regarding the legal aspects, such as pore space ownership and long-term liability, as well as clearly defined communication pathways and an ability to directly interact with regulators, are key tools in facilitating commercial deployment.

To aid in this endeavor, North Dakota was the first State to be granted primacy for the EPA's Class 6 Program. As of today, only Wyoming has joined us with that primacy, as we heard from Mr. Lanclos. We are hopeful that Louisiana will join that exclusive club soon.

My team has been helping with a number of States as they either contemplate or apply for that primacy, sharing our experiences and achieving it. These States include Texas, West Virginia, Alaska, Utah, Colorado, Louisiana, Nebraska, Montana, and Kansas, and again, including Mr. Lanclos' team.

I can testify, commercialization is beginning. Real-world examples are numerous. An essential component is transporting CO2 from where it is captured to where it is stored. A pipeline is the most efficient way to do this. Pipelines for CO2 have been operating in the U.S. since the 1970s and have been shown to be safe. They pose manageable risk, and they have an established legal and regulatory framework for their construction and operation at both the State and federal levels.

Again, I thank you for your time today, and thank you for the invitation to be with you.

[The prepared statement of Mr. Harju follows:]

Senator Carper. We thank you. It was great of you to join us.

In terms of the questioning today, we are going to start off with Senator Whitehouse, Senator Capito, Senator Cardin, Senator Cramer, myself, Senator Lummis. We will start off with Sheldon, and then back to Senator Capito.

Senator Whitehouse. Thank you so much, Chairman. I have a commitment in another committee.

Senator Carper. We know what that is like.

Senator Whitehouse. I appreciate you taking me out of turn.

It is really indisputable, right now, that we will overrun our climate safety barriers, particularly at 1.5 degrees, and because of that, we must be able to remove CO2 from the atmosphere. Once you are out of the safety zone, going to zero emissions doesn't help you any longer. You actually have to claw back the excess legacy carbon dioxide to get to safety. That, to me, is just a given as we forge a pathway to safety here.

This is a pretty well-established technology. I think the Boundary Dam Project in Saskatchewan kicked off in 2014 and proved the viability of carbon removal. Of course, they use it for enhanced oil recovery, which, to me, is a very disfavored use, because it plugs carbon back into the system after having

removed it. I think direct air capture, as the witnesses have mentioned, is absolutely essential, because again, you don't get to a positive outcome if all you are doing is stripping carbon dioxide out of carbon-emitting smokestacks. Direct air capture has to be an absolute priority in this work.

In that framework, we have done some good preliminary efforts here in the Senate, good bipartisan preliminary efforts here in the Senate, to solve the fundamental problem of this industry, which is that it lacks revenue. It is really hard to get innovation happening if there is no reward for the innovation. If there is no revenue proposition at the end of the day for the people who invest in, design, and build these plants.

So we have done that through 45Q. We have done that using public tax deductions as the revenue source, but obviously, that is limited to the scope of the program. I hope to see it continue to grow, but at the end of the day, it is still going to be a limited program compared to having the market operate the way it should.

I also have a CDR bill with Senator Coons that I hope will be able to move pretty quickly, where the United States Government comes in in its proprietary capacity as a buyer of carbon. Those are two ways, by making the U.S. a customer and by providing tax benefits that we can begin to establish at

least the framework for a revenue proposition that gets us through some of the early-stage incubator moments that this industry needs.

At the end of the day, the real solution has to be carbon pricing. Without that, you take away from the market the market signal. I think that if you connect a carbon price to carbon border adjustment, what you end up seeing is huge net value for the American economy. Because the carbon border adjustment, even if we do nothing and just pay the tariff, let's say, to the EU when CBAM comes, let us just say we are losers, and we don't keep up, and we just pay the tariff. On balance, we are still winners because although we lose in the tariff exchange with the EU, we gain an enormous amount, because the EU is also tariffing China.

It is also tariffing India. It is tariffing other countries where manufacturing takes place, and it is creating a price differential that will cause a move of manufacturing to the United States. That is a win for the American economy. At the end of the day, if we don't get carbon pricing and carbon border adjustment done, we are just whistling. We like to talk big on innovation here, but you can't do innovation while stifling the policies that give innovation its oxygen, which is a revenue proposition.

If I could ask, in the seconds remaining, Mr. Albritton or

Mr. Townsend, to say a word on the importance of having a robust, lasting market revenue proposition to support this industry.

Because my time will run out, maybe if we do that as a question for the record to all the witnesses. If you would like to comment on what I have said, I would appreciate it. That answer, in writing, will go into the record of this hearing, and that way, I won't have to hold up my colleagues any longer. Would that be all right?

Mr. Albritton. Yes, I would be happy to do that.

Senator Whitehouse. Great. Much appreciated. Thanks for being here. We have a big bipartisan opportunity, and I look forward to taking advantage of it. This committee can forge compromises that will make a big difference.

Senator Carper. Thanks for that tutorial. We look forward to the responses from our witnesses.

With that, Senator Capito, your turn.

Senator Capito. Thank you, Mr. Chairman.

Mr. Lanclos, it is clear from your testimony that there are a number of projects that are looking to locate in Louisiana because of how Louisiana has translated its expertise in oil and gas development into expertise on carbon capture and storage. Are companies looking at geologic storage onshore and offshore? How is that split?

Mr. Lanclos. Thank you, Senator Capito. At the present time, the State has two pore space agreements, one with a major hydrogen facility and another with a sustainable aviation fuels facility that are both located on State land. Those were two of the first pore space agreements that were done in the State, very innovative agreements that have kind of set the standard for going forward on how that is going to look.

We have interest in offshore. Right now, we are working with our federal family to try to look at how that permitting structure is going and what agency is going to be leading it. So right now, we have three miles offshore we can currently inject carbon dioxide. We do not currently have any projects that are looking specifically at doing that, other than right now, just kind of saying that this might be a viable option.

We haven't done pore space agreements, but we have interest, mostly, from our LNG facilities in Western Louisiana that are looking at doing offshore. But most of the interest, I would say probably 90 percent, has been on onshore, in terms of injections right now. We are looking at long-term management of making offshore resource something that we can put carbon dioxide into.

Senator Capito. Thank you. Could you also discuss what having the proximity to conventional oil and gas operations like refineries and petrochemical facilities affects the economy

scale of CCUS? We know how expensive it is. Does this proximity also provide you with a ready workforce, since there is a custom to working in the kinds of projects and environment?

Mr. Lanclos. Absolutely. Our industrial corridor provides what I would call an unprecedented opportunity, because most of the source material is located in a geographical area where the sinks are located. So investment and infrastructure will still have to happen, but the piping distances aren't hundreds of miles. We are talking about probably 10 or 20 miles, so that helps tremendously when the pore space is located close to it.

As we are looking at decarbonizing with 62 or 63 percent of our emissions coming from the industrial corridor and all of our industry combined, it is very helpful for us to have these sources located close to each other. So we are hoping that, as we continue to roll projects out, that we can start getting facilities into really the mindset to take carbon dioxide out and potentially to bring hydrogen into those facilities to help with long-term management of emissions.

I think that, for us, that has been really strategic in terms of how we are looking at projects. We have had a lot of developers that have put information together that are looking at really coupling sources across that whole corridor.

Senator Capito. Do you have any projects of enhanced oil recovery using carbon net going on right now?

Mr. Lanclos. We do. My understanding is that we have three, I think, two still being active, so one is in an agreement. Most of the interest that we have seen in terms of CCUS has been, I would say that probably 98 percent has been on geological storage. So there are some opportunities, I think, in the Haynesville Shale, where operators potentially have looked at EOR, but the bulk of our interest is in geological storage.

Senator Capito. Mr. Harju, congratulations on North Dakota being the first State in the Nation to get the primacy on the Class 6 wells, so well done. Thank you for mentioning our State. I know we are interested in this.

How has that specifically helped your State, and is it encouraging more additional project development? Has it increased efficiency in moving projects along? What kind of effects are you seeing since you were able to make this achievement?

Mr. Harju. Thank you for the question, Senator Capito. Yes, we have seen pretty substantial proliferation of project proponents in the State. At this point, the State has already issued three facility permits. We have our first commercial project operating. We have about a half a dozen more permits either with a decision pending or permit applications ready to be filed. So these range from power generation to backside of

gas processing to ethanol facilities, and from facilities bringing CO2 in from out-of-State.

Senator Capito. You mentioned you have one that is presently working. Is that correct?

Mr. Harju. Yes.

Senator Capito. Could you describe that one, just for a good example of how this is moving? Could you describe that one for me?

Mr. Harju. Yes, Senator Capito. The first Class 6 well operating in the State is associated with an ethanol-producing facility, namely the Red Trail ethanol facility near Richardton, North Dakota. We also have a series of Class 2 wells where CO2, and both of these were mentioned by Senator Cramer earlier, but Denbury Resources is injecting CO2 into one of our most prolific formations in the State for enhanced recovery. We expect many tens of millions of tons of CO2 to be stored in conjunction with that project.

Senator Capito. Did you have to build new pipelines to carry the CO2?

Mr. Harju. Senator Capito, yes. The pipeline from Wyoming into Southwestern North Dakota was recently extended by about 125 miles from southeastern Montana, actually, from a project that my team had worked closely with Denbury on since 2000, well, Denbury's predecessor, Encore Oil and Gas, since 2005. So

we have been at this a very, very long time.

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

Senator Carper. You are welcome. Thank you very much. Senator Cardin, please?

Senator Cardin. Thank you, Mr. Chairman.

Let me thank all of our witnesses for this very important hearing. I am very proud of the work being done in the State of Maryland. The Maryland Legislature passed a pretty aggressive plan to deal with carbon emissions, reducing greenhouse emissions by 40 percent by the year 2030 and to reach 100 percent clean electricity by 2040.

I might say that is well ahead of the commitments that we have made as a Nation in regard to the international climate meetings.

We know there is not one particular way that we can reach those targets, so CCUS is a very important part of the overall strategies for Maryland and for our Nation in regard to carbon. As we point out, there is no one tool. I just want to associate myself with Senator Whitehouse's comments. A price on carbon would not only accelerate CCUS; it would accelerate our ability to reach our carbon goals.

I want to talk about a couple other issues here. In Maryland, we have put a good deal of confidence in restoring wetlands. Wetlands are a natural ability to sequester excess

carbon. To me, it is low-hanging fruit. We have used our dredged materials to restore Poplar Island and now Mid-Bay, which we have been able to get a recognition of the economic benefit, environmental benefit cost associated with traditional locations for dredged sites. We have also now looked at using dredged material in Blackwater to restore the wetlands in Blackwater. Yes, it will have a plus advantage from the point of view of the environment generally, but it will also sequester carbon as part of this.

So, Mr. Albritton, let me just ask you, if I might, as we look for ways to sequester carbon, shouldn't we look at ways in which we can utilize restoration projects such as wetlands as a way to assist us in reaching these goals?

Mr. Albritton. Absolutely. I think, as you pointed out, we need all of the solutions, and natural solutions are a key part of that. The Nature Conservancy's own research shows that up to a fifth of our emission goals by 2030 can be achieved by these natural solutions. That includes restoring our wetlands, better management of our forests, reforestation, also agricultural lands, storing more carbon in the soil. We see a lot of opportunity here. These can complement the technological solutions we are talking about today, but we definitely need all of them, and it is a smart place to start.

Senator Cardin. I would also suggest an area that might be

a little more controversial. We should look at the NEPA process and use that to establish the real cost associated with transportation infrastructure, including its impact on climate. That would be, I think, a good start also, using another tool to help us reach these goals on carbon emissions.

In Maryland, we have also worked in conjunction with six other States in regard to the Midwest Regional Carbon Sequestration Partnership. Mr. Albritton, you may want to comment on this as to how States can work together to advance new technologies and knowledge and how the Federal Government could encourage that type of cooperative efforts among our States.

Mr. Albritton. I think that is absolutely critical when we think about how we are going to transition to these cleaner technologies. Transport of CO2 has come up a few times. That inevitably crosses State lines in many instances, so that coordination is critical. I think the Federal Government can play an important role in trying to bring States together and foster that collaboration.

One of the provisions in the USE IT Act that was already mentioned is this idea of these task forces to look at some of these issues and get regional input into how we can do that better. I think there are a lot of opportunities there, but while State leadership is important, we have got to look beyond

one State too and how States can work together to advance some of these technologies and some of these solutions.

Senator Cardin. Thank you.

Mr. Chairman, I think my point is this: we do need federal policies. They are critically important. We need our States to innovate, as we have seen in Louisiana and other States. We need regional compacts in order to work together in regions, and we need the private sector helping us if we are going to be able to reach our targets on carbon emissions.

I thank our witnesses for their contributions to this debate.

Senator Carper. Senator Cardin, thank you for those questions, and thank you for your leadership on these issues. It is so important. You are so thoughtful, really, and inclusive as we approach this challenge.

Okay. I think, next, North Dakota. Senator Cramer, thank you.

Senator Cramer. Thank you, Chairman Carper, again, and I thank you, witnesses.

I want to add one point to the Denbury example that John Harju talked about in response to Senator Capito's question, especially since my friend from Wyoming is sitting right next to me, that that example actually generates now net negative carbon oil in North Dakota, as a result of injecting into old wells. A

very important point, I think, that we haven't brought up yet.

There are so many things I want to get to, but Mr. Harju, I want to ask you, Senator Whitehouse talked about a value proposition, which we know he is talking about some sort of profit opportunity in all of this.

With regard to the tax credit system, there are different values. Not every credit is created equally. Not every carbon-reducing technology is created equally. Have you ever done an analysis on the benefit of, say, a 45Q credit versus a credit for, say, electric vehicles, for example, in terms of a dollar per ton or a ton per dollar comparison?

Mr. Harju. Senator Cramer, yes, thank you for the question. Actually, I was recently asked to give a comparative assessment of a conceptualized $10,000-ton EV credit in terms of what that would equate to a ton of carbon basis. My valuation gave me a price of somewhere between $200 and $300 per ton of CO2 avoided over the life of that vehicle. The average vehicle, if you consider that they are going to run somewhere in the neighborhood of about 120,000 miles, that they will have a fuel efficiency of about 23 miles per gallon, a gasoline-fired vehicle will emit about 50 tons of CO2 over its entire lifetime.

Electric vehicles are not zero, so considering that they take their power from the grid, if you used just normalized grid signatures, and the fact that there is a life cycle associated

with production of batteries and so on, they will actually emit somewhere in the neighborhood of about 15 tons of CO2 over the life of that vehicle, again, on a normal life.

So, your net savings would be about 35 tons and at $10,000, you are approaching $300 a ton there.

Senator Cramer. So, versus a 45Q, which is today?

Mr. Harju. Fifty dollars a ton for geologic storage, $35 for CO2 stored in conjunction with a --

Senator Cramer. So even if we went up to $80, it would still be a bargain?

Mr. Harju. I think it would be a relative bargain.

Senator Cramer. Yes. I want to also follow up with something Senator Capito asked you about, and that is, of course, the primacy that North Dakota has, now Wyoming has, and others are trying to get. Since you work across the Country and with the Federal Government, can you give us a little bit of a comparison as to why is this primacy important to a State, what is the benefit versus, say, States that don't have it, versus say, the Federal Government's response to all of this?

Mr. Harju. Sure. Well, I think the proof is in the permits. To the best of my knowledge, I believe the Federal Government has issued one Class 6 permit. The State of North Dakota has issued three, with several pending. We have only had that primacy since 2017.

Senator Cramer. Why is that, do you think? Why is the State doing better than the Federal Government?

Mr. Harju. I think, in the case of States, they are much more familiar with their local geology and the opportunities that the State affords. Regardless of the permitting authority, the federal oversight is really on the wells themselves. So the Class 6 Program really does not deal with pore space access and some of the other ancillary things that are necessary for the construction and operation of a CCUS site.

Our State actually passed comprehensive geologic storage rules prior to the existence of the Class 6 Program, and ultimately, needed to go secure that primacy, even though we previously had fully comprehensive rules, including pore space ownership, unitization provisions, et cetera.

Senator Cramer. How long does the permitting process take?

Mr. Harju. In the State of North Dakota, the average thus far for each of those permits has been seven months. My recollection of the one federal permit was on the order of five or six years in the State of Illinois.

Senator Cramer. Can you, in the remaining seconds, explain how EOR actually functionally works, the amount of carbon storage compared to the downstream emissions from oil produced? Because that is part of the program that is most controversial.

Mr. Harju. Absolutely. Denbury has done a fairly

extensive analysis of their own operations. They estimate that roughly a quarter of their operations, especially those that are industrially sourced or anthropogenic CO2, that each of those is a net carbon negative oil production operation.

So our own research at the Bell Creek Field in southeastern Montana further verifies that long-term secure geologic storage. Our average stored volumes over the course of a project suggests that it is going to be on the order of approximately one-half ton of CO2 stored for each barrel of oil produced.

Senator Cramer. Thank you. Thank you, Mr. Chairman.

Senator Carper. Thank you. We have been joined by Senator Kelly, and I am going to recognize Senator Kelly, and then we will come right to you, Senator Lummis, okay? Senator Kelly, welcome.

Senator Kelly. Thank you, Mr. Chairman. I ask for unanimous consent to change the temperature in this room through the thermostat.

[Laughter.]

Senator Carper. I object.

Senator Kelly. I have heard of these things, and they work pretty well. Thank you.

Mr. Albritton, good morning, and thank you, all of you, for testifying today. This question is for Mr. Albritton and Mr. Lanclos. I want to begin with the two of you.

As many of you know, I supported efforts to permanently reauthorize the FAST 41 permitting process, which I believe is a critical tool that helps large projects navigate the federal permitting process, which can be rather complex. It is especially critical that the federal permitting process doesn't needlessly delay projects that can help us fight climate change, which is why I am glad that the USE IT Act clarifies that carbon capture, utilization, and storage, or CCUS, projects are eligible for the FAST 41 process.

Mr. Albritton and Mr. Lanclos, can each of you speak to the potential benefits associated with allowing carbon capture projects to utilize the FAST 41 process?

Mr. Albritton. Sure. I think the FAST 41 process offers a lot of opportunity for these types of projects. It was actually legislation that I was deeply involved in when I was a staffer on this committee and I see the value of what it can do, because it encourages agencies to get together early and to coordinate permitting instead of doing it sequentially.

I think that type of coordination, as I highlighted in my testimony, can really help project approvals be much more efficient so that we don't go agency by agency by agency, but we kind of get together up front, figure out what the requirements are, and then try to do that in the most efficient and coordinated way possible.

Mr. Lanclos. Senator Kelly, thank you so much for your question. I think that Mr. Harju really articulated the point very well, that there haven't been many Class 6 permits that have been filed in the United States thus far, so the numbers are very, very small. If we proceed with what we are doing in Louisiana, we think that that number could be in the neighborhood of 25 to 30 permits in the next two to three years, rapidly changing how quickly we need to assess these permits.

Our big area of emphasis thus far has been, obviously, to try to get regulatory primacy, because we feel like we have an extensive staff who can really look at the geology and try to make these decisions more quickly. In addition, we also have the opportunity to get outside help to come in and bring this.

What FAST 41 brings to the table for us is exactly what was articulated by Mr. Albritton, the federal coordination and agencies working together early and consulting with us and working through these projects would help tremendously. Because the workload is obviously going to change based on the level of interest.

We really feel, to be able to make an impact and to get these projects out of the door, developers and folks who are doing these projects, they are very capitally intensive, and we have to make sure that they have clarity in terms of how quickly these permits can be turned around. We cannot afford to review

them in five and a half to six years. So focusing on resources and making sure that folks are coordinating needs to be first and foremost in this process.

Senator Kelly. Do you think OMB and the Council of Environmental Quality have done enough to allow projects to take advantage of this process?

Mr. Albritton. To my knowledge, I don't think a carbon capture project has yet stepped forward to take advantage of the FAST 41 process, and it is really on the project developers to come forward and request to be part of that, so I think that is something that is needed.

I do think the actions taken in response to the USE IT Act by the Council on Environmental Quality, to issue guidance to agencies to how to think about this is an important step forward. Obviously, there is always more that can be done, but that is a good start on this topic.

Mr. Lanclos. I think, in addition, I have heard that the two task forces that they are talking about, in terms of looking at offshore and onshore storage, I think that there is going to be a lot of interest in terms of moving both of those forward very quickly. I think that CEQ just leading that effort and making sure that the right partners are in place, land rights and pore space continues to be first and foremost when we are looking at siting projects.

So obviously, we have a lot of State lands, but obviously, when we start to look at offshore, we need to make sure that resources are in place and we have a very clear understanding of what the federal process is for injecting carbon dioxide into offshore waters.

Senator Kelly. Thank you. I appreciate that, and thanks again for being here.

Mr. Chairman, I yield back the remaining 14 seconds.

Senator Carper. We are happy to have them back.

Senator Lummis?

Senator Lummis. Thank you, Mr. Chairman, and thank you, Ranking Member Capito for hosting this hearing.

Senator Cramer and I have been sitting here, proud of our two States and their leadership in carbon capture, utilization, and storage. There has been a lot of forward-thinking in your State, mine, from policy leaders. The University of Wyoming School of Energy Resources, the Wyoming Energy Authority have been involved with you all in North Dakota, and you are making real, genuine progress. Substantive goals are being met. Thank you for that.

My first question is for Mr. Harju. Thank you for your testimony. I understand, from Dr. Holly Krutka at the University of Wyoming, that in a few days, we will be calling you Dr. Harju. Congratulations on that.

I want to focus on one aspect of CCUS with my questions, and that is geological storage. Mr. Harju, you mentioned in your testimony one of the challenges to expanding geological storage is the complicated legal and regulatory regime around pore space ownership and long-term stewardship. Can you talk a little more about what North Dakota and Wyoming have done to address these challenges, particularly around long-term stewardship?

Mr. Harju. Thank you for the question, Senator Lummis. Yes, North Dakota and Wyoming have had a wonderful working relationship for a long period of time. I am delighted to call Dr. Krutka a friend and colleague. Our States have shared our experiences over time, and copied one another's successes and avoided one another's misses. Anyway, it has always been a pleasure.

With respect to long-term liability, North Dakota established a long-term liability trust fund because of concerns that companies may not be around in perpetuity, and the fact that a trust fund would be a reasonable way to manage any long-term stewardship associated with CCUS projects.

The way that this works in the State of North Dakota is companies pay into this trust fund over the life of their project. The fee is set administratively and based on, essentially, you could almost contemplate it like a State-run

insurance fund is the way I would look at it.

In North Dakota, after a ten-year post closure monitoring period where the site is carefully monitored at the expense of the project developer and operator, the State is authorized to take title to that injected CO2. I believe the similar program in Wyoming has chosen a post-closure monitoring period of 20 years as the default.

Senator Lummis. Thank for your explanation. I think this is part of the example of the forward-thinking that is going on in expanding geologic storage, so good on you. Good on our States, and I am proud of the work you are doing.

My next question is for all witnesses. Should the CEQ support expediting CCUS permitting as a way to encourage and support carbon capture?

Mr. Albritton. I think there are always opportunities to be more efficient in permitting, and I think CEQ in its guidance laid out some opportunities on how we can do that, by regional approaches and other tools that they have. I think that has to also be balanced with making sure we are doing thorough reviews and getting strong community engagement in those reviews so that we get good outcomes at the end of the process.

So I think we can achieve both, and I think that is the right direction to go.

Mr. Lanclos. I agree very much with Mr. Albritton's

comments. I think that, again, that coordination and communication both from all federal agencies with the States is absolutely essential to moving these projects forward. These permits are extremely labor-intensive. We understand that the modeling and the geophysical aspects for a Class 6 is some of the most extensive that is out there right now. So having folks at the table working together is absolutely essential, so yes, thank you very much.

Mr. Harju. I would concur. I would especially urge the Federal Government to work toward a responsible means of permitting and accessing federal pore space. It is a really big issue as you get to the west.

For instance, in Senator Lummis's State, roughly half of the State is under federal pore space ownership. Right now, I do not see a means of accessing federal pore space to do these kinds of projects. So when we see federal pore space on the map in North Dakota, as we contemplate projects, we step away from it, because we see it as more of a risk factor than an opportunity.

Senator Lummis. Yes. Great point. Thank you all for your testimony. Yes, sir.

Mr. Townsend. If I may, sorry. Just sort of chiming in here remotely. I think, just to underscore, I think this is an area of real agreement. It is also certainly true that, in

order to meet climate goals and grow the economy, we have to be able to build a wide range of clean energy and zero carbon infrastructure, including CCUS infrastructure for transmission, et cetera.

It is also true, I think, that a growing number of organizations on both sides of the political spectrum acknowledge that the system we have in place is not currently working. So the good work being done by folks, for example, at the Federal Permitting Improvement Steering Council to promote transparency and coordination in partnership with CEQ is going to be really critical.

I think it is our view that there are certainly opportunities to improve the current system in ways that still protect the vital community and environmental interests while also allowing the Country to build the infrastructure we need for the net-zero transition. Thank you.

Senator Lummis. Thank you, gentlemen. I appreciate your testimony. I yield back.

Senator Carper. Thank you, Senator Lummis.

We have been joined by Senator Ernst. Great to see you, second time today. Welcome. You are a great, faithful attender of these hearings. We are grateful for that.

Senator Ernst. Thank you, Mr. Chair. I really appreciate it. Thank you to our witnesses for being here today, as well.

Mr. Harju, biofuels have really enabled the U.S. to cut emissions from the transportation sector for over a decade. Between 2008 and 2020, the RFS saved nearly one billion metric tons of carbon dioxide equivalent greenhouse gas emissions, and it is only getting cleaner at this point.

Biofuel can further reduce greenhouse gas emissions with carbon capture and sequestration technologies and on-farm conservation practices, which many of our Iowa farmers are actively engaged in.

Mr. Harju, in your testimony, you mentioned a need for an energy strategy to recognize the importance of the environment through lowering carbon intensity, as well as our economic and national security. Can you talk more about why CCUS is such a key part to that all-of-the-above energy strategy?

Mr. Harju. Absolutely. Thank you for the question, Senator Ernst.

In fact, I will offer a quote from our governor, Governor Burgum. We can reach carbon neutrality in the State of North Dakota by 2030 without a single mandate, without any additional regulation, and we can get there through innovation and the geology that we have. This has been a fundamental tenet of how North Dakota will be a carbon manager.

Ironically, some of that carbon dioxide that we intend to manage would actually be born in the State of Iowa, so one of

the project proponents and a client of my team is looking to gather carbon dioxide from 30 different ethanol plants, many of which are in your State, and move them up into the State of North Dakota, picking up CO2 in South Dakota and the State of Minnesota as well. So that really goes to that importance of a pipeline system that would take carbon dioxide from places that did not have geology that is favorable for direct storage of CO2 to places that are.

Senator Ernst. I appreciate that. I am a farm kid, too, and I am very familiar with the crossover between our energy and our agricultural sector.

What is really exciting to me about the CCUS technology is the ability to intertwine that carbon in that relationship. As you stated, in your home State of Louisiana, Governor Edwards has made carbon capture a priority for his administration.

Maybe describe a little more of that to me, if you would, please, but how has Louisiana really been working with those landowners to ensure them the support of those CO2, and yes, this is for you, Mr. Lanclos, to ensure that broad support for CO2 pipelines and avoid using eminent domain? Because right now, that is an issue.

I know that through some of our farmland, our ag land, we have experienced those that are using eminent domain, those that are trying not to use eminent domain. So, if you could just

address that, that would be good. Thank you.

Mr. Lanclos. Absolutely, thank you so much, Senator Ernst, for your question. About three years ago when we started with this process, early engagement is absolutely critical. So, we have a couple of association, one, the Louisiana Landowners Association, where we did a series of presentations. Our executive council actually created a committee which brought in landowners and folks who are actually using pipelines or potentially were looking at permitting pipelines to really look at ownership issues and look at siting.

So I think that that committee was instrumental in really educating folks in terms of what these projects look like in terms of what we would need. We are fortunate that we already have a number of CO2 pipelines that traverse the State. But obviously, there will be a need, as we move forward, for more.

I think that early and often engagement is absolutely essential in working with landowners so that they understand that these projects are critical and what their overall intent is doing in our State. We have continued to do that, and I think that the committee has been very successful in really educating folks about it.

Senator Ernst. I appreciate that. I think education is key to everything and making sure that the folks engaging in the project are well-advised on how it will impact them, and of

course, our future with the new technologies that are coming out.

I really appreciate the hearing today. Thank you to our witnesses. Thank you so much. I really appreciate the input. Thank you, Mr. Chair.

Senator Carper. Senator Ernst, thank you so much.

I think everyone else has had a chance now to ask at least one round of questions. I have several questions of my own, and then I am going to yield to Senator Capito, and see if anyone else shows up to join us. This has been a wonderful hearing so far. I knew it would be, and you haven't disappointed. You haven't disappointed at all.

The newest climate assessment report issued earlier this year by the United Nations International Panel on Climate Change is clear. Carbon capture, utilization, and storage technologies are not the only answer to climate change, but it must be part of the climate solutions. I am going to say it again. Carbon capture, utilization, and storage technologies are not the only answer to climate change, but must be part of the climate solutions.

More specifically, the report suggests that to limit global warming to 1.5 degrees Celsius by the end of this century, we need global usage of carbon removal technologies like direct air capture.

This will be a question, I think, I will ask for Mr. Albritton, Mr. Townsend, and Mr. Lanclos. Your testimonies identified the importance of CCUS in our battle against climate change. Would each of the three of you please take a moment and speak to the need for additional large federal investments in CCUS and other zero-emitting technologies so that these technologies are able to be deployed quickly into our economy?

In your answers, please discuss the cost to every American and to U.S. businesses if we fail to make significant investments in climate solutions this year. Mr. Albritton, do you want to lead us off on that question? Thank you.

Mr. Albritton. Sure, happy to. I think, as I highlighted in my testimony, we have had a lot of progress, so that Infrastructure Investment and Jobs Act invested 12 billion in carbon management technologies. That is a strong foundation, but we definitely need more. The 45Q tax credit, for example, is an important additional policy to continue to drive investment, and we need long-term extension of that.

There are a range of other clean energy technologies, from renewable energy to hydrogen that was discussed, that also need that same type of federal investment if we are going to see it scale up, and we are going to have this transition happen in a quick way.

I think there are clear economic benefits of doing that.

There is the economic costs that are avoided if we avoid those impacts of climate change. You highlighted a number of them in your opening statement, Senator Carper, that cost to communities, to taxpayers, whether it is floods or wildfires, that is a cost savings if we avoid this.

But these investments can create jobs and create jobs for communities, and so I think it is important to realize that there is an economic benefit of these types of investments that we can realize, and if we don't make those investments, we are leaving all of that on the table.

Senator Carper. Thank you. Mr. Townsend?

Mr. Townsend. Thank you for the question, Chairman Carper. I think, as Jason pointed out, the investments made as part of the Bipartisan Infrastructure Law are a really crucial down payment on the future of CCUS and carbon removal technologies. There is more that we could be doing, in terms of RD&D, including things like increasing the efficiency of separation technologies, regeneration and reuse of materials used to capture carbon dioxide, the potential of hybrid separation systems. Utilization is going to be a really critical opportunity on the research side to really expand markets for these products.

I also want to pick up on the second part of your question, which Jason also touched on, which is about the need for broader

investments in these technologies. There is a lot more that we could be doing on the hydrogen front and more broadly, as well.

You mentioned during your opening remarks some of the work the NOAA has done on weather and extreme weather and climate-related events. We have already had more than nine events with losses exceeding $1 billion this year in the United States, which is greater than the average between the years 1980 and 2021. So we are already seeing the impacts of climate change. These investments do pay a dividend in terms of reducing those long-term costs and impacts to communities.

But also there is the low-carbon economic opportunity that could be as great as $26 trillion, globally, by 2030. If we want to take advantage of that opportunity and reduce the cost of extreme weather, this is really the moment for policy makers to take significant steps to invest in that future.

Senator Carper. Thank you, sir.

Mr. Lanclos?

Mr. Lanclos. Yes, sir. Chairman Carper, fantastic question, because I think what we are seeing as well in working with DOE and some of our other federal partners, they are estimating that we need in the trillions of dollars for decarbonization. So every program that we put forward, we are going to develop efficiencies. We are going to develop economies of scale. Manufacturing is going to get better. We

are going to get better at producing hydrogen. We are going to become more efficient.

But with CCUS, it is absolutely critical that we get the cost down. I think that for us, we have done a lot of economic analysis and understood that there are some challenges to get there. The $50 per ton is fantastic, but a lot of industries that are hard to decarbonize will need more funding to be able to get those costs to where they are in a manner where they can rapidly deploy this technology.

In Louisiana, where we have so many industrial emissions, getting those costs down is going to be absolutely essential because we want to make sure that these projects can be beneficial in the long-term, but also be financially viable.

Senator Carper. Thank you. I am going to hold my questioning there and hand it back over to Senator Capito. I have some more questions, but Senator Capito, please.

Senator Capito. Thank you, Mr. Chairman.

I would like, Mr. Lanclos, follow up from where you left there. To make the 45Q tax credit more beneficial and be able to deploy these technologies faster and make the projects go faster, there has been some discussions of direct pay of the tax credit. Do you think that that is something that we should seriously look at? Do you have an opinion on that?

Mr. Lanclos. Thank you, Senator Capito. As I mentioned in

the earlier testimony, in terms of economic analyses, as we were going through the process of looking at the cost per ton, the 50 versus 85 when that was still in play, one of the analyses that we saw showed that if we got to even $85 to $90 per ton, that potentially almost 90 percent of the industry in the State of Louisiana could potentially utilize carbon capture, utilization, and storage to where the economics would make sense.

I think that for us, $50 is a tremendous start. It looks at, probably, and brings about 48 percent of industry to the table. But in addition, what gets left behind, I think, in the conversation sometimes is some of the smaller operators and the smaller industries that don't have a lot of tax liability and don't potentially have as much use for tax liability, where direct pay would be a lot more beneficial.

So I think that, for us, many of the companies that we have spoken to have said that that could be an absolute game-changer in terms of if it is still $50 a ton, direct pay would be tremendously beneficial to them getting deployment of CCUS projects earlier rather than later.

Senator Capito. Thank you. Let me ask a question about, there was some initial discussion, I think, in several of your statements about communities that have been heavily impacted by emissions. There has been some discussion in this committee as well as to how to help those communities.

In my view, I think that industrial use of carbon capture is a tremendous way to help those communities, obviously, from CO2 emissions. But isn't it also a way to, if carbon capture is occurring at an industrial site, say, a refinery is next door to a disadvantaged community who has been living there forever, are there other pollutants that are removed as you are cleaning up the carbon, are you cleaning up other things as well? Is that the case? Mr. Lanclos, I will go back to you.

Mr. Lanclos. Sure. So, Senator Capito, I have seen some preliminary analysis that shows that carbon capture, even amine-based carbon capture, significantly reduces criteria pollutants, in addition to particulates. So we are hoping that in the next several months that the funding associated with these studies continues that really illustrates that data, because at the end of the day, I think that there are often associated things about carbon capture meaning that they think that facilities will rapidly expand and that the footprint and the operations will get larger.

I think that, for us, it is imperative that community engagement includes that this actually just includes a pipeline and an injection well that is taking carbon out of these facilities and putting it into storage in geological formations.

So I think that your point is very well-received. The data that we have seen is very encouraging, and we are really hoping

that these studies can really move forward that shows that these community impacts can be positive if CCUS is employed in these areas.

Senator Capito. Does anybody else have a comment on that, from the panel? Mr. Albritton?

Mr. Albritton. I would just say, it is important, I think the criteria pollutant issue is a really important one to look at. I don't think there is enough data out there right now, but I think it is primary for research because, and I think that is one of the key issues. Removing the carbon is great, and that has a huge environmental benefit. We shouldn't discount that.

But many of these facilities have ongoing issues with other air pollutants, and that just has to be part of the equation. I think, if we make that part of the conversation about where we deploy this technology and, importantly, get input from those communities that live there as part of the process and understand what their concerns are, I think that is also an important part of this, to make sure we are addressing these concerns.

Senator Capito. Thank you.

Senator Carper. The Council on Environmental Quality recently issued CCUS guidance as directed by the USE IT Act recognizing the climate change benefits from CCUS deployment, as well as a possible public health and environmental impact,

especially for frontline communities. Some of our colleagues have stated that CEQ's guidance does not adequately expedite the deployment of CCUS projects and has suggested that additional reforms are needed at a time when federal agencies are still developing best practices within existing permitting processes to support the deployment of CCUS.

Mr. Albritton, how do you think the implementation of the USE IT Act is going? Do you share CEQ's view that early public engagement and the CCUS permitting process is likely to lead to a more efficient approval process?

Mr. Albritton. I think important progress has been made on implementation of the USE IT Act. We talked about a number of the provisions there, that we are seeing progress, including the guidance as well as the announcement this morning of nominations for the task forces.

I do think that, and this was in my answer to Senator Capito as well, that early engagement is really important in making sure that impacted communities are at the table early in the process. I think that is critical. I think the CEQ guidance recognizes that. That is an important part, because if we don't engage those communities early, that concern and the opposition to these projects will build, and that will ultimately delay deployment. That doesn't serve any of our interests, so I think that is a critical piece that we really

have to focus on.

Senator Carper. Thank you. Just as a follow up, would more resources for the federal as well as State agencies to review and to approve carbon management projects help expedite the permitting process, and if so, why?

Mr. Albritton. Absolutely. Doing robust permitting, doing good community engagement, it takes resources, and we have to invest in that. I think we often think about investing in the technology or investing in other aspects, but discount this piece. But it is an important piece, and if we all share the goal of rapid deployment of these technologies, this is one of those places we have to put more funding into, and I think it often is not in the same discussion. We have to make it.

The Princeton Net Zero America Analysis that was released recently looked at carbon capture deployment, and they estimated that by 2035, we need to invest nearly $13 billion in stakeholder engagement, permitting, site assessment if we are going to deploy these technologies at the scale that we need. So I think that is a good indicator of why this is such an important issue and why we need significant investment in this.

Senator Carper. Thanks for that.

Mr. Townsend, if I could, I would like to address another question to you. Direct air capture is one type of CCUS technology that can remove existing CO2 from the atmosphere, as

we know. Direct air capture technology offers virtually unlimited carbon dioxide removal potential, if cost and other barriers can be overcome. This technology also has important advantages in terms of siting flexibility and scalability.

Mr. Townsend, would you take a moment, please, and describe for us some of the benefits of direct air capture technology in comparison to other carbon removal approaches? What is maybe the most important thing that Congress can do, that we in this body could do in the near term to help direct air capture technologies be quickly deployed and commercialized to scale?

Mr. Townsend. Thank you very much for the question, Senator Carper. I think there are really two chief advantages of direct air capture, and you touched on them, scalability and siting flexibility. Not only is this technology deployable at really significant scale, it can also be co-located in places where there is either excess renewable power or even excess nuclear capacity, as well.

I think the chief thing, the principal thing that Congress could be doing at this point was already a part of the conversation around the extension and expansion of the 45Q tax credit, which would be adding the $180 per ton credit via 45Q, which would really go a long way towards facilitating projects.

Additionally, some of the work that has been done around hubs that works to capitalize on shared infrastructure are also

key. But really, the extension and expansion of 45Q, I think, would be the most significant priority.

Senator Carper. Okay. Senator Capito, please, and then I have a couple more questions as well.

Senator Capito. I don't have any further questions, Mr. Chairman, but I do want to express my gratitude to you and to the staff of the committee for putting this together. I think it is really refreshing to have a goal of cleaning the environment and decarbonizing where we can both, from each side of our aisles, because sometimes it would be very sensitive subjects, we can work to find solutions, and I think that is what we have heard today.

We have got some really good suggestion on ways that we can improve this. I am very excited about the future of this. Thank you.

Senator Carper. I am excited, too. My colleagues, certainly Senator Capito, has heard me quote Albert Einstein too many times, but among the things he said was, in adversity, lies opportunity. In adversity, lies opportunity.

People, my wife thinks I am too much of an optimist. I am an optimist, and I have always been an optimist. But I think there is a reason, as we face all this terrible climate crises going on around the world, there is a real opportunity here. There is a real opportunity to take some of these ideas that we

are discussing today and prove them and go to work on it.

Not only address the climate crisis, but also provide for economic opportunity, job creation, which for me is like, the golden, not the golden rule, but it is exactly where I want us to go.

Okay. A couple more questions, if I can, and then we will wrap it up.

Maybe I can move to a question for the entire panel. I appreciate the perspectives the entire panel has shared with us. We appreciate the perspectives that you all have shared with us and the opportunities and some of the challenges for carbon capture utilization and storage. I hope that this dialogue can help inform thoughtful action to support the future deployment of CCUS innovation and deployment.

I would just like each of you to take a minute or two and tell us where you believe there is common ground among all of you on this panel. Senator Capito and I always try to come back to, where do we agree. There are plenty of areas where we can disagree, but I always look for consensus among the panels, especially one as good as this one.

If you all would just give us your thoughts, where do we agree? Let us start on my left. Go ahead, please.

Mr. Albritton. Sure. I think we have heard tons of agreement on this panel, which is encouraging. I think a couple

of different areas that I have heard, one, I think the continued federal support and investment in these technologies, whether it is the 45Q or other means, I think that is a pretty shared perspective, because it will be vital to continue to scale up these technologies in the years to come.

I also think that that idea of how do we better coordinate as we try to deliver this, so that we are getting all of the folks around the table, whether it is the State agencies, the federal agencies, or the outside stakeholders. I think that is another shared priority, and I think we can do much more in that space. That is an opportunity.

Mr. Lanclos. Chairman Carper, I think that at the end of the day, for us and as the panel has expressed, there is hope that we have solutions. I think that, for us, that is what is most exciting. I think that, for a State like Louisiana, we have gotten to the point where we have seen four and five record storms that have happened per year in the last several years. This gives folks an opportunity to say that, look, we are working towards solutions. We are working together. Folks are coming together to employ the best available technologies. We are looking at things from a very comprehensive lens, and we are thinking about our communities and making sure that they remain a priority and that folks understand why we have to make these investments.

I really appreciate your support and all your committee staff support to really put this dynamic legislation together to put 45Q in a position to really make an impactful change.

Senator Carper. Thank you.

Mr. Harju. Certainly, I can echo those comments. I would say growing the 45Q values at least commensurate with the kind of inflation we have seen. I know on capture projects that we have on the cusp of implementation, we have seen prices of steel up considerably. Total installed capital costs on one of the projects we have been working on has gone from right around $1 billion to almost $1.6 billion. So you see the effects of the monumental inflation we are experiencing, and it would be really nice to see that in the credit values as well.

I would urge anyone who can be helpful to help grow that primacy club and extend it to our colleagues in Louisiana and those other States who are eager to move forward with these kinds of projects.

Finally, I would just implore everyone, let us focus on emissions and carbon reductions, as opposed to on fuels themselves. I see a lot of discriminatory action regarding the sources of emissions as opposed to the things that we can do to mitigate emissions.

Senator Carper. All right, one more. We have one more witness. Please.

Mr. Townsend. Yes. Thank you, Chairman Carper. Thanks again, also, to you and to Senator Capito and your teams for holding this hearing. It is incredibly important in this moment. I would echo, among the panel there certainly seems to be a lot of agreement, and that is a very encouraging thing to see.

I think a few things stand out to me where there has been some pretty clear consensus, including the fact that CCUS and carbon removal technologies just have to be part of the solution to address long-term climate mitigation. Secondly, that there are significant opportunities, economic opportunities to deploy these technologies and benefits both domestically and globally, presuming that there is early and continuous public engagement in working with communities.

The last area where I heard a lot of agreement, I think, which Mr. Harju just touched on, is policy is going to be really important to help not just drive these technologies, but really to attract the private sector investment that is going to be necessary to deploy them at the scale and speed that is needed. Thank you very much.

Senator Carper. Thank you, thank you very much.

We have a little time here. I want to say, if you prepare for these hearings, and you prepare for probably much of your life, actually, and the work that you do is just so important.

We have asked some questions, and my colleagues have asked some very thoughtful questions, and you have provided thoughtful responses. Each one of you, starting off with maybe Mr. Albritton, is there a question that maybe you think could have been asked, should have been asked, that you would like to say, well, maybe you should have asked this one too, and here are my thoughts?

Mr. Albritton, why don't you go first? I don't believe we have asked every good question, so maybe you have another one.

Mr. Albritton. It is always tough to go first on this one. I think we have covered a lot of the important issues around this technology and the deployment.

I think one issue we haven't focused on as much, because this hearing is about carbon capture, is how does carbon capture fit in with all of the other solutions that we have to deploy to address climate change. Clearly, it is an important tool, but I think that is an important question moving forward, and we have to look at this and a lot of different solutions if we are going to really address this problem.

Senator Carper. Thank you.

Mr. Townsend, maybe one question you think we didn't ask that we should have asked?

Mr. Townsend. Thank you. I think that I would be keenly interested in further discussion around the workforce needs, in

terms of the skills that are developed that has been touched on, the fungibility of skills in traditional fossil, oil and gas and other sectors. I think really sort of building out a deeper set of knowledge about what it is going to take to facilitate and build the workforce that we need to deploy these technologies would be an interesting area of discussion.

Senator Carper. Good, thank you.

Mr. Lanclos?

Mr. Lanclos. Yes, sir. At the end of the day, I think for us, one question would be as a State, we are advanced in our primacy application. But I think it is important for States that are considering it to understand what resources and what is ahead of them in terms of how they can be successful in getting primacy and deploying CCUS in their States.

We have been trying very hard to work with other States to provide resources. I know Mr. Harju and his team have really been a great resource for us, as well as Wyoming. They have come to us and helped us with training. So I think that just making sure that States understand the process and have all of the associated resources for community engagement and also for staff.

Because again, if we are successful in deploying CCUS and we do get to a point where we have a multitude of permits that get filed, that last thing that we want to have happen at the

end of the day is that there is a tremendous backlog. So making sure that resources are in place and that we have a plan to be able to move these projects forward and move these permits forward is absolutely essential.

Senator Carper. Thank you.

Lastly, Mr. Harju, a question maybe we could have asked, should have asked, that you would like to share with us?

Mr. Harju. Yes, I guess the one that I would think of is regarding the linkage between energy security and carbon management. In my opinion, you hear a lot about a carbon constrained future.

We like to think about a carbon managed future. As you look at the part of the world where we are from, economic activity and carbon utilization and in turn, emissions, are inextricably linked. Being able to effectively manage that carbon, I think, is our real challenge and our real opportunity. I guess that would be the one that I would focus on.

Senator Carper. Okay, good.

Senator Capito, any last thoughts?

All right. One of the questions I like to ask people, I am not going to ask you all, but one of the questions I ask people is, what gives them joy in their work or in their life? You know, more often than not, what people say is, I like helping people; that gives me joy in my life. One of the best ways we

can help the people of this planet is to make sure we have a planet in the years to come.

The people of this Country want us very much to find ways to work together to get stuff done, and this is about as important as anything that we are working on. There is a great opportunity for us to make real progress. I think it is an encouraging time that we spent together.

I just really want to thank Senator Capito. This is a great idea. I am so pleased that we were smart enough to say yes, that is a good idea.

I want to thank your staff, I want to thank our staff on the majority side, and everyone who has participated today.

It is clear that while we cannot meet our climate goals or decarbonize certain sectors of our economy without carbon capture, utilization, and storage technology, congress must be ready. We must be ready to support rapid and responsible deployment and promote solutions that we just discussed here today for the last couple of hours.

We have been here for a few hours now, and in the last, Mr. Lanclos, in the last two hours, Louisiana has lost two more football fields. I know it is a big State compared to mine, but eventually you run out of football fields. We have got to impart a sense of urgency for all of us.

Before we adjourn, a little bit of housekeeping. Senators

will be allowed to submit written questions for the record through the close of business on Wednesday, August the 10th. We will compile those questions and send them out to all of you. We would ask that you try to reply to us by Wednesday, August 24th.

With that, with a deep sense of gratitude, this hearing is adjourned. Thank you so much.

[Whereupon, at 11:52 a.m., the hearing was adjourned.]