

WALKER AND WINBERG NOMINATIONS

HEARING BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED FIFTEENTH CONGRESS

FIRST SESSION

TO

CONSIDER THE NOMINATIONS OF BRUCE J. WALKER TO BE AN ASSISTANT SECRETARY OF ENERGY (ELECTRICITY DELIVERY AND ENERGY RELIABILITY) AND STEVEN E. WINBERG TO BE AN ASSISTANT SECRETARY OF ENERGY (FOSSIL ENERGY)

SEPTEMBER 26, 2017



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WALKER AND WINBERG NOMINATIONS

TUESDAY, SEPTEMBER 26, 2017

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The Committee met, pursuant to notice, at 10:13 a.m. in Room SD-366, Dirksen Senate Office Building, Hon. Lisa Murkowski, Chairman of the Committee, presiding.

OPENING STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

The CHAIRMAN. Good morning and welcome everyone. I apologize for being a few minutes late here this morning.

We have the opportunity this morning to continue our hearing on nominations. We have two nominees before us today for the Department of Energy (DOE).

Before I introduce the nominees, I want to take a quick moment this morning and reiterate that the people of the U.S. Virgin Islands and Puerto Rico, all who were affected by Hurricanes Irma and Maria, certainly remain in our thoughts and in our prayers.

I do hope that we will have an opportunity to visit the islands in the next several weeks to get a better assessment to determine how we, here in Congress, can help with their recoveries.

I also intend to hold a hearing on the situation in Puerto Rico and the U.S. Virgin Islands as they recover. I think we are all very cognizant of the fact that we do not need to be pulling FEMA or the governors out right now to come to Washington, DC, for a hearing. I think it is important to allow them to focus on their recovery efforts. So the timing of that is not yet locked in, but I think it is important to allow the situation on the ground to stabilize and ensure that the islands' leaders can be participating in it.

As an appropriator, I certainly will look forward to being there to be of assistance to make sure that these islands receive the help that they need in the time that they need it. I think we all recognize this is a very bad and difficult situation. I want the people of U.S. Virgin Islands and Puerto Rico, just like the people of Florida and Texas and the Gulf Coast, to know that they are not forgotten and that we stand in unity with them, and we will be working with them to help them get back on their feet.

Today we are here to consider two nominees for the Department of Energy: Mr. Bruce Walker, to be the Assistant Secretary of Energy for Electricity Delivery and Energy Reliability; and Steven Winberg, to be the Assistant Secretary of Energy for Fossil Energy.

These are critical leadership positions at the Department. I want to thank both of our nominees for their willingness to serve.

Here on the Committee we certainly recognize the importance of the Department of Energy. DOE has helped make our nation a global technology leader by supporting basic research, encouraging scientific exploration and fostering innovation. The Department is also meant to be our chief advocate for energy supply which affects everything from our national security to market stability and prices. I encourage both nominees to work with the Administration and with Congress to increase access to energy, to make it more affordable and to continue to improve its environmental performance.

One of my top priorities is finding ways to address our high energy prices for those who live in our rural areas and, certainly in Alaska, we know what we are talking about here. We have so many of our communities that still rely on diesel as their primary energy source, a fuel that has to be brought in, oftentimes flown in, costing as much as \$9, \$10 a gallon. To say it is a burden on our villages is an understatement.

I did enjoy having Deputy Secretary Brouillette in Alaska in August. We discussed this issue at length during his trip. What he saw is that there is a genuine need for help in Alaska. He also saw that in Alaska we can be the perfect proving ground, if you will. If a new technology makes sense anywhere it should make sense in a high-cost state like Alaska.

So what we are looking for, going forward, is for the Department to take the next step—to look at both our challenges and our opportunities and to form meaningful partnerships with communities and organizations in Alaska that will lead to lower energy costs.

I also want to see the Department work with our state to help us bring more of our resources to market and that includes renewables which we have in great abundance from hydropower to wind to biomass. It also includes our stranded gas and resources with significant potential, like methane hydrates.

The Office of Fossil Energy has focused almost exclusively on the environmental aspects of fuels in recent years, but its mission is considerably broader than that. So I will be looking for greater balance in this area.

For members who have questions for our nominees, I am going to be here for as long as we need to process these questions today. If any members have additional questions after the hearing, questions for the record will be due at the close of business today, as usual. It is my intent to report these nominees as soon as possible.

I note to colleagues that we now have a total of nine nominees who have already been favorably reported from our Committee. They are awaiting confirmation by the full Senate—that includes three nominees for the Department of Energy, four for the Department of the Interior and two for the Federal Energy Regulatory Commission (FERC). We do need to get moving on these nominations. Secretary Zinke and Secretary Perry need their teams in place, whether it is to help with hurricane recovery or a variety of other tasks. After months without a quorum, FERC needs a full complement of its five commissioners. I would encourage members to recognize the importance of confirming these individuals, and we

will certainly be working to secure their approval this week and for as long as it takes.

With that, I will turn to you, Senator Cantwell, for your opening remarks and then we will swear in our witnesses and proceed with their statements.

**STATEMENT OF HON. MARIA CANTWELL,
U.S. SENATOR FROM WASHINGTON**

Senator CANTWELL. Thank you, Madam Chair, I will be brief this morning, but I, too, want to start with mentioning the crisis in Puerto Rico and how much we need to continue to be vigilant on the help and assistance in Puerto Rico.

As an oversight committee of our Interior Department and the fact that Puerto Rico is a U.S. territory, we need to make sure that they get every bit of assistance and focus from the Federal Government possible.

I have called on the Administration to create a position of special counsel at the White House to make sure that every agency, not just FEMA, but every agency, is working to help us coordinate what will be a very long response for Puerto Rico.

So, thank you for your statement this morning and your focus on this as well. You are always reminding people you were born in a territory.

The CHAIRMAN. Yes.

Senator CANTWELL. And that you remember that that is such an important aspect of our responsibilities as a nation. Thank you for your willingness to be very, very focused on Puerto Rico.

I have encouraged Senator Hatch to do the same thing, given that there are so many things in the Finance Committee as it relates to health care for Puerto Ricans and where we were already going to be in this situation. Hopefully we can all unite behind what will be support for American citizens who are in a very desperate situation.

This morning's hearing is about critically important jobs at DOE.

The Assistant Secretary for Electricity Delivery and Reliability is responsible for the Department's efforts to modernize the electricity grid, to improve the security and reliability of the energy infrastructure and to facilitate recovery from supply disruptions. This is a critically important job as we call upon the 20th century electricity grid to adapt to the growing demands of the 21st century. At the same time, we must work to protect the grid and energy infrastructure from an ever-growing threat of cyberattack. So I will have some questions about that.

I had an opportunity to meet with Mr. Walker last week and was very favorably impressed with his extensive knowledge and experience, particularly as it relates to helping develop a workforce for tomorrow because we have, as the Quadrennial Energy Review stated, a need for 1.5 million new energy jobs. I think that he can help us in catalyzing the efforts of DOE to help us get those energy jobs and the focus that we need to make them a reality so we can move forward on the grid.

The job of the Assistant Secretary for Fossil Energy is also important. He will be responsible, not only for the fossil fuel energy research and development at a time of shrinking budgets for en-

ergy and R&D, but also for licensing national gas exports and managing the Strategic Petroleum Reserve.

You might have noticed the Strategic Petroleum Reserve has been debated a lot lately on its use and its strategy and focus for the future. We have tried to continue to focus our colleagues' efforts on the fact that it, too, needed infrastructure improvement and were successful in getting it some of the resources that it needs.

I have not had a chance to meet with Mr. Winberg yet, but I note he has extensive experience with a variety of issues: clean coal, carbon capture, storage and R&D.

I welcome both of the nominees to the Committee this morning. I look forward to hearing their testimony and asking them questions. Again, thank you for your willingness to serve, to both of you.

The CHAIRMAN. Thank you, Senator Cantwell.

The rules of the Committee which apply to all nominees require that they be sworn-in in connection with their testimony. I ask that you both rise and raise your right hand.

Do you solemnly swear that the testimony you are about to give to the Senate Committee on Energy and Natural Resources shall be the truth, the whole truth and nothing but the truth?

[Nominees respond, I do.]

The CHAIRMAN. You may go ahead and be seated. Thank you.

Before you begin your statements, I will ask three questions addressed to each nominee before this Committee.

Will you be available to appear before the Committee and other Congressional committees to represent departmental positions and respond to issues of concern to the Congress?

[Nominees respond, yes.]

The CHAIRMAN. Are you aware of any personal holdings, investments or interests that could constitute a conflict, or create an appearance of such a conflict, should you be confirmed and assume the office to which you have been nominated by the President?

Mr. WALKER. Having worked with the Office of Government Ethics, I have developed and signed an agreement that in the event I have the opportunity and honor to be confirmed, I have to effectuate that agreement within 90 days of the confirmation.

The CHAIRMAN. Are either of you involved or do you have any assets held in blind trusts?

[Nominees respond, no.]

The CHAIRMAN. Okay. Thank you both.

As I mentioned, Mr. Walker has been nominated to be the Assistant Secretary of Energy for Electricity Delivery and Energy Reliability, and Mr. Steven Winberg has been nominated to be the Assistant Secretary of Energy for Fossil Energy.

Gentlemen, this morning I ask that you introduce yourselves to the Committee. We would be delighted to be introduced, as well, to any family members that you may have. You have five minutes. Your full statement will be included as part of the record and then we will have an opportunity for questions.

Mr. Walker, if you would like to begin, please?

STATEMENT OF BRUCE J. WALKER, TO BE AN ASSISTANT SECRETARY OF ENERGY (ELECTRICITY DELIVERY AND ENERGY RELIABILITY)

Mr. WALKER. Thank you, Chairwoman.

Chairman Murkowski, Ranking Member Cantwell, members of the Committee and professional Committee staff, thank you for the opportunity to appear before you as the President's nominee to be the Assistant Secretary of Energy for the Office of Electricity Delivery and Energy Reliability at the Department of Energy.

It is truly an honor to be before this Committee, and I would like to thank President Trump and Secretary Perry for displaying their confidence in me by nominating me to this important position. If I have the distinct honor of being confirmed by the United States Senate, I look forward to working with each of you and your respective staffs to address the energy issues and opportunities within my role at the Department.

I would like to introduce my family to the Committee. With me today are my wife of twenty-five years, Lisa; our three children, Bryce, Lahra and Greyson; my parents, Joseph and Dorothy; my brother, who was able to fly in from Eielson Air Force Base in Alaska; Emily Dickinson, Bryce's girlfriend, whom I've known since she was five years old and I have coached in soccer. I would like to also welcome my friends and family who could not be here but are watching on TV. And last, I would like to thank my friends and mentors who have enabled me to sit here today, especially the professional tradesmen and women, men and women who taught me their trade, providing me with a hands-on understanding of the complexities and intricacies of the electric system.

Though I am a lawyer, my career in the electric industry began as a junior at Manhattan College where I was studying electrical engineering. I began an internship with the local utility, Consolidated Edison, where I also worked upon graduation in continuing levels of responsibility for 18 years.

Throughout this time, I was primarily focused on the electric power system. As a Field Engineer, I worked designing, inspecting and integrating the largest customers in Consolidated Edison's service territory. I was also part of the Environmental Response Team and the Biological Weapons Response Team which prepared for and responded to significant events in New York City.

In addition to gaining hands-on experience in the field, I was a key contributor in the merger of Consolidated Edison and Orange and Rockland Utilities with the responsibility of the organizational restructuring for several departments including Gas Operations, Electric Operations and Research and Development.

Upon completion of the merger, I assumed the role of the Control Center Manager where I had the opportunity to operate a gas and electric system. In this capacity I developed and implemented modernization and resiliency strategies including the use of software programs to improve the reliability and response to system emergencies. As I was the Control Center Manager during the 9/11 World Trade Center Attack and the 2003 Blackout, I am keenly aware of the need for preparedness and response plans as well as the cybersecurity and resiliency of the electric power system.

After five years managing the control center, I was selected to lead the operation for the first rate case since New York's de-regulation of the electric industry. In this capacity I acted as a subject matter expert and attorney for the regulatory team regarding capital investments necessary for the reliability of the electric power system.

Following the rate case, I developed the Corporate Coastal Storm Plan based upon the disasters realized during Hurricane Katrina. This detailed and complex plan was successfully utilized by Con Edison during the response to Hurricane Sandy. This plan established industry-leading practices such as pre-emptively shutting down lower portions of Manhattan and asset specific evaluations and remediation strategies for critical infrastructure necessary to maintain the grid.

As a result of the failure of the Long Island City network, underground secondary network, which at the time was one of the largest and most logistically critical in the world, I was placed in charge of interim operations of the network and developed a comprehensive recovery and reconstruction plan.

Coincident with managing this recovery, I was made the Director of Con Edison's Corporate Emergency Management. In this position, I developed and implemented regulatory approval for the Corporate Emergency Management Strategy.

Following my career with Con Edison, I became the Vice President of Asset Strategy and Policy for National Grid. In that capacity, I oversaw the investment strategies for a \$3 billion, five-year program focused on improving and making investments to modernize the grid. Accordingly, I was also responsible for the research development and demonstration projects necessary to achieve these strategies.

As we have recently witnessed, events like Hurricanes Irma, Harvey and Maria are indiscriminate regarding whom they impact. And it is in the preparation and response to these types of events that we can identify opportunities to address the security and resiliency of the electric grid for the safety and the health of the American public.

The Department, specifically the Office of Electricity, is uniquely positioned to facilitate emergency preparedness and response plans throughout the nation. Moreover, the Department can further its efforts to facilitate the advancement and modernization, in every form, working with the states and their respective utilities and energy partners. If confirmed, I will effectively lead the Office of Electricity by leveraging my twenty-five years of electric power industry experience to improve the reliability, security, both physical and cyber, and modernization of the nation's electric delivery system.

Chairman Murkowski, Ranking Member Cantwell, and members of the Committee, thank you for the opportunity to appear before you as the President's nominee as Assistant Secretary of the Department of Energy.

I look forward to answering your questions as you consider my nomination.

Thank you.

[The prepared statement of Mr. Walker follows:]

**OPENING STATEMENT
BRUCE J. WALKER
NOMINATION HEARING
UNITED STATES SENATE
COMMITTEE ON ENERGY AND NATURAL RESOURCES**

Chairman Murkowski, Ranking Member Cantwell, members of the Committee, and Professional Committee Staff, thank you for the opportunity to appear before you as the President's nominee to be the Assistant Secretary of Energy for the Office of Electricity Delivery and Energy Reliability at the Department of Energy.

It is truly an honor to be before this Committee and I would like to thank President Trump and Secretary Perry for displaying their confidence in me by nominating me to this important position. If I have the distinct honor of being confirmed by the United States Senate, I look forward to working with each of you and your respective staffs to address energy issues and opportunities within my role at the Department. As we have recently witnessed, significant events like hurricanes are indiscriminate regarding whom they impact, and it is in the preparation and response to these types of events that we can identify opportunities to address the security and resiliency of the electric grid for the safety and health of the American public.

I would like to introduce my family to the Committee. With me today are my wife of twenty-five years, Lisa, our three children, Bryce, Lahra and Greyson, and my parents; Joseph and Dorothy. My brother Matthew is also here, having just flown in at midnight from Eielson Air Force Base in Alaska.

Though I am a lawyer, my career in the electric industry began when I was a junior at Manhattan College. I began an internship with the local utility - Consolidated Edison of New York - where I also worked upon graduation, and continued to work for eighteen years, in increasing levels of responsibility. Throughout this time, I primarily focused on the electric power system. As a Field Engineer, I was responsible for designing, inspecting construction and integrating the largest customers within Con Edison's electric power system. I was also part of the Environmental Response Team and a member of the Biological and Chemical Weapons Response Team - preparing for and responding to significant events that impacted the electric power system in New York City.

In addition to gaining hands-on experience in the field, I was a key contributor to the merger of Con Edison and Orange and Rockland Utilities with responsibility for the organizational structure and regulatory integration for several departments, namely; Gas Operations and Engineering, Transmission and Distribution Electric Operations and Engineering, Research and Development, Legal and Regulatory and Control Centers. Upon completion of the merger, I assumed the role of a control center manager where I had responsibility for gas and electric operations. In this capacity, I worked with System Operations to consolidate the control of the generation/transmission system with the distribution system, and developed and implemented

modernization and resiliency strategies, including the use of software programs to improve the reliability and response to system emergencies. As the control center manager during the 9/11 World Trade Center Attack and the 2003 Blackout, I am keenly aware of the need for preparedness and response plans as well as building a secure and resilient electric power system.

After five years managing the control center, I was selected to lead operation specific aspects of the first rate case since New York State de-regulated the electric industry. In this capacity, I acted as a subject matter expert and attorney for the regulatory team regarding capital and operational and maintenance investments to ensure the reliability of the electric power system. Following the electric rate case, I developed the Corporate Coastal Storm Plan based upon the disaster realized during Hurricane Katrina. This detailed and complex plan was designed for the worst case scenario which was realized by New York City during Hurricane Sandy. This Corporate Coastal Storm Plan was successfully utilized during Con Edison's response to Hurricane Sandy. This plan established industry leading practices such as pre-emptively de-energizing portions of lower Manhattan and asset specific evaluations and remediation strategies for critical infrastructure necessary to maintain the integrity of the energy systems.

As a result of the failure of the Long Island City underground secondary network, which at the time was one of the largest underground secondary networks in the world and one of the most logistically critical networks in New York City, I was placed in charge of interim operations of the network and developed a comprehensive recovery and reconstruction program. Coincident with managing this recovery effort, I was made the Director of Con Edison's Corporate Emergency Management. In this position I developed, implemented and secured regulatory approval for the Corporate Emergency Management Strategy, master plan and organizational structure including gas, electric and steam operations.

Following my career at Con Edison, I became the Vice President of Asset Strategy and Policy for National Grid. In that capacity, I oversaw the development of asset strategies and policies for a \$3 billion, five-year capital investment plan in New York, Massachusetts, Rhode Island and New Hampshire. These asset strategies focused on making investments that modernized the grid – thereby improving reliability, resiliency and security of the electric power systems.

With our recent witness of the massive destruction and death caused by Hurricane Harvey, Hurricane Irma, and Hurricane Maria we can appreciate the critical nature of resiliency and preparedness plans that are crucial to establish and maintain normalcy – especially as they relate to the availability of electric power. The Department, specifically the Office of Electricity, is uniquely positioned to facilitate emergency preparedness and response plans throughout the Nation. Moreover, the Department can further its efforts to facilitate the advancement and modernization, in every form, of the electric power system throughout the United States by working with the States and their respective utilities and energy partners. If confirmed, I will lead the Office of Electricity by leveraging my twenty-five years of electric power industry

experience to improve the reliability, security (physical and cyber), and modernization of the Nation's electric power system.

Chairman Murkowski, Ranking Member Cantwell and members of the Committee, thank you for the opportunity to appear before you as the President's nominee as an Assistant Secretary in the Department of Energy. I look forward to answering your questions as you consider my nomination.

The CHAIRMAN. Thank you, Mr. Walker.
Mr. Winberg, welcome to the Committee.

**STATEMENT OF STEVEN E. WINBERG, TO BE AN ASSISTANT
SECRETARY OF ENERGY (FOSSIL ENERGY)**

Mr. WINBERG. Chairman Murkowski, Ranking Member Cantwell, members of the Committee and staff, thank you for the opportunity to be part of this nominations hearing.

I am extremely honored to appear before you as President Trump's nominee to be the Department of Energy's Assistant Secretary for Fossil Energy.

Also, thank you for the opportunity to meet prior to this hearing in order for me to better understand your interests and priorities at the Department of Energy. Your thoughtful insights and counsel on energy needs in the United States and in the states you represent were informative and helpful. I learned a great deal and will carry these lessons with me if I am confirmed.

I would also like to thank President Trump and Secretary Perry for displaying their confidence in me by nominating me and supporting me. This is both a humbling and an exciting time for me and, if I have the honor to serve, I look forward to working closely with all of you and the knowledgeable, hard-working people at the Department.

In order to address the numerous challenges and opportunities that face our domestic fossil energy resources, it will require consistent collaboration between multiple levels of government and private industry. I believe that, if I'm confirmed, my past experiences have prepared me well for this position.

I have both friends and family here today, and I want to take a minute to introduce you to my family. First, my wife, Anne, sitting directly behind me. I am blessed to have her with me and for her strong support. My sister, Christina Gutwein, and her husband Dan; my brother, David Winberg; Anne's brother, Mike Nolan; and friends and colleagues. Thank you all for being with me today. My daughters, Lauren Winberg and Anna Winberg, are in Denver preparing for my daughter, Anna's, wedding. And Anne's children, Rebecca Burns and Christopher Burns, are watching from Pittsburgh.

I am especially grateful to have my parents, Harry and Mary Winberg, here today. My mother has been the rock in our family, quietly and resolutely holding our family together. My father served for 29 years in the Air Force. He served in both Korea and Vietnam and was awarded the Purple Heart when his plane was shot down over North Korea and he was wounded during the extraction effort. That close call makes me feel very happy to be here today but is also a reminder to me that, if confirmed, this is my opportunity to serve my country.

I spent my entire career in the private fossil energy sector developing and demonstrating emerging coal, oil and natural gas technologies for both the production and use of these fuels.

I have also been involved in a variety of policy issues affecting fossil energy, and I recognize the critical importance of the interface between policy and technology development. Sometimes policy drives technology and sometimes technology drives policy. Our goal must be to develop technologies that allow us to use our abundant

domestic resources in a sustainable, efficient and environmentally-sound manner.

I've been directly involved in developing fossil energy technologies that improve combustion efficiency and reduce emissions. Early in my career, I focused on criteria pollutants such as SO_x, NO_x and particulates. To that end, I have two patents for innovations that reduce NO_x emissions from coal-fueled boilers.

Over my 39-year career, great progress has been made on both efficiency and emissions reduction. Progress has also been made developing technologies applied to the production of fossil energy, thus lowering the cost, reducing the environmental footprint and improving safety. The steady technology advancements in both the production and use of fossil energy have resulted in low-cost, reliable, abundant and sustainable energy for the United States and I am proud to have been associated with these advancements.

DOE has been at the forefront of developing the vast majority of fossil energy technologies that are employed both here in the United States and around the world. I am excited about what can be further accomplished at the Department as fossil energy continues to play an important role in our nation's energy mix.

If confirmed, I will work hard to keep the United States in the lead in developing the next generation of coal, oil and natural gas technologies. The Department's leadership and expertise, when coupled with private industry, can serve as a catalyst for the development of transformational energy technologies.

If confirmed, I look forward to serving as the Assistant Secretary for Fossil Energy and to working in close cooperation with the members of this Committee and your staff, Secretary Perry and the talented and dedicated staff at DOE. I will put my private sector experience to work to augment the fine work being done at DOE to maintain the affordable, reliable energy that adds so much value to our daily lives and to our nation's prosperity.

I look forward to your questions.

[The prepared statement of Mr. Winberg follows:]

**Opening Statement
Steven Eric Winberg
Nominee to be Assistant Secretary for Fossil Energy at the Department of Energy
Nominations Hearing
U.S. Senate Committee on Energy and Natural Resources
September 26, 2017**

Chairman Murkowski, Ranking Member Cantwell, members of the committee, and staff, thank you for the opportunity to be a part of this nominations hearing. I am extremely honored to appear before you as President Trump's nominee to be the Department of Energy's Assistant Secretary for Fossil Energy.

Thank you for the opportunity to meet prior to this hearing in order for me to better understand your interests and priorities at the Department of Energy (DOE). Your thoughtful insights and counsel on energy needs in the United States and in the states you represent were informative and helpful. I learned a great deal and will carry those lessons with me if I am confirmed.

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I am especially grateful to have my parents, Mary and Harry Winberg, with me today. My mother, has been the rock in our family, quietly and resolutely holding our family together. My father served for 29 years in the U.S. Air Force. He served in both Korea and Vietnam and was awarded the Purple Heart when his plane was shot down in North Korea and he was wounded during the extraction effort. That close call makes me feel blessed to be here today but is also a reminder to me that, if confirmed, this is my opportunity to serve my country.

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I have also been involved in a variety of policy issues affecting fossil energy and recognize the critical importance of the interface between policy and technology development. Sometimes policy drives technology and sometimes technology drives policy. Our goal must be to develop technologies that allow us to use our abundant, domestic resources in a sustainable, efficient, and environmentally-sound manner.

I have been directly involved in developing fossil energy technologies that improve combustion efficiency and reduce emissions. Early in my career, I focused on reducing criteria pollutants such as SO₂, NO_x and particulates. To that end, I have two patents from the U.S. Patent and Trademark Office for innovations that reduce NO_x emissions from coal-fueled boilers. Over my 39-year career, great progress has been made on both efficiency and emissions reduction. Progress has also been made developing technologies applied to the production of fossil energy, thus lowering the cost, reducing the environmental footprint and improving safety. The steady technology advancements in both the production and use of fossil fuels have resulted in low cost, reliable, abundant and sustainable energy for the United States and I am proud to have been part of these advancements.

DOE has been at the forefront of developing the vast majority of the fossil energy technologies that are employed both here in the United States and around the world. I am excited about what can be further accomplished at the Department as fossil energy continues to play an important role in the nation's energy mix. If confirmed, I will work hard to keep the United States in the lead on developing the next generation of coal, oil and natural gas technologies. The Department's leadership and expertise, when coupled with private industry, can serve as a catalyst for the development of transformational energy technologies.

My personal and professional experiences have contributed to a strong understanding of the broad needs of the energy sector. If confirmed, I look forward to serving as the Assistant Secretary for Fossil Energy and to working in close cooperation with the members of this committee and your staff, Secretary Perry, and the talented and dedicated staff at DOE. I will put my private sector experience to work to augment the fine work being done at DOE to maintain the affordable, reliable energy that adds so much value to our daily lives and to our Nation's prosperity.

I look forward to your questions.

The CHAIRMAN. Gentlemen, thank you both. I appreciate your comments and your willingness to serve. And to the families that sit behind them, stand behind them, thank you for being here and thank you for your support of these individuals as they stand before the Committee today.

Mr. Walker, let me begin with you.

I talk a lot about microgrids here in the Committee and the promise that I think they hold in places like Alaska that are remote where we do not have a connected grid. So many of our remote regions really do rely on our microgrids.

We have been doing some pioneering. Senator Cantwell had an opportunity to join me in Cordova where we had a field hearing last year to look at what one small community is doing to make a difference to increase the reliability and the resiliency of the traditional grid by really working to incorporate so many different opportunities. So flexibility has been a key for us.

A question for you this morning is regarding the current definition that DOE has of a microgrid. It states that, "a microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island mode."

The question is, if you are confirmed as Assistant Secretary, will you work with us to modify the definition of microgrids to ensure that microgrid projects in remote areas where a larger grid does not exist are more expressly included because right now we are being bound by a definition?

We are not part of anybody else's grid and so we cannot disconnect. Just your thoughts, if you would, on microgrids, what you might be able to do to prioritize the research, the development, the demonstration, but also how we deal with that definition.

Mr. WALKER. Sure. Thank you for the question, Senator Murkowski.

And I'd like to acknowledge some of the work that both you and Senator Cantwell sponsored from this Committee and thank this Committee for S. 1460 which, I would note, Senator Murkowski, I noticed a new term, hybrid microgrid.

The CHAIRMAN. Yes.

Mr. WALKER. And when I saw that I had to chuckle a little bit to myself because within the industry we're still debating exactly what a microgrid actually is.

So I am open to a discussion as to what a microgrid or a hybrid microgrid is and it's fundamentally driven by a number of changes in the industry that have happened throughout the last 10 years. And that is the integration of renewables as well as the physical and cybersecurity aspects regarding grids.

So I think we need to take another look at this within the industry to incorporate where we are today, focusing in on a variety of different things, essential services, reliability that will improve and allow us to deal with security aspects, both physical and cyber.

The CHAIRMAN. Well, I appreciate that and would certainly invite you to come up North to see some of the innovation and the pioneering that is going on. It is exciting and it will give new definition to what we are talking about when we are talking about hybrids.

Mr. WALKER. Absolutely. I'm looking forward to coming up and seeing the \$6.2 million project at Cordova.

The CHAIRMAN. That is right. Good deal.

Mr. WALKER. And timing it with my brother, next time he flies up.

The CHAIRMAN. Fishing is always good.

Mr. WALKER. Exactly.

The CHAIRMAN. Let me ask you, Mr. Winberg. You mentioned that technology can drive policy and policy can drive technology.

There is a lot of focus on the Arctic right now as we are seeing increased shipping opportunities as ice is moving away. We are seeing more travel, whether it is tourism or commercial, there is a much more keen interest in what is happening in the Arctic right now.

The Department of Energy used to operate an Office of Arctic Energy to do some review and understand what fuels would work best in a harsh, Arctic climate because what works down here does not necessarily work up there.

As we are seeing increased attention on the Arctic for a whole host of different reasons, what do you think about this Office of Arctic Energy that has been suggested that they just shut it down and close it off? How important do you think this kind of technology is that can help drive an Arctic policy?

Mr. WINBERG. Senator, thank you for the question.

Clearly Alaska is one of our most prolific energy states. A lot of energy is coming out of there, potential for more energy to come out as well.

I have not been briefed on the activities that took place in the past or currently with the Arctic Energy Office. But what I commit to you is that, if I'm confirmed, I will make it one of my high priorities to understand what activities have taken place and what activities could take place in the future with respect to a variety of energy opportunities and needs in Alaska.

You mentioned some of the villages that are paying quite high prices for energy and there are some technologies, modular technologies, that might be able to be brought to bear that I know the DOE is working on.

And so, I look forward to working with you and your staff and this Committee on some of those opportunities for an Arctic Energy Office.

The CHAIRMAN. I appreciate that and I remind my colleagues a lot that we are an Arctic nation, even in Nevada we are still an Arctic nation. And so, understanding and working with other Arctic nations about those technologies that allow us to be more efficient operators in, again, a pretty tough environment is important, advancing those technologies.

Senator Cantwell.

Senator CANTWELL. Thank you, Madam Chair.

I wanted to ask Mr. Walker—thank you for bringing up the issues of energy efficiency and the work of our legislation. Obviously, we tried to focus on the more than 130 million buildings, which consume 40 percent of our energy, the most of any sector. And that is why we have been big supporters of taking it to the next level.

The Chairman mentioned we got to go to Alaska and look at microgrids. We also got to go to Seattle and look at the Bullitt Center, which is one of the cleanest, smartest buildings in the world, managing its energy resource.

Will you support ongoing participation of the Office of Electricity in this important work on building modernization and energy electricity grid efficiency?

Mr. WALKER. Thank you for the question, Senator Cantwell.

Indeed, my entire career has been spent in the energy industry in the electrical power systems in modernizing the systems, improving the resiliency as well as reliability.

As my opening statement included, having run control centers and understanding what the impact is of a system failure and understanding what the modernization opportunities are is very important.

My intent in this position, if I'm confirmed, is to continue my work and continue to strive to push and work with the industry for increased modernization, resiliency and reliability, as well as focusing on the cybersecurity aspects.

Senator CANTWELL. Thank you.

What steps do you think we need to take to ensure that we have the trained workforce that we need in both this and cybersecurity?

Mr. WALKER. That's a great question, and I thank you for the opportunity to meet with you and twice with your staff.

You know, this industry has evolved from one that was done with paper and pencils and it was developed without the existence of computers. One hundred thirty years ago, when the system was introduced there was no such thing as a computer. And so the system relied on basic physics to make it operate.

And as we've evolved the system, it's grown in complexity, particularly as it relates to the introduction of integrated circuitry, the internet, computer programs and unfortunately, I think, that the people who are in the industry haven't—while they're able to utilize it, we've lost sight of some of the basic aspects of, let's say, doing a load flow by hand. And, in fact, I'm not sure there's too many people around that can do that. I don't know too many that can do that.

And the point is, as we rely upon computers, I think we've lost sight of some of the underlying, basic physics. And I think that as we look to, you know, train the next workforce that we focus back on the simplicity and the basics of the system and allow people to understand how the system actually comes together.

Senator CANTWELL. Thank you, thank you for that.

Mr. Winberg, your responsibilities will include licensing for natural gas exports. How much natural gas do you believe we can export without raising natural gas prices domestically for consumers or threatening our energy here at home?

Mr. WINBERG. Thank you, Senator, for the question.

The unconventional oil and gas drilling that we have seen in this country, often referred to as the shale plays, is unprecedented. And I think that there is a lot of room for both domestic, increased domestic consumption, as well as export.

We've got numerous rigs, drilling rigs, that are sitting idle and we've got drilling rig crews that are also sitting idle.

So I think there's quite a bit of head room. Specifically, how much? I think the market will, by and large, determine that. And as we move forward in looking at opportunities to export LNG, the market will sort out the total export versus what we're going to use here in the United States.

Senator CANTWELL. You are not worried about being in a situation where the Midwest, for example, sees a spike in prices right where we have manufacturing jobs and yet, it takes a while for the market to adjust?

As somebody who lived through the electricity crisis, I can tell you the markets do not always function the way you want them to. Are you worried about that?

Mr. WINBERG. I think the fact that we've got unconventional oil and gas spread across the United States, there's pretty prolific opportunities there in the Midwest, a year and a half ago, we were at \$1.00, \$1.20 at the well head. So, I think there's a lot of head room left in the oil and gas market, especially in the unconventional oil and gas.

Senator CANTWELL. Okay. I will have more questions on this, but thank you.

My time is expired, Madam Chair.

The CHAIRMAN. Senator Gardner.

Senator GARDNER. Thank you, Madam Chair.

Thank you, Mr. Walker, Mr. Winberg, for being here today, and welcome to your families as well and thank you for your willingness to serve our country in these capacities.

I also want to thank the Chairman for her leadership in Puerto Rico. I know at the beginning of this hearing she talked about a series of hearings and continued work to make sure that we provide what I believe we have to, when it comes to Puerto Rico, and that is a massive surge of involvement from Congress to make sure that we are providing the policy guidance, those resources necessary to rebuild Puerto Rico. This is critically important that we get this right. It presents both a great challenge and unique opportunities before this country.

I think there are some ways that we can work with the Department of Energy. For instance, perhaps dealing with mutual assistance opportunities for Puerto Rico to rebuild the grid in Puerto Rico, but also opportunities when it comes to technologies from NIST and other agencies that could provide assistance with telecommunications capabilities.

And certainly, we had a conversation, Mr. Walker, when we had the chance to meet about how we could pursue reliability in a new way, a new way of thinking when it comes to Puerto Rico and its electricity systems.

I would just like to talk about the challenge that we face here, but hear from you as well what you might be thinking and looking at when it comes to opportunities with Puerto Rico in the future?

Mr. WALKER. Thank you, Senator Gardner, for that question. Thank you for allowing me to meet with you and your staff to talk about some of these things.

So one of the things I think we have tremendous opportunity, particularly with Puerto Rico and other areas that have been adversely impacted by the hurricanes, is to utilize the R&D projects

that are the result of investments made by Congress and into the national labs, to use a territory like Puerto Rico as a test bed to introduce new concepts, perhaps new architectural construction.

One of the things we talked about real quickly in your office was the ability to build, let's say, a collapsible system as opposed to one that was, you know, meant to stand 30- or 40-mile-an-hour winds. Build something that's a little bit more resilient from the standpoint of, you know, it can come down but it can actually be restored very quickly.

I think that plus, you know, some of the newer innovations, particularly with the newer technologies, would allow a redevelopment and a reconstruction of the actual overall system in Puerto Rico.

Senator GARDNER. Thank you, Mr. Walker.

Your testimony talks about your experience, and we had the opportunity to talk about it in my office as well, developing and executing plans for the utility industry.

We, in Congress, passed legislation that designated the Department of Energy in a leadership role on developing and executing a Cyber Emergency Response Plan. Your experience with that—what are the essential elements that we have to be talking about, including to make sure we have a strong, secure, resilient electric grid and energy networks that can defend themselves from and respond to future nation-state attacks?

Mr. WALKER. Thank you for the question, Senator.

I think that's a very challenging question, but there are some fundamentals that are absolutely critical as we move forward in the cyberspace.

Number one, I would say the situational awareness within the utility industry is critically important and I know there's a program at the Department of Energy called CRISP that involves that two-way communication with utilities to give them situational awareness. And along with that there's some opportunities to do machine learning with regard to establishing and identifying certain threats and being able to communicate them within the industry.

Secondly, I think there's the opportunity to work within the industry, Department of Energy, to develop coordinated plans for the actual response in the event that we, you know, do realize one and that we know how to disaggregate the system similar to what was done in the Ukraine and then rebuild it in a very expedited way.

And lastly, I think there's some very specific R&D projects that could be undertaken, specifically, as they relate to things like monitoring, correlation modeling, again, with that machine-to-machine learning and the identification that allows you to take a look at the overall architecture.

I think in that R&D component there's a very important aspect. We're taking a look at the actual architecture of the grid and recognizing that the SCADA systems that basically enable the opportunity because of the use of the remote terminal units and some of the other integrated circuitry in these devices.

I think people have to take a step back within the industry and take a look and say, you know, the system existed well before these technologies that created the vulnerability it did and they are nothing more than add-ons to the system. And so, inherently some of

the basic components that actually run the system don't have the logic and intelligence to operate the system.

And so, I think the R&D component would be focused on a look at the architecture and have it disaggregate the existing SCADA systems that create the vulnerability to enable the intelligence to actually be in the components that operate under basic physics of the law.

Senator GARDNER. Great, thank you.

Just quickly, in conversations I have had with utilities in Colorado, they talk about the need on security clearances. Would an improved security clearance process be helpful in the work we are doing in cyber? Yes or no?

Mr. Walker?

Mr. WALKER. Sure, thank you, Senator.

That's another component with the situational awareness.

Today, within the industry many major utilities, some of them I'm familiar with, have very few people that have clearance within the company. And so, the ability for a department, like the Department of Energy, to communicate what would be classified information, is hampered.

And so, there's been a bit of discussion with regard to expediting the process for clearances to allow that communication and therefore increase the situational awareness or create a different level of clearance to be able to ensure that communication is made.

Because that situational awareness, and having been a control center manager, you know, when you're operating and flying the plane blind, it's a little harder.

So, if you have some information and knowledge that would make your awareness level that much higher, it would be very helpful.

Senator GARDNER. Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator Gardner.

Senator Franken.

Senator FRANKEN. Thank you, Madam Chair.

The Chairwoman mentioned the Arctic and the Arctic ice, the word our same Chair used, was moving. In many cases, it is not so much moving as it is changing state from a solid state to a liquid state.

Mr. Walker, do you believe that human activity accounts for the majority of climate change since the industrial revolution?

Mr. WALKER. Thank you for the question, Senator.

I believe the climate has been changing and will continue to change as long as we're on the planet. I think there is a contribution from man. I couldn't quantify exactly what that is.

Senator FRANKEN. Okay.

Do you know that there is a consensus among climate scientists though? You are aware of that, right?

Mr. WALKER. Yes, I am.

Senator FRANKEN. Okay, good, good.

Now with a changing climate, climate scientists tell us that we are going to see more extreme weather events, and in the last few weeks Hurricanes Harvey, Irma and Maria have reminded us of the risks the electric grid faces from extreme weather.

We have been mentioning, and I am glad the Chair brought up Texas and Florida and Puerto Rico and U.S. Virgin Islands and they, especially Puerto Rico and the Virgin Islands, are all facing dire situations with widespread blackouts that may last not just weeks but months.

The Chair also brought up microgrids. I think they are—when we saw Sandy happen we saw some good things happen in terms of electric systems that were working in isolation and did not go down, that increased resilience.

And since we have this urgent need for federal assistance, and you were asked by Senator Gardner about taking the situation and you started to talk about building a more resilient grid or more resilient buildings. And I did think this is an opportunity, actually, to take what new things that we know and to build a more resilient grid.

How do you think the Department of Energy can help Puerto Rico and the Virgin Islands get the grid up and running again, and do you see this as an opportunity to use what we have known or learned? You said that, so I applaud you for that.

To use that to build to see what works, I mean, to use what we know works and to build a more resilient, more efficient grid and, kind of, to take this terrible catastrophe and use it as an opportunity.

Mr. WALKER. Thank you for the question, Senator.

I strongly agree that we do have the opportunity to utilize resources within the Department of Energy to bring to bear much of the research and development that is done within the Department as well as that which is done at our national labs and to utilize places like Puerto Rico, and maybe Puerto Rico is exactly the one to do that, to use it as a test bed to demonstrate the integration of the renewables and what impact it has on the resiliency and reliability of the grid.

Senator FRANKEN. And I think the Virgin Islands as well, because—

Mr. WALKER. Sure.

Senator FRANKEN. In a way, if you are doing these experiments you may want to use a smaller platform. St. John and St. Thomas got hit by Irma and then St. Croix got hit by Maria and all three are pretty leveled.

We saw, like Texas Medical Center which is the largest medical complex in the world, because they had an island mode electric system with combined heat and power plant, they kept going.

I just think that this is actually an exciting opportunity, taking it out of a disaster, to create a more efficient, more resilient, modern grid for all four islands, Puerto Rico and the three Virgin Islands, and I would hope that you would do that.

Mr. WALKER. Absolutely.

Senator FRANKEN. In this job—and by the way, I wanted to say hi to both families and I can tell all your children are just fascinated by electric grids.

[Laughter.]

Mr. WALKER. You'd be surprised. I used to take them reporting to emergencies with them.

Senator FRANKEN. Okay.

[Laughter.]

Well, good.

[Laughter.]

That doesn't mean they——

Mr. WALKER. Brought them to splice.

[Laughter.]

Give them a little workout every once in a while.

[Laughter.]

Senator FRANKEN. Thank you.

The CHAIRMAN. Thank you, Senator Franken.

Senator Manchin.

Senator MANCHIN. Let me thank both of you for being willing to serve and your families for coming up and for your support.

I will start with you, Mr. Winberg.

You have a great deal of experience managing technology development throughout your time in the energy industry, particularly at the tail. I would like for you to elaborate a little bit and give me an idea of how you manage technology development throughout the highs and lows of budget and fiscal environments because I know that can be quite challenging.

Mr. WINBERG. Thank you for the question, Senator.

It is challenging and it's a very appropriate question because I spent 30 of my 39 years in the commodity business—coal, oil and natural gas, oftentimes referred to as a boom-or-bust business.

And especially when I was at Consol Energy, when budgets were tight, we hunkered down with our research budget and we focused on basic, fundamental research and we made some pretty significant progress.

I think the most notable basic research being done by the Department of Energy that's talked a lot about now is the basic research for unconventional oil and gas which then was taken by private industry and, clearly, commercialized; however, when times were a little bit better in the commodity industry, there was more free cash available and we were able to do pilot plants and demonstration projects.

So, if I'm confirmed to be the Assistant Secretary, I look forward to working with all of you and whatever money is appropriated by Congress. I will commit to you that I will spend that as wisely as I possibly can to move our domestic energy effort forward across all three fossil fuels—coal, oil and natural gas.

Senator MANCHIN. Mr. Walker, while on the topic of grid study, I know we have been talking about reliability and grid study, I would like to get your opinion on a couple of conclusions the Department of Energy came to regarding the extent to which regulatory burdens, as well as certain federal policies, have forced a premature retirement of baseload power plants, including the biggest contributor to coal and nuclear plant retirement which has been the economics of natural gas-fired generation and, basically, FERC is going to low cost.

Dispatch of variable renewable energy has negatively impacted the economics of baseload plants and investments required for regulatory compliance have also negatively impacted baseload plant economics.

The Department then recommends developing a comprehensive strategy for long-term reliability and resiliency. They just went through that. I am sure you have probably looked at that.

Mr. WALKER. Yes, sir, I did.

Senator MANCHIN. Okay.

So do you agree with their assumptions or are you concerned about reliability? Are we getting ourselves into a precarious position?

Mr. WALKER. I'm always concerned by reliability. It's part of just being an electrical operations person.

That study, you know, there were a number of things that were in there regarding the baseload concept specific to what you're speaking to. I think there was a very important component that was spoken about in there that is very important as we've discussed baseload. And that is the essential reliability services that are part of the baseload, traditionally, and those involve things like frequency control, inertial control, reactive power flow control and, traditionally, within the industry those were realized through coal and nuclear as, you know, a number of things like regulatory impacts, the day rules, low prices of gas, that have changed the diversity or the utilization or the stack, if you will, the economic stack of the dispatch of energy.

And, accordingly, what's happened is there's been a large amount of natural gas combined cycle that has displaced the coal and nuclear components of what was usually the diversity.

I think, as was noted by the NERC Chairman in a May letter to the Secretary of Energy, there is a concern with reliability if we forgo the recognition of the essential reliability services that were provided, traditionally, by the nuclear and coal aspects.

So I think as we move forward the ERS component is something that needs to be noted.

Senator MANCHIN. You are going to be in a unique position to either change that direction or make sure that this country has reliability.

The PJM system is a big system distributing a lot of power.

Mr. WALKER. Sure, absolutely. I was part of PJM when I was running a control center.

Senator MANCHIN. I thought so.

But with that being said, they almost had, during the Polar Vortex, a complete shutdown and they have taken 10,000 megawatts, I think, offline since then.

Mr. WALKER. Right. And again, you know, that fuel assurance component is another component with regard to what was traditional baseload, the nuclear and the coal aspects. And the Polar Vortex is where we realized, through the freezing temperatures, the inability or unavailability of the gas necessary for the combined-cycle components.

Senator MANCHIN. But what I think—and I will finish up with it, I know I am over my time. A lot of the coal plants were converted or new ones haven't been built—

Mr. WALKER. Right.

Senator MANCHIN. —but they have been converted into having all of the environmental compliance scrubbers, low NOx boilers,

bag houses for mercury, and on and on. And they have some life left in their cycles.

If they shut down because they cannot compete with the lower prices, they are not going to come back up and they will be dismantled.

Someone has got to step up to the plate and say, listen, we have to keep some of these in that rate base so that we have the reliability. Right now, we are concerned no one is stepping up to the plate. I know there are quite a few of them in my state that are going to be going down. They are really good plants that should not go down for the reliability that we need.

I don't know how you feel about that and if you feel that you all can weigh in concerning the reliability to the system that we have.

Mr. WALKER. The one thing I will add to what you just noted and I think it's something that's being realized throughout the United States and the grid report doesn't go deeply into it, but you know, after deregulation the number of plants went into merchant hands as well as—

Senator MANCHIN. Yes.

Mr. WALKER. And so, merchant plants make economic decisions and they don't necessarily have the responsibility for the reliability of a once very clearly integrated utility.

And I think that's something that the Department of Energy, working with the respective states, has an opportunity to do that may very well stave the results of these retirements.

Senator MANCHIN. Thank you, sir.

The CHAIRMAN. Thank you, Senator Manchin.

Senator Barrasso.

Senator BARRASSO. Thank you, Senator Murkowski.

Congratulations to both of you on your nominations.

Mr. Winberg, in Wyoming we have tremendous coal, tremendous natural gas, tremendous oil resources. These resources fuel our state's economy and are responsible for billions in state and local revenues.

Carbon capture, utilization, sequestration technology, or CCUS, supports the production of these abundant energy sources while also advancing environmental aims. We have had hearings about that in the Environment and Public Works Committee and continue to discuss those things. I believe wider deployment of this technology is supported by a diverse coalition of energy, of labor and environmental interests.

How are you going to prioritize the resources of the Office of Fossil Energy to maximize the deployment of CCUS technologies?

Mr. WINBERG. Senator, thank you for the question.

The prioritization—and it gets a little bit to Senator Manchin's question, whatever dollars Congress appropriates for the Fossil Energy Office, I will make sure that those dollars are put to the best use.

Clearly, carbon capture, sequestration utilization is an important part of what the Department of Energy has been doing for the last decade or so.

There's a lot of work that still remains to be done. If the budgets are small, there's work that can be done on basic fundamental research to get the cost of capturing carbon down, CO₂. If there are

funds available for pilot plants and demonstration projects, there's certainly no question that there's a need to do that type of work too.

And so, I would commit to you that I would manage the budget according to whatever Congress appropriates for Fossil Energy.

Senator BARRASSO. In August the Department announced about a \$50 million funding opportunity through the Office of Fossil Energy for a public/private partnership to design and construct and operate transformational coal technologies. So I am encouraged by this announcement, because I have seen the success that results from these partnerships.

In our State of Wyoming, several electric utilities have come together to construct the Wyoming Integrated Test Center. Once operational this center is going to be one of the only facilities in the world that provides research space to promote the development of useful products for carbon emissions.

Under your leadership will the Department pursue public/private partnerships that drive the development of emerging coal technologies?

Mr. WINBERG. Thank you for the question.

And yes, Senator, if I'm confirmed we will indeed move forward on private/public partnerships.

I am familiar with the test center in Wyoming, although I have not visited and I look forward to that opportunity, but it is of a size that will allow us to do a lot of what I would call applied research in pilot-scale demonstration. So it's a great facility and a great asset that, I believe, we'll be able to use.

Senator BARRASSO. Well we appreciate your comments and look forward to having you visit us in Wyoming.

Thank you, Mr. Winberg.

Mr. Walker, in your testimony you explain that you have been involved with the efforts of two large Northeast electric utilities to invest in reliability, resiliency and security of the electric power system.

In Wyoming and throughout the West, power systems face unique challenges. Many Western communities are in sparsely populated areas where electric power infrastructure really has to navigate some difficult terrain.

How will you prioritize the Department's resources to develop technologies that ensure safe, affordable, reliable service to power customers in the West?

Mr. WALKER. Thank you for the question, Senator.

The prioritization work is primarily done on a risk-based analysis. Working throughout the United States and recognizing the diversity of geography and the different challenges each part of the United States has, we prioritize the work according to their impact on reliability and resiliency component. And now also, we've got the cyber and physical security to focus on.

So, the prioritization components we use are typical. We use DHS standards, which is similar to the international standard of 33,000 which is risk-based, to prioritize work.

The R&D work that is done cuts across the United States from the standpoint of the technologies that are actually there. It doesn't necessarily get so much into the actual physical geography compo-

nents, but there are aspects that we are starting to look at. And as I mentioned earlier, the resiliency components, particularly in places like Puerto Rico, where we have the opportunity to change the standards by which things are built. So, for instance, in the situation like Puerto Rico or hurricane areas, you look at a system that might be collapsible, similar to the way that a shear pin might be used on something as simple as a rototiller, right?

So the redesign or reconstruct are also things that we look at for areas in the country where we've got different opportunities and challenges. We modify the programs to adapt to them.

Senator BARRASSO. Thank you, Madam Chairman.

The CHAIRMAN. Senator Heinrich.

Senator HEINRICH. Thank you, Madam Chairman.

One of the things I continue to be incredibly excited about is the potential for energy storage to improve the efficiency, the reliability and the resiliency of our system that generates and delivers electric power to homes and businesses.

Widespread use of energy storage could help integrate renewable energy resources into our grid, support more robust microgrids, like we heard about in Alaska, and optimize the operation of all types of power generating sources.

Increasingly battery technologies at the utility scale and in homes and businesses are already helping to shave peak periods, provide valuable ancillary services and displace new investment in generation substations and transmission and distribution lines.

That is why I will soon be reintroducing the bill, the Energy Storage Tax Incentive and Deployment Act, that establishes a new investment tax credit for energy storage technologies. Currently, there are no direct tax incentives available for energy storage and the bill would provide an investment credit of 30 percent for both grid and residential applications that would phase down over a period of five years.

As storage technologies improve and state and federal regulations continue to evolve to remove barriers to energy storage in all applications, my bill will help stimulate integration of energy storage into the nation's grid. I am pleased that a number of my colleagues on this Committee have chosen to be original co-sponsors of that legislation.

That leads me to my first question for you, Mr. Walker.

I have to say I was disappointed that energy storage did not appear more prominently in the recommendations of Secretary Perry's recent staff report on reliability and resiliency of the power grid. I wanted to ask you what your thoughts are on the state of energy storage and DOE's role in supporting innovative storage technologies and for that matter, their deployment.

Mr. WALKER. Thank you for the question, Senator.

I am a huge proponent of storage. Storage within the industry has always been considered the holy grail of the technology leaps that we could possibly make.

So when you talk about storage, and the reliability report does not specifically spend a significant amount of time regarding storage, but there is one component that is spoken about in that report wherein the reference is meant to be storage, even though I'm not sure it articulates it that way, and that deals with the flexibility

of the system. So when discussing the reliability and the resiliency of the system, particularly with the integration of renewables, the flexibility component is the component that enables the peak power, the utilization of some of those renewables against the base-load.

So, you know, based on work that I've done at GridWise Alliance, advocating for modernization, storage was a big component of that. And when I sat on the Electricity Advisory Committee (EAC) about 10 years ago for the Department of Energy, we spent a great deal of time dealing with storage and, in fact, the president of the largest storage consortium was on that EAC Committee with me as well.

So it is something that we're very much focused on. There's existing R&D projects presently at multiple of the national labs—

Senator HEINRICH. Right.

Mr. WALKER. —sponsored by the Department of, the Office of Electricity.

Senator HEINRICH. I would suggest that storage is no longer the holy grail of the power system. It's more like the bacon of the power system, a little bit makes everything better.

[Laughter.]

Mr. WALKER. Point taken.

Senator HEINRICH. I want to ask you a little bit about—you mentioned the Polar Vortex and the impact that had on our power grid based on the impacts on combined-cycle natural gas. Are you also familiar with the role that demand response played in that episode, because I think that was one of the unsung heroes of resiliency in the midst of the Polar Vortex?

Mr. WALKER. I don't have all the details of the Polar Vortex and the use of demand response, but I'm intimately familiar with the use of demand response. It was something at Con Edison when we would go into, you know, into the heat waves in the summer and I was the emergency management director we would utilize demand response as one of the methodologies to control the 30 plus, independent secondary networks within Manhattan.

Senator HEINRICH. I would urge you to take a look at that because I think it played a very important role in that episode and one that was not necessarily appreciated at the time because it went unseen, as many things in the power sector do.

Mr. WALKER. I will.

Senator HEINRICH. Thank you, Mr. Walker, and I will come back for a second round, if I have time.

Thanks.

The CHAIRMAN. Thank you, Senator Heinrich.

Senator Cassidy.

Senator CASSIDY. Hello, Mr. Walker, I am from Louisiana so I look at the people of Puerto Rico, Florida and Texas with great empathy because that was our state 10 years ago.

You look at the grid in Puerto Rico, just smashed, and I gather all the plants are on the southside of the island, but the wires have to go over the mountains and now you have to rebuild over the mountainous terrain. It is an awful situation. It seems like if ever there were a place for both distributed energy and distributed storage, that would be Puerto Rico.

What is the possibility of taking this opportunity to reshape their grid with more distributed, say solar or whatever, it is Puerto Rico, with some distributed storage to make them less reliant on those wires coming over the mountain, but also ideally standing something up very quickly?

Mr. WALKER. Thank you, Senator, for your question.

As I mentioned earlier with regard to Puerto Rico specifically, I think there's a present opportunity to utilize it as a test bed to integrate all sorts of renewables and some of the work that has been done at the Department of Energy. Things like solar, wind, battery storage, to rebuild the system to make it more resilient, establish it as a test bed that can be utilized and replicated throughout the United States.

Senator CASSIDY. Let me ask because I went to California a few years ago and they were having such a hard time with high electricity rates. There was some group that was getting natural gas and having a micro generator, if you will, right on their ground, going off the grid, just using the gas to power up and, kind of, circumventing all the kinds of high rates that Californians have to endure.

What is the possibility of doing that? Obviously, you would have to get some sort of big supply of natural gas there, but that is doable.

What is the possibility of distributed natural gas? Just because for, obviously, industrial use, renewables are not going to cut the mustard. So the degree to which they have large-scale industrial use you are going to need something more powerful, more 24/7.

Mr. WALKER. Yes, sir. That is a possibility to utilize the different technologies that are available on the gas side. With Louisiana being a gas producer, that would be a good product for them to export to Puerto Rico. But that definitely is an opportunity particularly for the industrial customers, as you noted.

Again, part of that, part of the strategy to rebuild it, I think, would—and not being 100 percent familiar with the intricacies of their infrastructure, I am aware that the two power plants that basically supply the whole island are on one side which requires them to use a significant amount of transmission lines and distribution lines to get the power throughout the entire island.

So there's clearly an opportunity to integrate different types of generation to reduce the necessary transmission wires and distribution, as we know them today, to bring the power.

And when things like hurricanes are realized they'll have less of an impact if there's less transmission——

Senator CASSIDY. Easier to put up solar panels than to rebuild lines across the mountain.

Mr. WALKER. Sure.

Senator CASSIDY. Mr. Winberg, the office for which you have been nominated to lead recently announced \$36 million in financial assistance for design and testing of advanced carbon capture technologies.

Now, obviously, Kemper has had a hard time doing this in Mississippi even though they were ideally situated: here is the coal, here is the plant and here is the place we are going to put the car-

bon capture in. On the other hand, I gather NRG has been able to do it successfully out in Texas.

In your opinion, what do we need to do in order to implement carbon capture and storage on a large scale and to do it economically? Does it always take a special geologic, sort of, the production and the storage is right next to each other? I am told it is like \$1 million a mile for the pipeline to ship the gas.

Your thoughts?

Mr. WINBERG. Thank you for the question, Senator.

As I talked about earlier, there are opportunities, work that needs to be done to reduce the cost of CO2 capture and there's ongoing work and part of this funding is to do just that.

You asked about the sequestration. There is also opportunities to use this CO2, to think of it more as a commodity and use it in things such as enhanced oil recovery.

So we're capturing the CO2 from an anthropogenic source. We are piping it, but we're piping it into an existing oil field and we can—

Senator CASSIDY. No, I get that it does seem to take proximity for that to work. I think they are doing that in West Texas, maybe New Mexico, but again, if you are going to take something off of a too-far field, the expense seems to be an obstacle. Is that a fair statement?

Mr. WINBERG. I think the expense, primarily, is in the capture component. Pipelines are not inexpensive, I don't want to give that indication, but the primary expense right now that we need to work on is in the capture part.

There's also been some discussion that if we get to the point where we can capture that CO2 at a lower cost than what it takes to pull natural occurring CO2 out of the ground, we could set up a pipeline infrastructure to move the commodity CO2 into those fields where we can use them for enhanced oil recovery.

Senator CASSIDY. Okay, thank you.

I yield back.

The CHAIRMAN. Thank you, Senator Cassidy.

Senator Daines.

Senator DAINES. Thank you, Chair Murkowski.

I want to thank the two nominees for your willingness to serve in these very important capacities.

I just returned from Taiwan and Korea Saturday night. Of course, Korea is focused right now on what is going on with the North Korean threat, but I stopped in Taipei and met with President Tsai and her team.

I was struck by what happened there just last month where they had a six-hour blackout in Taiwan as they were not able to take care of peak load. There was doubling down on decommissioning their nuclear power capabilities and it left them without enough power to keep the grid going there for six hours in August during peak demand.

These issues we are talking about here today, and with the expertise you both respectively bring to the job, are I think of utmost importance as we have seen mistakes made around the world—Australia, Germany, I think I would add Taiwan to that list now—I mean, not thinking through really a diverse portfolio and balance

capabilities, not just to meet baseload and how critically important that is, but also peak.

In my home State of Montana our baseload largely comes from coal-fired generation, about 50 to 60 percent. I remember a couple of years ago when I was out at Colstrip where the power plant is and chatting with the manager there. It was a hot July day and they were doing some maintenance on part of the plant. They were off the grid for a period of time.

Well, when a high-pressure system moves into the Northwest in July and August, the temperature goes up and, of course, the wind stops blowing.

I support renewable energy and we are very excited about what we are seeing in Montana with our renewable portfolio, but it is also a reminder that we have a diverse portfolio here to ensure that we keep baseload and, importantly, peak load as well going forward.

Our largest coal-fired plant in Montana at Colstrip has been under a threat from the litany of heavy-handed regulations as well as litigation from the prior Administration.

That plant employs 350 people, the mine about 400 people. It is one of the largest taxpayers in our state. It is a heavy economic contributor, particularly at a time right now in Montana where we are facing a fiscal train wreck where at the moment we are having to cut across the board 10 percent, it looks like, across state agencies because revenues are not coming in as anticipated.

If we lost this huge economic driver in Montana that pays a lot of taxes to keep our teachers and our schools, our infrastructure funded, not to mention reliable and low-cost energy, it would be a catastrophe in my state. We are very concerned about the future of Colstrip right now in Montana.

I very much understand the importance of a diverse energy portfolio. I am the only chemical engineer serving on the Hill so I know what it is like to get in and, kind of, geek out on some of these issues as it relates to energy and so forth.

But we are very concerned. We need a diverse portfolio. We need to provide our operators with a suite of options to keep the grid secure. I do not think we can remove baseload power, specifically coal generation, from our nation's energy mix.

By the way, Montana has the largest coal reserves in the United States. You think of Montana as the state that is famous for Yellowstone National Park and Glacier Park and fly fishing, "The River Runs Through It" and Brad Pitt with a fly rod in his hand. That is all true. And we have more recoverable coal than any state in the United States. The responsible use of this natural resource, in my opinion, is certainly in my state's and, I think, our nation's best interest.

Mr. Walker, I greatly appreciate the operations background that you have. I was an operations guy when I worked for Proctor & Gamble. Operations guys are not dealing in theory, they deal with reality every day, and I appreciate that background you will bring to the job.

I understand you touched on this with Senator Manchin when he asked questions about the importance of coal generation to reli-

ability of the grid, but I want to move into the national security implications.

What is your perspective on the importance of baseload generation, specifically coal generation, to our national security?

Mr. WALKER. Thank you for the question, Senator Daines, and I appreciated meeting with your staff last week to learn a little bit about some of the details of the projects you have going on.

Specifically to the question you asked me, I am a strong supporter of a diverse portfolio. I'm a strong supporter of traditional baseload, particularly as it relates to the essential reliability services aspect that often go unspoken when people talk about generation, and that component is what provides the national security benefit that you're alluding to.

When you run an electricity system from an operations perspective there's some fundamental practicalities that are driven by fundamental physics. And the reason that coal and nuclear were utilized as traditional baseload were to control those essential reliability services, more specifically, things like controlling the frequency of the system, the inertial energy of the system and the reactive power flow of the system. And so, those components are the underpinnings of what allow all of the other renewables and other type of technologies to ride on top of it, if you will, to provide and meet the demands of the load profile that's there.

So I revert back to the basic reasons that the traditional load was made up of, of coal and nuclear, which was really to facilitate the rest of the load portfolio. So I'm a strong supporter of traditional baseload.

Senator DAINES. Mr. Walker, thank you.

I am out of time, but thank you for the term "fundamental physics" as we talk about this. I would like to get your commitment if you would come out to Montana, visit Colstrip, and I would like to get your assessment on grid security once you are confirmed.

Mr. WALKER. If confirmed, even if I'm not confirmed, I'd love to come out to Montana. You just have to promise me I don't have to bring my skiing son who is trying to get to Montana anyway he can.

[Laughter.]

Senator DAINES. Montana State is a great place to go to school and you can ski a lot, if you want. Just to let you know that.

[Laughter.]

Mr. WALKER. He's studying chemical engineering.

Senator DAINES. God bless you. Good work.

[Laughter.]

Thank you.

The CHAIRMAN. Fundamental physics, too geeky.

[Laughter.]

Let's go to Senator Cortez Masto.

[Laughter.]

Senator CORTEZ MASTO. Thank you, Madam Chair.

You are always welcome to come to Nevada and Tahoe skiing, and you can go to the University of Nevada-Reno.

[Laughter.]

We will welcome you there.

Thank you, gentlemen, for your willingness to serve and thank you and welcome to the family members. And thank you, Mr. Winberg, for your service to our country. I really appreciate that and what an honor it is to have you here. Thank you.

This is an important topic for Nevada, as you well know. Renewables and clean energy are very important to Nevada and many of us, and we are trying to find that right balance for the portfolio that we need.

And so, Mr. Walker, I want to talk with you and I apologize, I think you have already talked about this but I am juggling two Committees at the same time, so I just ran back from Banking so I can ask a few questions.

I am interested with your background. Can you talk a little bit about your thoughts when it comes to the intersection of the grid modernization and cybersecurity and how you see those fitting together and your role in both of those?

Mr. WALKER. Thank you, Senator, for the question.

That's a fantastic question because that is the nexus point where cybersecurity, particularly on the OT side, the operational technology side, really begins.

I mentioned earlier, the utility industry when it was developed 130 years ago, there were no computers. When the advent of integrated technology or ICE, integrated components, came into play and computer technology came into play, the SCADA systems and the components that have susceptibility from the cyber perspective, fundamentally became add-ons to the existing architecture, if you will, of the electric grid. The fundamental architecture of the grid never changed, and it's these add-ons that created the vulnerability and the susceptibilities with regard to the cybersecurity risks that we have.

And one of the components, one of the three areas that I believe we need to focus on in cybersecurity is the R&D component with taking a look at the actual operational technologies and the architecture of the system so that as we move forward with modernization, things that facilitate efficiencies and better logic schemes and correlation modeling for predictive analysis, that that's done so in a way that doesn't create the susceptibilities that we realize today by virtue of the way the system is developed independently.

Senator CORTEZ MASTO. Thank you and I could not agree more. I think, oftentimes, cybersecurity is an afterthought and we do not think about it as part of the infrastructure, the architecture when we are moving forward.

So I appreciate those comments, thank you.

Mr. WALKER. Thank you.

Senator CORTEZ MASTO. Mr. Winberg, welcome.

In June 2016, the Secretary of Energy Advisory Board reported that there currently is no large-scale R&D programs in direct air capture of carbon dioxide from the atmosphere that are sponsored by the Department of Energy. Several recent studies referenced in the task force report have estimated the cost to be approximately \$600 per ton of CO₂, if not higher.

But in that same report, it notes that developing novel, liquid absorbents and solid absorbents, membranes and hybrid systems would contribute to developing low-cost, direct air capture and are

being addressed through current Office of Science and Fossil Energy sponsored research.

Do you believe that continued investments in these types of direct air capture technologies are worthy of future investment?

Mr. WINBERG. Thank you for the question, Senator.

Many of the capture technologies, whether it's solvents or membranes that would be used in direct air capture would be very similar to those used in more concentrated levels of CO₂ coming out of power plant stacks or industrial facilities.

So, I think, to the extent we're looking at basic or even applied research in evaluating those absorbents or membranes, using them or testing them on a higher concentration levels probably makes more economic sense, at least in the early stage of the research. As we get out into pilot-scale and larger-scale demonstrations, that's a different matter because now you're getting into integration of large equipment.

But where we are right now on the R&D timeline, if you will, I think the best use of funds is probably in those more concentrated streams.

Senator CORTEZ MASTO. Okay.

As Assistant Secretary would you consider supporting investments in carbon capture research on natural gas power plants?

Mr. WINBERG. Thank you for the question.

Again, in general, yes, but again, natural gas CO₂ is about 50 percent of what you have on coal-fired or some industrial sources. So again, it's a matter of using the most concentrated sources.

But yes, as we continue down the development timeline and we start to look at equipment and integrating that into existing sources, then yes, we need to look at natural gas as well.

Senator CORTEZ MASTO. Thank you. I appreciate your comments, gentlemen. Thank you very much.

The CHAIRMAN. Thank you, Senator.

Gentlemen, I have a few more questions but I also have a commitment that I am already late to. We are juggling a lot of things here this morning. I am sure you can appreciate that. So I will submit them as questions for the record. One, Mr. Winberg, is specific to the Strategic Petroleum Reserve.

Senator Cassidy has a follow-on question I will allow him to ask and then he will close the Committee out.

But again, I want to thank you for stepping up. I want to thank your families for backing you and my hope is that we will be able to move these nominations expeditiously through the Committee.

You certainly have my support, and I think your knowledge of the issues and your desire to learn more than you already have done and provided is greatly appreciated. So we thank you for that.

With that, Senator Cassidy, if you would like to ask your questions and then close this out, I would appreciate it. Thank you.

Senator CASSIDY [presiding]. Thank you, Madam Chair.

Mr. Winberg, you are going to know the details better than I can describe it, but by reference, that project in Texas where they are taking CO₂, using it to directly drive a turbine. Are you familiar with that?

Mr. WINBERG. Yes, Senator, I am.

Senator CASSIDY. I saw something recently building upon that concept. They take natural gas and/or gasified coal, mix it with oxygen, spark it and the CO₂ that results is used to drive a turbine, capturing some of it to recycle back into the process of driving the turbine and perhaps capturing and storing another part. Are you familiar with that technology and conceptually does it make sense?

Mr. WINBERG. Yes, Senator, I am familiar with the technology, super critical CO₂.

Senator CASSIDY. Define super critical CO₂ because that is a technical term, I gather?

Mr. WINBERG. I'm sorry, yes.

High pressure, high temperature CO₂. So rather than using steam which or hot gases to drive a turbine, you use the high pressure, high temperature CO₂. And it creates a closed loop, recycling that CO₂ and then eventually it can be sequestered or used for enhanced oil recovery.

I think that the technology is one of those transformational technologies, quite frankly. There are a couple of others and they are probably from large-scale, commercial development. They're probably 5 to 10 years out, but they hold a lot of promise for not only capturing CO₂ but perhaps more importantly, significantly increasing the efficiency of coal-fired and natural gas-fired generation in the United States.

Senator CASSIDY. So you can see that it is almost as an ancillary where you would have it as an add-on to your standard plant producing the CO₂ or know you can take your gasified coal and then directly feed it in.

Put it this way. Do we have to replace the plants we have or is this something that can be an adjunct?

Mr. WINBERG. Good question.

I think we would have to replace parts of the plant for sure. So it could either be a greenfield site or a brownfield site or retrofit, if you will. But the majority of the equipment, probably at the end of the day would be replaced. Things like—

Senator CASSIDY. Let me stop you just because I have limited time.

Mr. WINBERG. Sure.

Senator CASSIDY. You say it is 5 to 10 years out, but there is already this prototype based upon this concept being built in Texas right now. Why 5 to 10 years out because it sounds like this is incredibly promising?

Mr. WINBERG. It is incredibly promising, but I'm talking about getting to commercial-scale and wide-reaching deployment.

Senator CASSIDY. Now, there are two things about that.

There are technical problems of getting it to commercial scale and then there is a second, well, we do not replace power plants that often—so that is a separate issue.

Mr. WINBERG. Yes, sir.

Senator CASSIDY. So which of those two or is it both?

Mr. WINBERG. I think it's a little bit of both, but probably more the former than the latter.

Senator CASSIDY. So that is just getting the experience with it—the technical experience?

Mr. WINBERG. Yes, sir.

Senator CASSIDY. Anything else you would add to that before I turn it over to Governor Hoeven?

Mr. WINBERG. I'm sorry, I didn't hear the question.

Senator CASSIDY. Is there anything else you would add to that? I am interested in this because it does seem a way to find a use for this instead of having to pipe all this natural gas far away for EOR, to ship it down the street, to run it in this, sort of, turbine and/or to use this coal that Senator Daines is talking about in a way which captures the CO₂ and, ideally, all these other countries that are using so much coal could deploy the technology and decrease their greenhouse gas emissions. All that make sense?

Mr. WINBERG. Yes, it does, sir.

Senator CASSIDY. And so, the technical aspect of it, you have \$36 million to, kind of, further this. Would this be one of those things you would further or is this different than the approach you would take?

Mr. WINBERG. I believe this is one of the things that we could further with that \$36 million. Yes, sir.

Senator CASSIDY. Okay.

Gentlemen, thank you very much. I will now turn to Senator Hoeven.

Senator HOEVEN. Doc, you must be in charge looking around the room here.

Senator CASSIDY. You are in charge now, buddy.

[Laughter.]

Senator HOEVEN [presiding]. Thank you.

First, welcome to both of you and it looks like you have family here, so welcome to your family as well. And congratulations on being nominated for these important positions.

I would like to start with Mr. Winberg.

First, I want to thank you for coming by and visiting with me in my office. I am going to go right to what we talked about and that is supporting fossil research and developing clean coal technology.

To do that we need industry out there doing new, innovative, creative things which they are doing. I gave you an example in North Dakota where our companies are using the latest, greatest technology to already, not only capture CO₂, but compress it, condense it, pipe it out to the oil fields and put it down a hole for tertiary oil recovery.

Now we are working on new projects, plants that are coal-fired electric plants, both to capture CO₂ in the back end, that is called Project Tundra, and to build a new plant with very low CO₂ emissions which is the LM cycle.

The partnership between our industry, between our state, and we really need the DOE and the Fossil Energy Research Program to partner with us to make this happen. So we take this technology from technically-viable to commercially-viable and really then, you will see it adopted across the country and in other countries as well.

So please, obviously that is a huge concern in terms of your support for that kind of research and development. I would like you to tell me your thoughts and your commitment to it. And then also,

willingness on your part to come see what we are doing and work to partner with us.

Mr. WINBERG. Thank you for the question, Senator Hoeven.

Absolutely, I support this type of research. I've spent 39 years doing exactly this type of research.

And so, if confirmed, I look forward to continuing that.

I also look forward to coming out to your state and meeting with some of the people that are doing this fine work. I have worked off and on with the ERC, so I'm very familiar with those folks and the fine work that they do.

But absolutely, Senator, I am very supportive of this type of work that is going on in North Dakota as well as other states around the country.

So, thank you.

Senator HOEVEN. That is an excellent answer, and I certainly look forward to supporting you in the nomination process.

Mr. Walker, I would turn to you and just ask about electric grid reliability and touch briefly on your approach, but then also on baseload because one of the challenges we have is both baseload and variable energy going into that grid.

We need both but we have to make sure that we preserve that baseload, and if it gets pushed out because some of the variable players come in at a preferential rate, that could create a long-term issue for us.

So how do you handle that and make sure that we continue to promote the development of all industry, but whether it is baseload electric or these other baseload energy providers that we keep them in place, which we very much need for long-term safety and security of our energy supply?

Mr. WALKER. Sure, thank you. Thank you for the question.

I spoke earlier about this and it was focused on the essential reliability services that are provided by the traditional baseload. And, while I support a diverse portfolio, I revert back to the fundamental physics that drive the operations of the utility generation business.

Traditional baseload was put into place at the time it was very cost-effective based on the operation and maintenance aspects and the low number of forced outages on both the nuclear and the coal components.

But there was another component that doesn't get talked about often which is referred to as the ERS component, which is the Essential Reliability Services, and by those I mean things like controlling the frequency, inertial capabilities, reactive power flow and traditional baseload generation does those three things and those are critically important for the rest of the fleet, if you will, of generation to operate properly.

So, as we add things in, some of the renewable technologies that still relies on the basic fundamental physics that require reactive power flows and magnetization that are created by the traditional baseload.

So I'm a fan of traditional baseload and, more importantly I think, the fundamental physics that drive the system.

Senator HOEVEN. Thank you, I appreciate your answer as well.

Thanks again to both of you for your willingness to serve in these important positions. We appreciate it very much.

And with that, I will turn to Governor King.

Senator KING. Governor Hoeven, thank you.

[Laughter.]

It looks like we are in charge here.

Senator HOEVEN. Yes, sir.

Senator KING. No telling what good we could be up to.

Senator HOEVEN. Exactly.

Senator KING. Gentlemen, I apologize for being late. There is no effort in the Senate to coordinate schedules of hearings, and I have been at an Armed Services Committee hearing this morning.

I guess I would start with Mr. Walker.

You are walking into an agency that, I think, is critically important and your Administration is proposing an \$85 million, 40 percent, cut in your budget. Does that make sense to you?

Mr. WALKER. Well, thank you for the question, Senator King.

Unfortunately, I wasn't here during the development of the budget. I am aware of the cuts. I'm also aware that the Appropriation Committee and Congress, you know, made up of the House and the Senate, fundamentally drives and establishes the budget at the end of the day. And I know there's been quite a bit of talk with regard to the cuts for this Department.

Senator KING. Will you commit to expending the funds efficiently and effectively that are appropriated by the Congress, regardless of what the proposed budget was of the Administration?

Mr. WALKER. I will spend the funds that are appropriated by Congress efficiently and effectively.

Again, I haven't had the opportunity to be at the Department so I don't have all the information that went into developing the budget but, if confirmed, I commit to review it. I work on a risk-based approach with expenditures and I will absolutely spend the money efficiently and effectively, as determined by the risk components and what drives the industry at the Department.

Senator KING. But you will execute the budget as passed by Congress? That is what I want to hear you say.

Mr. WALKER. I will execute the budget as executed by Congress.

Senator KING. Thank you.

On this issue of baseload, I am concerned that there is—I have never heard the word "baseload" so often as in the past three or four months. It seems to be becoming a magic term that says we do not want any more renewables.

Denmark, for example, I remember hearing—I have been in the renewable business for over 30 years before coming into this job, and I remember hearing that you could only penetrate into the market so far, 10 percent of renewables, 10 percent, 20 percent.

But aren't there places in the world, Denmark, for example, where a much higher percentage of that is based upon wind power coupled with hydro?

Mr. WALKER. As I am familiar with Denmark's baseload generation component, it is higher than the 10 percent figure you're speaking about, yes.

Senator KING. Significantly higher, 30, 40 and some days 50, 60, 70 percent. Isn't that correct?

Mr. WALKER. I'm not sure exactly what Denmark's actual base-load component is, Senator.

Senator KING. Then I guess the point I would make is that renewables plus storage, and hydro can be storage, can equal base-load. Can it not?

Mr. WALKER. Well, absolutely.

You know, you weren't here earlier, Senator, so I am a huge fan of renewable energy, but I believe in a portfolio approach to be able to do that—

Senator KING. I do too. There has got to be a diversity. I fully agree.

Mr. WALKER. Absolutely and you know, pump storage hydro, which is the greatest amount of storage technology today, is highly reliable and has been utilized as baseload throughout the United States.

Senator KING. And can be used to offset when the sun doesn't shine or the wind doesn't blow?

Mr. WALKER. As long as gravity works, we're okay.

[Laughter.]

Senator KING. Even Congress cannot repeal that law.

[Laughter.]

Mr. WALKER. Can't legislate physics.

[Laughter.]

Senator KING. Although in Maine one year we tried to repeal February. It was a—

[Laughter.]

Let's turn to a different question about threats to the grid because your role includes reliability.

I consider cyber, probably, one of our greatest national vulnerabilities. Do you agree?

Mr. WALKER. Absolutely.

Senator KING. And do you feel that we are adequately protected now, in terms of a potential cyberattack on our grid?

Mr. WALKER. I believe there's quite a bit of work being done in the cyberspace. I think there's opportunity to do more.

Earlier I articulated three different components to address cyber. The first has to do with the situational awareness with regard to the information that's communicated through the Federal Government back to the utilities throughout the United States regarding threats and the information, you know, backflow between both the utilities and the industry. There's an existing program called CRISP that has to do with the information sharing between utilities that's already being done by the Department of Energy that I think could be further expanded. The second component involves the preparing for the actual event—so an incident response component. And then the third component involves specific R&D, particularly as it relates to the architecture of the grid.

I spoke earlier about the architecture of the grid that we have today was developed 130 years ago, independent of any of the technologies that enable the cybersecurity risk that we realize today.

So the SCADA systems and the RTUs and all of those did not exist when the original systems were put in and developed. They're effectively add-ons. And when they were added on they, in fact, created the vulnerability for cybersecurity on the grid.

The R&D component would be focused on taking a look at the architecture and perhaps building some of the logic into, or building logic simultaneously into, the components that actually operate under the basic physics that drive the system.

Senator KING. My time is expired but I would suggest that one strategy that we need to be thinking about, and the destruction of the grid in Puerto Rico, it seems to me, gives us a chance to think about it and perhaps execute this, is more distributed generation so that if when you knock out the central generating plant, you do not knock out the whole system. And more in terms of demand response distributed generation that, in itself, can create a more self-healing grid and a more resistant to a central point of attack.

Would you agree?

Mr. WALKER. I would agree.

Senator KING. Thank you.

Thank you, Mr. Chairman

Senator HOEVEN. Did you have any other questions? If so, you can go ahead and ask them.

Senator KING. No, I think I am fine, thank you.

Senator HOEVEN. Okay.

Again, thanks to both of the witnesses.

If any members do have questions for the record they need to submit them by close of business today.

With that, we are adjourned.

Thanks very much.

[Whereupon, at 11:53 a.m. the hearing was adjourned.]

APPENDIX MATERIAL SUBMITTED

**U.S. Senate Committee on Energy and Natural Resources
September 26, 2017 Hearing: Pending Nominations
Questions for the Record Submitted to Mr. Bruce J. Walker**

Questions from Ranking Member Maria Cantwell

Question 1: Relief for Puerto Rico

Based on your experience in New York, what can the whole of the federal government do immediately to help restore power to Puerto Rico as quickly as humanly possible? What should DOE do to use this internal expertise and manpower to help remedy this desperate situation?

Answer: The hurricane damage to Puerto Rico is tragic. Restoring power to the island is of the utmost importance as it is necessary for the basic needs of its residents. It is DOE's responsibility to do all that it can to help the people of Puerto Rico, and if confirmed, I will get to work immediately on this task and make it my top priority. Having a full leadership team at the Department - so that the Department can focus all of its available resources at restoring power to Puerto Rico - would be extremely helpful.

Question 2: Grid modernization

One of the Office of Electricity's most important roles is integrating new technology and the transmission and distribution sides of the grid. What unique role do you think the Department can play, whether as a clearinghouse of information or funding demonstration programs, to help the country modernize our grid?

Answer: One of Secretary Perry's goals at the Department is to prioritize the modernization of the electric grid. If confirmed, I will ensure that the Office of Electricity Delivery and Energy Reliability is focused on modernizing and improving the grid. I will also utilize the national laboratories and their expertise and research on this important issue.

Question 3: Apprenticeships

With an aging workforce and looming retirements, the energy industry faces a skills gap. Apprenticeship programs can help fill this gap, recruiting workers who learn while they work. But training is not keeping pace with retirements. In Washington, 8 percent of utility workers are apprentices, but 18 percent of workers are expected to retire by 2018. Will you work with industry, organized labor, and community colleges to expand the use of apprenticeships in energy workforce training?

Answer: A sound workforce is critical for stability in the energy industry, and I know this is an important issue to you. It is also important to me. If confirmed, I look forward to getting more input from you and your staff, and seeing what capabilities the Department has to help address this important issue.

Question 4: Cybersecurity

How will you help protect us from Russian attacks, and how can cybersecurity be a top priority if the administration cuts funding by 32 percent?

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Answer: Cybersecurity is vital to the nation's security. The people of this nation entrust the Federal government to help keep the grid and government systems safe from people and countries who seek to harm the U.S. If confirmed, I would immediately request cybersecurity briefings, and work with Secretary Perry, as well as other relevant agencies and the private sector, to identify strengths and focus resources on areas where improvements could be made. I would also work with your staff to review DOE authorities approved by Congress in the FAST Act for way to fully implement and improve those authorities.

Questions from Senator Ron Wyden

Question 1: Mr. Walker, energy storage is one of the most rapidly growing energy technologies out there, and it can provide multiple benefits to the grid, including enhanced grid reliability. Yet, many energy storage technologies are still in their infancy, requiring further research and development, which historically requires a significant governmental role. Do you support increasing funding levels at the Department of Energy (DOE) for energy storage research, development, and demonstration?

As the Assistant Secretary in charge of energy reliability, would you continue to push the development of energy storage to enable more efficient use of a variety of energy source as a means of ensuring a reliable grid? Will you commit to partner with the private sector to deploy clean energy game-changing technologies?

Answer: Energy storage is a crucial component of a reliable grid. The ability to store energy means we have the flexibility to strategically deploy renewables, among other things. This could lead to lower energy costs by increasing efficiency. I commit to working with all stakeholders on the early-stage development of these transformational technologies.

Question 2: DOE's Office of Electricity Delivery and Energy Reliability oversees regional smart grid demonstration projects. Let me tell you about a highly innovative project which has demonstrated transactive energy management, a promising, cost-effective way to integrate variable renewable energy, energy storage and demand response at scale. The Pacific Northwest Smart Grid Demonstration Project is a successful public-private partnership involving 17 organizations across five Northwest states.

PGE, an investor-owned utility that serves more than 821,000 customers in northwest Oregon, is one of 11 electric utilities from five Northwest states that are participating in the five-year, \$178 million regional smart grid project that was launched in 2010. About half of PGE's \$23 million involvement in the project was paid for with DOE funds, including the \$10 million Smart Power Center. I'd like to hear some support from you for good projects like this.

As the Assistant Secretary in charge of drive electric grid modernization and resiliency, can I expect to see more innovative projects like the Pacific Northwest Smart Grid Demonstration Project?

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Answer: If confirmed, I commit to utilizing the private sector and working together on grid modernization efforts when appropriate.

Question 3: I am currently thinking about the “next big things” in the energy and energy efficiency sectors. For instance, I am very curious about the potential to extract savings from the efficiencies generated when devices and buildings become connected and those connections optimized. This is commonly referred to as “systems efficiency” and it has applications in building energy codes, appliance and equipment standards, workforce development, and the various research activities underway at DOE. What do you think is the potential at DOE, across the federal government, and in states to capture these savings and deliver greater benefits to homeowners, consumers, and businesses? What are some barriers that we in Congress could consider removing to unlock even greater savings?

Answer: I believe this falls under the jurisdiction of the Office of Energy Efficiency and Renewable Energy; however, there is vast potential for improvement. If I am confirmed, I look forward to working with DOE staff and your staff to identify any barriers Congress could consider removing.

Question 4: Right now, we are in the middle of a natural disaster across the American West: the burning of over 8.44 million acres of forests. Governors across the West have declared states of emergency, with the evacuation of towns and homes, and the loss of businesses. What role do you see the Trump administration's DOE should have in fighting climate change? How would you incorporate predicted climate changes into your preparation and response to significant events like hurricanes or wildfires?

Answer: If confirmed, I will help the Department implement its policies in accordance with the law. Following Hurricane Katrina, I helped develop a Corporate Coastal Storm Plan based upon the lessons learned from the hurricane. Planning for worst case scenarios in storm plans for our critical infrastructure helps maintain the integrity of energy systems.

Question 5: Mr. Walker, our electricity grid--once touted by the National Academy of Engineering as the single greatest engineering achievement of the twentieth century--is in need of serious help. Can you commit on working to modernize our electric grid? If so, what steps will you take to advance grid modernization?

Answer: Yes. If confirmed, I commit to being fully briefed on current initiatives at the Department to modernize the electric grid. I will work to ensure that the Office of Electricity Delivery and Energy Reliability is focused on modernizing and improving the nation's electric grid.

Question 6: What specifically would you do at the DOE to protect the electricity grid--and American citizens--from cyberattack?

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Answer: As the Sector-Specific Agency for energy sector cybersecurity, DOE serves as the lead agency for protecting the grid. If confirmed, I look forward to continuing DOE's ongoing efforts and to working with the private sector on improving the security and protecting our grid from attacks. There is significant work being done in this area across various federal agencies that I need to be briefed on in order to specifically define a course of action. If confirmed, I would also engage our national laboratories and their expertise and research on this important issue.

Question 7: Considering the integrity and security of the nation's electricity system, as well as the efficiency with which smart-grid enabled appliances and equipment are deployed in the market, do you believe it would be useful to promote open interoperability standards for smart-grid enabled technology? And if so, how would you recommend doing so?

Answer: If confirmed, I look forward to receiving briefings on this issue and working with your office to see how we can achieve a viable solution. It is important to balance the benefits of open source standards with the challenges of physical and cyber security.

Question 8: Utility data access is important for many businesses capable of providing services to consumers, such as enabling more accurate modeling and forecasting of locational electricity demand needs. What is your view on utility data access, and how would you work to make sure both sides of this debate get a fair shake?

Answer: I value the opportunity to participate in discussions focused on data access and will ensure, if confirmed, that it receives appropriate attention especially as it is important for a complete discussion regarding an "all of the above" generation portfolio.

Question 9: Mr. Walker, I'm sure you realize that energy storage and an increasing number of aggregated distributed energy resources (DERs) can provide a range of valuable services to the electricity grid, such as frequency regulation and capacity. In many parts of the country there are no means for remunerating these technologies for the services that they provide, which creates a market distortion against these technologies. What will you do at the Department of Energy, and in your relationship with the Federal Energy Regulatory Commission, to ensure that the full suite of technologies are identified for the value-streams they provide to the grid? For example, would your DOE continue working to better define the value different services the grid can provide?

Answer: Like Secretary Perry, I support an "all of the above" energy strategy. I believe that an "all of the above" energy generation portfolio is beneficial to the electric grid and supports the grid's resiliency and reliability. Traditional baseload generation plays a vital role in the resiliency and reliability of the grid, as well. If confirmed, I will promote the utilization of all our energy sources and follow all laws set by Congress.

Question 10: Electric vehicles (EVs) have come a long way. The problem is that we're talking about two very separate, siloed industries with very few interconnections. With more EV-grid integration, it's possible for EVs to even provide valuable services back to the grid when needed.

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What can we expect from you in supporting further electric vehicle-grid integration, and in facilitating dialogue between US automakers and electricity companies?

Answer: It is my understanding that the Department's budget includes early-stage R&D to enable next-generation combustion vehicles and electric vehicles. If confirmed, I will work appropriately with the Office of Electricity Delivery and Energy Reliability on EV integration. I will also work to utilize the expertise of US automakers and electricity companies where appropriate.

Questions from Senator Bernard Sanders

Climate Change

Question 1: President Trump has suggested in the past that climate change is a hoax. Is the President correct? Is climate change a hoax?

Answer: I believe that the climate is changing. However, the relationship between climate change and human impact must be carefully weighed when jobs, national security, reliable and affordable energy are at stake.

Question 2: Do you agree with the vast majority of scientists that climate change is real, it is caused by human activity, and that we must aggressively transition away from fossil fuels toward energy efficiency and sustainable energy like wind, solar, and geothermal?

Answer: I agree humans may have some effect on climate and if confirmed I look forward to working with you and all stakeholders to further implement an "all of the above" fuel generation portfolio.

Question 3: Do you agree with the vast majority of scientists that the combustion of fossil fuels contributes to climate change?

Answer: I agree humans may have some effect on climate and, if confirmed, I look forward working with you and all stakeholders to further implement an "all of the above" fuel generation portfolio.

Question 4: If confirmed, how will you work to address climate change?

Answer: If confirmed, I look forward to working with you, Congress, and all stakeholders to implement an "all of the above" fuel generation portfolio.

Fossil Fuels

Question 5: If confirmed, how will you lead the Office of Electricity Delivery and Energy Reliability in a way that will reduce the extraction and use of fossil fuels?

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Answer : If confirmed, I look forward to being more fully briefed on all of the tools available within the Office of Electricity Delivery and Energy Reliability and using those tools in a thoughtful manner to implement an “all of the above” energy strategy.

Question 6: How do you see storage and other new technologies supporting electric reliability to allow for the U.S. to reduce the amount of fossil fuels that we use to support our energy needs? If confirmed, how will you support new, clean reliability technologies?

Answer: If confirmed, I look forward to being more fully briefed on how the Office of Electricity Delivery and Energy Reliability can stimulate energy storage technologies to support a diverse fuel portfolio.

Question 7: What do you believe are the best current and prospective electricity delivery and energy reliability policies to effectively reduce carbon pollution from energy development and use? If confirmed, how will you ensure the Office of Electricity Delivery and Energy Reliability supports these policies?

Answer: If confirmed, I look forward to being more fully briefed on delivery and energy reliability policies, reviewing those policies, and working with Congress to implement an “all of the above” energy strategy.

Energy Future

Question 8: What do you believe is the role of renewable energy in our energy future?

Answer: Renewable energy has a role in our energy portfolio, and I believe it should have a role in the nation’s energy future like all of our nation’s energy resources.

Clean Energy

Question 9: Vermont is a leader in clean energy innovation and jobs, from companies that assemble solar arrays to firms that specialize in making homes and businesses more energy efficient. In Rutland, Vermont, Green Mountain Power’s (GMP) Stafford Hill solar and battery storage project is the first of its kind in the nation. This project is saving Vermonters money: on a hot summer day in 2016 when demand was very high, the project saved customers approximately \$200,000 during a single hour. Instead of buying expensive peak electricity from the regional grid, GMP was able to use the electricity generated by the solar farm and stored in the batteries. The State of Vermont set a goal of 90 percent clean energy by 2050. How will you support Vermont’s efforts to achieve a clean, reliable electric grid?

Answer: If confirmed, I look forward to being more fully briefed on the appropriate role the

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Office of Electricity Delivery and Energy Reliability could have to help Vermont achieve its goals.

Question 10: If confirmed, what specific actions will you take as Assistant Secretary of Electricity Delivery and Energy Reliability to ensure low-income communities, communities of color, and tribal communities have access to reliable, clean energy?

Answer: If confirmed, providing reliable and affordable energy to all Americans will be a top priority.

Question 11: Electricity costs represent a disproportionate share of the household spending of low-income households, as pointed out by DOE's Quadrennial Energy Review. What specific actions will you take to ensure that DOE programs, technical assistance, and regulations provide low-income households with access to affordable clean energy so that they do not bear a disproportionate burden of investments in the power system?

Answer: Providing affordable electricity to all Americans is important and, if confirmed, I will work to keep consumer prices affordable and energy reliable for all.

Question 12: Secretary Perry requested a study to ascertain whether wind and solar power are threatening electric grid reliability. The study found no such threat. Do you agree with the science that demonstrates wind and solar can in fact improve reliability while decreasing costs?

Answer: I support of an "all of the above" energy strategy that includes wind and solar, and believe we should support all energy resources for reliability and a resilient grid.

Question 13: Several of my colleagues and I recently introduced the 100 by '50 Act to lay out a roadmap for the United States to transition away from fossil fuels and toward 100% clean and renewable energy. This bill includes major investments in clean and renewable energy as well as in energy storage and grid infrastructure to ensure reliability and affordability. If confirmed, do you commit to supporting investments in grid infrastructure to ensure our clean energy future is achieved in a way that ensures electricity reliability? If so, what specific steps will you take as Assistant Secretary of Electricity Delivery and Energy Reliability to move us closer to this goal?

Answer: If confirmed, I commit to following the laws enacted by Congress and the President.

Question from Senator Debbie Stabenow

Question: Mr. Walker, as Ranking Member of the Senate Committee on Agriculture, Nutrition, and Forestry, I am all too familiar with the energy and electricity challenges facing rural communities, especially related to transmission and affordability.

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In the past, the Department of Energy has partnered with the Department of Agriculture (USDA) to, for example, improve energy efficiency in rural areas. If confirmed, would you extend and build on these partnerships with the USDA to improve rural electrification and tackle the issue of energy affordability in our rural communities?

Answer: Rural areas often have several challenges in the energy sector, including energy affordability. If confirmed, I commit to work with your staff to more fully understand the challenges faced by our rural communities. I will also commit to looking into and understanding what federal partnerships the Department is currently undertaking to address rural electrification.

Questions from Senator Al Franken

Question 1: I believe that energy storage will transform our electric grid. Not only can efficient and effective energy storage systems improve the reliability and resiliency of the grid, but these technologies also allow increasing amounts of variable renewable energy sources to reach the market. That's why I worked with the Chair and Ranking Member to authorize an additional 50 million dollars for energy storage research and development through the Office of Electricity in the Senate Energy Bill. What role do you see energy storage playing in the electric grid in the future? And if you are confirmed, how will the Office of Electricity help advance energy storage?

Answer: I do believe storage can play an important role in strengthening the grid, which is one of Secretary Perry's priorities. If confirmed, I look forward to working with him, others at DOE, Congress, and the private sector to find ways to make storage work for the grid.

Question 2: President Trump's budget guts funding for research and development across the government, putting at risk our international competitiveness and innovative edge. This is especially pronounced at the Department of Energy. His budget slashes energy research programs by \$3.1 billion, including a 48 percent decrease in the Office of Electricity. Are you confident that these budget cuts would not detract from American competitiveness in energy innovation, and if so, why?

Answer: The President's budget focuses the Department's priorities on early stage research and development. It is important to focus on the development of innovative technologies, tools, and techniques to modernize the distribution portion of the electric delivery system - the infrastructure that takes power from the transmission system and delivers it to individual businesses and homes.

Question 3: I am concerned about the physical security of our grid. In 2013, an armed attack severely damaged 17 large transformers at the Metcalf substation in California. Fortunately, this incident did not cause outages. However, it exposed a great risk because transformers are extremely difficult to replace in a short time span. This is because large transformers take a long time to manufacture; they are heavy and hard to transport; they must be customized for each

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substation; and we import most of them from other countries. I think policymakers need to be thinking about this, because if there were a large-scale attack that destroyed a significant number of transformers we would have no way to quickly replace them. Do you believe that there is a federal role to ensure we have adequate transformer supplies if there is an attack on substations? Do you believe that a national strategic transformer reserve is necessary?

Answer: Grid resiliency and security is a matter of national security and are some of Secretary Perry's top priorities. The federal government currently works with the North American Electric Reliability Corporation (NERC), and industry to improve programs such as Edison Electric Institute's Spare Transformer Equipment Program. If confirmed, I look forward to being briefed further on this issue. The risk to critical infrastructure from physical attack is high and needs to be addressed through various means that I will, if confirmed, further investigate and seek to implement.

Questions from Senator Mazie Hirono

Question 1: As recently as a decade ago, Hawaii relied on imported fossil fuels for over 90 percent of its energy production. Thanks in large part to a memorandum of understanding first signed in 2008, the DOE has been a key supporter of Hawaii's efforts to shift towards sustainable, locally produced, renewable sources of energy. Hawaii set a goal of 100 percent renewable energy by 2045. In 2016, Hawaii got 26 percent of its electricity from renewable sources, and the Big Island of Hawaii currently averages above 50 percent renewable electricity. As the Second Installment of the Quadrennial Energy Review noted, Hawaii is "currently experiencing the bulk system frequency stability impacts that mainland U.S. power systems will experience in the coming years and decades." DOE renewed the memorandum of understanding with Hawaii in 2014. Will you commit to supporting DOE's continued assistance to Hawaii with research, technical assistance, and grants where appropriate to help Hawaii inform the nation on how to integrate high levels of renewable power sources?

Answer: If confirmed, I will commit to thoroughly reviewing the Office of Electricity Delivery and Energy Reliability's research, technical assistance, and grants that impact Hawaii.

Question 2: Twenty-nine states plus the District of Columbia have established renewable portfolio standards and five states have set targets at or above 50 percent, including Hawaii's 100 percent goal for 2045. If you are confirmed as Assistant Secretary of Energy for Electricity Delivery and Energy Reliability, how specifically do you plan on assisting the states with RPS provisions to be successful in their energy self-sufficiency and energy security objectives?

Answer: I believe that Federal and State policy makers should work together in close consultation on energy needs, especially those issues that have a deep impact on our nation's energy security. If confirmed, I will commit to working with the States on energy policies that impact the American public.

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Question 3: An annual survey conducted by the Department of Defense (DoD) found that a majority of utility outages were the result of electric disruptions. This survey estimates the financial impact of these outages is approximately \$500,000 per day. Improving energy resilience will not only sharpen DoD mission assurance, it will also save the DoD money. If confirmed, will you commit to encouraging technical collaboration between the DOE Office of Electricity and Energy Reliability and the DoD? This kind of collaboration is very important to Hawaii. As an islanded community, Hawaii's own ecosystem of resilience must also include the military.

Given your extensive professional expertise working with system operations in the electricity sector, how do you think the Department of Energy's Office of Electricity Delivery and Energy Reliability can best lend its technical expertise to improving energy resilience for the electric power system that service military installations throughout the country?

Answer: If confirmed, I look forward to identifying opportunities to address the security and resiliency of the electric grid for the safety and health of all the nation, including at our military installations. I will use my professional experience from being a field engineer in the beginning of my career to developing comprehensive recovery and reconstruction programs for New York City's Long Island City underground secondary network, and call upon the dedicated staff at the Department, to better secure (physical and cyber) the nation's electric power system.

Question 4: What more needs to be done from a technical standpoint to protect the systems that power military installations from cybersecurity threats? If confirmed, will you commit to ensuring DOE and the National Laboratories are in a position to provide technical expertise to DoD to help address potential cyber threats to our military installations?

Answer: It is my understanding the Department works closely with the Department of Defense on this important issue. If confirmed, I will work to learn and support the role the national labs play to help address cyber threats to our military installations and the electric grid.

Questions from Senator Tammy Duckworth

Question 1: A modern electricity grid that is flexible, resilient and accommodating of all forms of energy is critical to our Nation's security, economy and maintaining our way of life. I believe that the U.S. Department of Energy (DOE) and DOE National Laboratories play an important role in modernizing our grid.

In January 2017, the Obama Administration published a number of recommendations in the Quadrennial Energy Review (QER) on how DOE should accomplish the goal of grid modernization. Do you support these recommendations and, if confirmed, how will you implement these recommendations and prioritize grid modernization?

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Answer: I agree that a modern electricity grid that is flexible, resilient and accommodating of all forms of energy is critical to our Nation's security, economy and maintaining our way of life. While I am generally aware of the Quadrennial Energy Review, I am not familiar with all of the 2017 published recommendations. If I am confirmed, I will review recommendations from DOE experts, including the incredible people who work at the DOE National Laboratories, to formulate recommendations on how DOE can best accomplish the goal of grid modernization. This is a very high priority for Secretary Perry, so I look forward to drawing on my experience and the recommendations of others to implement steps that will modernize and protect our electricity grid.

Question 2: Earlier this year, the Secretary of Energy Rick Perry directed staff to author a report on electricity markets and reliability. The report suggests that grid operators and planners should focus on baseload generation as a way to mitigate reliability risks. However in PJM and MISO interconnections, both of which service Illinois, wind, solar, energy efficiency and fast-deploying natural gas are providing the same services as traditional baseload. Wind and solar in many regions of the country fit the report's own definition of baseload, namely that it must run at "high, sustained output levels".

It appears having an adequate resource mix is more important than having any single unit of generation. How do you reconcile the findings of Secretary Perry's report with data from grid planners and operators that indicate renewables have the capacity to deliver the same services as traditional baseload power plants?

Answer: I share Secretary Perry's view that an "all of the above" strategy is crucial to maximizing America's energy security. Different parts of the country deploy a varying portfolio of energy sources, depending on what is most abundant and reliable within their respective states and regions. While we should value the 24-7 reliability of traditional baseload generation, we should also invest in research that will enable us to maximize storage capabilities for renewables. This will enable us to attain even greater benefits from these emerging sources of energy.

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Questions from Chairman Lisa Murkowski

Questions: The Strategic Petroleum Reserve is sometimes seen as a convenient way to fund other endeavors. For example, Congress has passed legislation requiring the sale of SPR crude to fund unrelated legislation. And the President's proposed FY 2018 budget request advocates for selling half the SPR to raise more than \$16 billion.

In the wake of the disastrous hurricanes, the Secretary authorized releases from the SPR. In addition, the Secretary commented that he disagrees with the Budget request and is a "big believer that it makes sense for us to have a Strategic Petroleum Reserve."

- a. Do you believe the Strategic Petroleum Reserve is a national asset?

Answer: I support the President's budget, but I understand Congress' role in the appropriations process. I also agree with the Secretary regarding the value of the SPR. It is noteworthy that, today, the United States is producing oil and gas at unprecedented levels. The SPR is a product of the 1970s, an era when the United States imported 5-6 million barrels of oil per day from the Organization of Petroleum Exporting Countries (OPEC). Today our imports from OPEC countries are roughly half that amount, despite our significantly larger economy.

- b. How will you approach the management Reserve, if you are confirmed?

Answer: If Congress appropriates money to manage the SPR, I will follow the law and will adhere to all relevant Departmental policies and procedures.

Questions from Ranking Member Maria Cantwell

Question 1: Natural gas exports

Do you think the Department should take into account the environmental impacts of greenhouse gas emissions from natural gas when it makes export licensing decisions?

Answer: Minimizing our impact on the environment is important with any energy development and policy. It is my understanding that FERC typically has the primary role in the environmental review for the siting of LNG export facilities, but that DOE also has a role in participating in FERC's analysis. I will ensure that I am more fully briefed on the issue should I be confirmed.

Question 2: Strategic Petroleum Reserve

How much oil do we need to retain in the SPR to meet our international obligations and ensure that we have an adequate supply to meet our needs in the event of a major supply disruption? In light of all the sales Congress has already ordered to fund other priorities, can we afford to make any further sales without falling below the minimum amount we need to keep in the Reserve?

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Answer: I have not been fully briefed on the specifics regarding our domestic needs and international obligations surrounding the reserve. If confirmed, I look forward to learning more about this issue and working with Congress to address this issue consistent with any legislation that is passed.

Question 3: Regional Petroleum Reserves

The President's budget proposed eliminating the Northeast Gasoline Supply Reserve, which was established after Hurricane Sandy. In light of Hurricanes Harvey, Irma, and Maria, do you think eliminating the Gasoline Reserve is a good idea? Do you think other regional reserves are needed?

Answer: Recent severe weather events have inflicted serious damage in many parts of the country, and I believe maintaining strategic reserves is vital for consumer protection. The President's budget proposal prioritizes the nation's energy security by enabling and increasing American energy production rather than the government storing large amounts of gasoline. Congress and the President will ultimately decide the issue and I will implement policies consistent with the law.

Question 4: Fossil energy R&D

President Trump proposed a 55.7 percent budget cut for fossil energy research and development overall in this year's budget request, including a 69.5 percent budget cut for carbon capture and storage programs. If confirmed, how would you prioritize fossil energy research programs to accomplish the most good with a limited budget?

Answer:

Fossil energy sources constitute more than 80% of the country's total energy use, and are important to the nation's security, economic prosperity, and growth. The budget focuses on cutting edge, early-stage R&D that will prepare innovative new technologies for the private sector to further develop, scale up, and deploy. If confirmed, I look forward to being involved in the fossil innovations of the future.

Question 5: Oil train research

Will you commit to prioritizing the research being conducted by DOE and the Pipeline and Hazardous Materials Safety Administration to better understand the characteristics of crude oil, particularly how volatility and other characteristics may the transportation of crude oil by rail?

Answer: If confirmed, I look forward to being briefed on this issue and working with you to improve the safe transport of crude oil.

Questions from Senator Ron Wyden

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Question 1: The 17 DOE laboratories make up a federal research powerhouse, providing the United States with the best in energy technology innovation and scientific research. Would you agree that the national labs, like the National Energy Technology Lab facility located in Albany, Oregon, represent crucial one-of-a-kind assets to this country, which should be maintained and invested in? And will you commit to maintaining the existing network of labs?

Answer: Our National Labs are critical assets that enable us to achieve energy security and global energy leadership. I commit to working with your office and all relevant stakeholders regarding the existing network of labs and the future deployment of our research assets.

Question 2: The Office of Fossil Energy coordinates DOE's development of Carbon Capture and Storage (CCS) technologies. I favor a technology-neutral approach to transition to a low-carbon economy; CCS could be a component of that transition, though some technical and economic challenges remain. How would you, as Assistant Secretary for Fossil Energy, continue DOE's development of early-stage R&D of advanced carbon capture technologies and larger-scale demonstration of more mature technologies?

Answer: Over my nearly 40-year career in the fossil fuel industry, I have focused on the development of innovative technologies and bringing those to commercial viability. If confirmed, I will bring that experience to bear on future initiatives. The President's budget focuses on early-stage R&D, but if a final agreement between Congress and the President appropriates funds for large-scale demonstrations, I will execute the law.

Question 3: Natural gas is an abundant, domestic fuel for electricity production. There has been lots of back and forth over the proposed Methane Waste Prevention Rule finalized November 2016. The rule updated 30-year old regulations governing venting, flaring, and leaks of natural gas extracted on public lands managed by the BLM. Then there was a push earlier in the year via the Congressional Review Act, to repeal a host of Obama-era regulations including the methane rule. While this push was narrowly defeated in the Senate, a month later BLM published a Federal Register notice suspending the implementation of the second phase of regulations slated to go into effect January 1, 2018.

What is DOE doing to increase the capability to detect methane? Do you think there are methane leaks happening right now in the United States that we are unaware of? Are you committed to looking for ways to cut natural gas waste and greenhouse gases to make the natural gas industry more efficient?

Answer: I am not fully aware of the specifics regarding DOE's efforts in methane detection and reduction. Methane leaks and similar issues generally are under the jurisdiction of the Environmental Protection Agency. If confirmed, I commit to working towards more efficient use of fossil fuels.

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Question 4: Researchers at Oregon State University are working with DOE to develop a range of technologies for advanced power systems. These DOE-funded projects support our next generation of scientists, and the general public. How will you strengthen ties between DOE and university researchers?

Answer: Utilizing relationships with experts at universities across the country can lead to technological breakthroughs, innovations and efficiencies. If confirmed, I look forward to working with industry, the national labs, and universities to deliver reliable, affordable, and clean fossil fuels.

Questions from Senator Bernard Sanders

Climate Change

Question 1: President Trump has suggested in the past that climate change is a hoax. Is the President correct? Is climate change a hoax?

Answer: The climate is changing and human activity does have some impact. We must address the issue in a thoughtful way that does not compromise economic growth or jobs.

Question 2: Do you agree with the vast majority of scientists that climate change is real, it is caused by human activity, and that we must aggressively transition away from fossil fuels toward energy efficiency and sustainable energy like wind, solar, and geothermal?

Answer: I believe that the climate is changing and human activity does have some impact. We must address the issue in a thoughtful way that does not compromise economic growth or jobs.

Question 3: Do you agree with the vast majority of scientists that the combustion of fossil fuels contributes to climate change?

Answer: Fossil fuel resources play a crucial role in delivering affordable, reliable electricity and energy to people across the globe. Fossil fuels do emit greenhouse gases, primarily carbon dioxide and methane that contribute to atmospheric concentrations of greenhouse gases. At the same time, fossil energy is crucial for electricity production, transportation and our overall economy and must be managed accordingly. Advancing technology is the best way to address human contribution to atmospheric greenhouse gas concentrations.

Question 4: If confirmed, how will you work to address climate change?

Answer: If confirmed, I will make sure to follow all the relevant Departmental policies and applicable laws passed by Congress. I will also bring my nearly 40-year career in the fossil fuel industry with me where I have focused on development of innovative technologies to address environmental and other issues relating to the use of our energy resources.

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Fossil Fuels

Question 5: How important do you think it is to reduce the amount of fossil fuels that we use to support our energy needs?

Answer: I believe the Department should pursue policies that ensure affordable, reliable electricity and energy prices for all Americans. That includes an “all of the above” approach to energy and the responsible use of fossil fuels.

Question 6: In 2013, you stated that you believed the Obama administration was not investing enough money in coal and gas. Do you still believe the federal government needs to invest more in polluting, finite resources like fossil fuels? Do you believe that renewable energy research and development deserve increased federal funding?

Answer: The federal government should continue investing in early-stage research for fossil fuels because these resources will continue to be a part of our energy infrastructure for decades to come. I support an “all of the above” energy policy. There are opportunities to make progress in early-stage research across all energy sources.

Question 7: You spent your time as Vice President for Consol Energy Inc. promoting expanded fossil fuel extraction and production. Given your history of promoting fossil fuel interests, how are you qualified to help the American people move their energy economy away from dirty fossil fuels and toward clean, renewable sources of energy?

Answer: Over my nearly-40 year career, I’ve worked to improve efficiency and reduce emissions from fossil fuels. While the office for which I have been nominated focuses on fossil energy, I do believe there are opportunities to make progress in early-stage research across all energy sectors, including renewable sources of energy.

Energy Future

Question 8: What do you believe is the role of renewable energy in our energy future?

Answer: I support an “all of the above” energy strategy and believe that renewables will play an important role in our energy future.

Question 9: If confirmed, how do you plan to work to help DOE achieve a decrease in future extraction and use of fossil fuels?

Answer: I believe the Department should pursue policies that ensure affordable, reliable electricity and energy prices for all Americans. That includes an “all of the above” approach to

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energy and the responsible use of fossil fuels. I will work to ensure the Office of Fossil Energy budget is executed to the letter of the law.

Question 10: The availability of cheap natural gas through the process commonly known as fracking has drastically changed the economics of electricity generation. Coal-fired and nuclear power plants are closing because they are unable to economically compete with high-efficiency gas-fired power plants. However, scientists now tell us that methane and carbon dioxide pollution from natural gas are also very dangerous in contributing to global climate change. What DOE efforts or incentives would you consider appropriate to assure that the nation's electricity comes from means other than sources that contribute to carbon pollution, while assuring stable electricity prices?

Answer: I am supportive of all energy sources and, if confirmed, will commit to work with the other DOE Offices to ensure that affordable, reliable, and clean electricity is available for all.

Question 11: Oil, gas, and coal are global commodities subject to market supply and demand. Even if the United States completely met its own demand for fossil fuel energy—as it is close to achieving—consumers would remain subject to significant variability in fuel prices. For solar and wind energy, however, the electricity produced by these sources of energy remains in the United States. How do you believe the Office of Fossil Energy can help the Department of Energy prioritize solar and wind-generated electricity that can't be exported from the United States and is invulnerable to global pricing swings?

Answer: I believe we must consider the risks, costs, and the benefits of all energy sources.

Question 12: What are the geopolitical consequences of U.S. fossil fuel consumption on our national security?

Answer: I do believe that domestic energy production is important for ensuring our national security, but I believe the State or Defense Departments may be more qualified to address this question in detail. If confirmed, I look forward to working with other agencies to ensure the safety of the nation.

Question 13: Several of my colleagues and I recently introduced the 100 by '50 Act to lay out a roadmap for the United States to transition away from fossil fuels and toward 100% clean and renewable energy. This bill includes major investments in clean and renewable energy. If confirmed, do you commit to supporting investments to transition the U.S. away from fossil fuels?

Answer: I commit to following the laws passed by Congress and to promote the responsible use of reliable, affordable fossil fuels.

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Ethics

Question 14: You were the Vice President of Consol Energy Inc. from 2002-2014. This company made headlines for donating money to special interest groups and politicians. To your knowledge, did this type of corporate bribery occur while you worked at Consol Energy? If confirmed, do you commit to preventing or eliminating this type of behavior in the Office of Fossil Energy? Will you commit to rejecting favors or special attention for the Consol Energy and other actors in the fossil fuels industry? What specific steps will you take to combat it?

Answer: I am not aware of any “corporate bribery” by CONSOL Energy, Inc. during my tenure. If confirmed, I commit to manage the Office of Fossil Energy in a manner that complies with ethics rules and is respectful to the American taxpayer. I also commit to following the law and all relevant Departmental policies and procedures.

Questions from Senator Al Franken

Question 1: With the threat of climate change, it is clear to me that we need to find ways to reduce greenhouse gas emissions from our coal plants. Carbon capture could help reduce emissions from existing fossil-fuel power plants, and it will be especially important as developing nations continue to invest in coal-fired power plants. Fortunately, the Office of Fossil Energy has for several years now been making targeted investments to accelerate the deployment of this important technology.

- a. What do you see as the major technological roadblocks in developing carbon capture systems that will be economically viable on an industrial scale?

Answer: The major roadblocks for CCS technologies are capital and operating costs. Therefore, more work needs to be done on alternative carbon dioxide capture membranes and sorbents.

- b. And how will the Office of Fossil Energy work to overcome these obstacles under your leadership?

Answer: If confirmed, I will set research priorities given the Congressional funding levels for carbon capture technology research and development.

Question 2: The President’s budget has proposed cutting the Office of Fossil Energy’s funding for research and development by \$388 million or 58 percent. If you are going to meet the office’s stated goal of having an advanced carbon capture technology portfolio ready for industrial-scale demonstration by 2020, how would you compensate for this dramatic loss of funding?

Answer: While I was not party to the drafting of the Administration’s FY18 budget, I support its mission of focusing on early-stage R&D. I understand the role of Congress in the budget process and, if confirmed, will execute the law.

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Question 3: What do you see as the potential for carbon capture technology deployed in the industrial sector, including ethanol facilities?

Answer: Industries with high concentrations of carbon dioxide emissions are ideally-suited to serve as host facilities for emerging carbon capture technologies and are potential good sources of carbon dioxide for enhanced oil recovery.

Question 4: Do you believe that humans are responsible for the majority of climate change occurring since the industrial revolution?

Answer: I believe that the climate is changing and that humans do have an impact. I believe in advancing technology and reducing greenhouse gas emissions in a thoughtful way that doesn't compromise economic growth, the affordability of energy, or American jobs is the correct approach.

Questions from Senator Mazie Hirono

Questions: In your oral testimony, you described your belief that the proper balance of natural gas exports to domestic gas consumption would be decided by the market. As Assistant Secretary for Fossil Energy, you will have a key role in approving natural gas export terminals to export natural gas to the highest foreign bidder. Do you consider the global natural gas market, which features state-owned companies from China, Venezuela, and other countries as significant buyers and sellers of natural gas, to be a free market? Given current forecasts, what level of U.S. export capacity would you consider as raising an unacceptable risk of natural gas price increases to households and industries in the United States?

Answer: One of the advantages of the growth of American oil and gas development is that the United States is less susceptible to foreign influence on the oil and gas market. I believe that policy decisions about how to interact with foreign state-owned businesses may be in the purview of the State Department. As to the impact of U.S. exports of natural gas, I know that it has had a profoundly positive impact on the American economy and provided the United States and its friends and allies a variety of benefits. Should I be confirmed, I will monitor the impact of exports and their impact on the American economy.

Questions from Senator Bill Cassidy

Question 1: The first commercial-scale U.S. carbon capture project, PetraNova just outside of Houston, began commercial operations earlier this year. It is designed to capture over 4,000 tons of carbon emissions from a coal plant and use those emissions to produce 15,000 barrels of oil each day, a 50 times increase over the fields status quo. North Dakota is also exploring two innovative "clean fossil fuel" facilities, a 300MW coal-fired plant that would utilize the captured

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carbon for enhanced oil recovery and a CO₂ capture retrofit technology on an existing lignite coal unit that will utilize the CO₂ to develop Bakken oil and gas fields.

The pilot project identified technical issues before commercial deployment and was fundamental in Petra Nova's success. Given the administration's focus on basic research, how will the Department of Energy collaborate with industry on pilot projects?

Answer: The Administration, through the FY18 budget, indicated an increased reliance on the private sector to fund later-stage R&D and commercialization of energy technologies. Collaborating with the private sector, and all the relevant stakeholders in this process, is necessary as the Department transitions early-stage technological breakthroughs to the private marketplace.

Question 2: How does the Department's budget aim to leverage federal resources to advance energy innovation and make our vast fossil energy resources cleaner, more reliable, more affordable while creating U.S. jobs?

Answer: By focusing federal taxpayer dollars on early-stage R&D, the President's budget will leverage federal resources in areas where the private sector is not incentivized to do so. In addition, DOE and the Administration have invested millions in CCUS, have authorized numerous exports for LNG, and have increased coal exports from 2016 levels. All of these progressions create jobs and are a benefit to the economy overall, while still addressing the issue of emissions.

Questions from Senator Tammy Duckworth

Question 1: As you are aware, Illinois is home to an Archer Daniels Midland project that captures carbon dioxide from an ethanol production facility with the capacity to capture up to 1.1 million tons of CO₂ per year. I believe that these CCUS projects like these are critical to helping us reduce greenhouse gas emissions.

If confirmed, please describe the specific actions you will take to make sure DOE promotes and achieves wide deployment of CCUS?

Answer: I am supportive of CCUS. The President's budget focuses on early stage R&D and leaves deployment of technologies to the private sector. If confirmed, I will work to ensure that the budget agreement between Congress and the President is executed.

It's also my understanding that Secretary Perry recently reinforced to our international counterparts his interest in reducing emissions and improving all forms of energy use, and that includes fossil energy through CCUS technology.

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Question 2: In 2012 testimony to the House Energy and Commerce Subcommittee on Energy and Power, you claimed that CCUS is, “more important than renewable technology development, more important than efficiency improvements and more important than advances in nuclear energy development.”

Please confirm whether your quote accurately reflects your current position on our energy landscape, or explain how and why your views evolved.

Answer: That quote accurately reflects my view that CCUS is not just an issue for the United States, but is a global challenge. Developing and underdeveloped countries are increasing their fossil energy use. If we are going to attempt to reach significant reductions of carbon dioxide emissions, CCUS must be a principal contributor to that effort. However, my support for CCUS is not to the exclusion of an “all of the above” view about energy resources, which must include nuclear, renewables and energy efficiency.

