

**THE PRESIDENT'S BUDGET REQUEST
FOR THE DEPARTMENT OF ENERGY
FOR FISCAL YEAR 2020**

HEARING
BEFORE THE
COMMITTEE ON
ENERGY AND NATURAL RESOURCES
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THE PRESIDENT'S BUDGET REQUEST FOR THE DEPARTMENT OF ENERGY FOR FISCAL YEAR 2020

TUESDAY, APRIL 2, 2019

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

The Committee met, pursuant to notice, at 10:06 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, everyone. The Committee will come to order. We are here this morning to discuss the President's budget request for the Department of Energy for Fiscal Year 2020.

Mr. Secretary, it is good to have you back in front of the Committee again. We appreciate it. It seems like it has been a really quick year, at least maybe for me, and I would imagine for you as well.

We are back with a conversation again about the budget. In looking at the budget, actually many parts of this look familiar to where we were last year.

I am pleased to see the President's budget seeks to increase funding to address vulnerabilities in our electric infrastructure. Ensuring the cybersecurity and resiliency of our nation's grid is really a top priority for many of us here on this Committee, so it is good to see your priority is here as well.

These issues also fall squarely in our jurisdiction, which is why we have devoted significant time to these challenges, including in the area of electromagnetic pulses and geomagnetic disturbances. So, again, it is good to see the Department focused so keenly on them.

While I do appreciate many parts of this budget, there are other parts that I will disagree with. It seems like we always get to the disagreeing part of it rather than the things that we do agree on. But there are significant areas—your focus on national labs, on the advanced nuclear, on the exascale computing, quantum information science—these are all matters that have come before our Committee that we have enjoyed some success in moving legislation out. So these are certainly areas of support.

We have also been talking a lot in this Committee this year about the issues of climate, what we can be doing to reduce emis-

sions more broadly, what we can do to enhance our efficiencies to reduce costs for power generation and really just be better environmental stewards.

I think, as we talk about those opportunities moving forward, and we had a chance in the Appropriations Energy and Water Subcommittee last week with Chairman Alexander who chairs that Approps Subcommittee, talking about his Manhattan challenge for us if you will. Much of what he has outlined in terms of ways that we can make an impact really lies squarely within the Department of Energy.

So it is somewhat disappointing to see the budget request again putting programs that promote energy innovation and cutting-edge science on the chopping block. I know many of my colleagues share the disappointment in the request to eliminate ARPA-E, a program that brings the private sector together with the national laboratories and universities to bridge the valley of death for emerging energy technologies.

Your budget request also eliminates both the Weatherization Assistance Program and the State Energy Programs, and I will get a little parochial here because these are so important to a state like mine.

I do appreciate the efforts of the Department to work with Alaska Native villages so that they, and tribes across the country, can access the Tribal Energy Loan Guarantee Program, but I am troubled that the budget request proposes to eliminate that program, just as it is now getting off the ground.

These are the types of programs that help Alaskans as they are addressing the high energy prices, really the highest energy prices in the nation. And Mr. Secretary, when you were with me in the state, when we had an opportunity to go to Kodiak and to Old Harbor, you saw firsthand how these challenges that we face, I think, challenge us to be more innovative and to seize on some of the innovation opportunities that we're working to advance.

You saw an electric grid powered by nearly 100 percent renewable energy in Kodiak, and then you saw the first stages of a small hydro there at Old Harbor. These are not only part of Alaskans' efforts to reduce greenhouse gas emissions, they also reduce the high cost of diesel fuel, which again you saw firsthand, so that residents can stay in their communities, and open up new economic opportunities.

It is communities like these, spread all over our country, that stand by ready to innovate and transition to a cleaner energy future, but they need our help, and they need the help of the Department of Energy. Programs like those proposed for elimination, and offices like the Office of Indian Energy, are vital to our future and our ability to move forward.

We all know that we need to make responsible cuts to the budget, but we don't want to forget the critical role that innovation plays for us in helping to create jobs, boost economic growth, increase competitiveness, and strengthen our long-term security.

So upon initial review and without all the details of the budget, I do have some concerns about the proposals. I have outlined a couple. But I also recognize that this is a starting place, this is where we begin the conversation about your priorities, about the Presi-

dent's priorities, and the priorities of those of us here. And that from here it is incumbent on all of us to seek that common ground and areas for compromise.

So I look forward to our discussion and then moving forward after this. Again, Mr. Secretary, I appreciate a great deal your leadership and being here this morning.

Senator Manchin.

**STATEMENT OF HON. JOE MANCHIN III,
U.S. SENATOR FROM WEST VIRGINIA**

Senator MANCHIN. Madam Chairman, thank you again for gathering our Committee together today for this important hearing. And I want to welcome my friend, Secretary Perry. He and I have worked together a long time back in the good old days of being governors, and it is a pleasure to welcome you and your third presentation hearing before the Committee as Secretary of Energy, which I am understanding you consider your coolest job. Well I am happy to continue working with you in what I consider a new cool role as the Ranking Member, so it is going to be exciting.

The energy sector is undergoing rapid change. The natural gas revolution is still going strong, the grid is getting cleaner and more efficient, and every day we have new cyber and resilience challenges to tackle.

And the conversation around climate change is center stage. The conversation that we have had here, myself and the Chairwoman, has not shied away from that in this Committee. But when I look at the Administration's budget request, I am disappointed to see numbers that neither reflect the priorities of the Department nor get us where we need to go in order to tackle carbon emissions.

Looking at the top line, the budget request proposes cutting non-National Nuclear Security Administration funding to the Department of Energy by over 25 percent. I think this proposal would limit the DOE in a number of critical ways, including its ability to maintain a global leadership role in research and development.

In my view, the United States as a leader in energy production has a unique and necessary role to play in developing and commercializing innovative technology solutions for the climate problems that we are facing globally. The International Energy Agency, or the IEA as we know it, reported earlier this week that global energy demand grew by 2.3 percent over the past year, and fossil fuels met a lot of that demand and will continue to for some time.

And that is going to be the story for the next few decades in part because the average coal plant in Asia is only 12 years old. The fact is that fossil fuels, including coal, will continue to be part of our energy mix. And if we can agree on that, it is clear as day to me that the United States needs to put its money where its mouth is in advanced solutions like carbon capture, storage and sequestration.

It is also what the experts are saying. Dr. Birol, of the IEA, told the Committee just last month that CCUS may be the most critical technology that we can invest in. We need a moonshot when it comes to carbon capture, so I am working on legislation that will refocus the DOE on coal and natural gas RD&D. My hope is that between the brilliant minds at your DOE and our national labs and

the private sector, we can crack this nut sooner than later. I think we can all agree that this kind of innovation is necessary to ensure economic competitiveness, environmental responsibility, energy security, and national security.

In addition, we need to keep up the good work at the Advanced Research Projects Agency-Energy, or ARPA-E, which is another critical part of ensuring U.S. leadership in advanced energy technologies in a tech race with China.

Then there is the Loan Program Office, which I am very much concerned about. A program with a high repayment rate that has made money for taxpayers, it is a perfect tool to promote public-private partnerships for innovative energy technologies, especially advanced fossil technology.

I was very disappointed to see proposals to eliminate both of these valuable programs when right now we need to be fostering them.

On the other hand, I was pleased to see that the budget request included a significant 30 percent increase in funding for the Office of Cybersecurity, Energy Security, and Emergency Response, or CESER for short. Our folks at NETL in West Virginia are responsible for managing about a third of that funding.

I am also optimistic about what we can accomplish together this year on some of the tougher issues like nuclear waste storage and disposition. I look forward to working with you at the DOE and Chairwoman Murkowski and our Appropriations colleagues on that.

I was also encouraged to hear that in your Appropriations hearing last week you expressed willingness to work with Senator Alexander on R&D goals. I share his desire to increase funding and focus the Department on those technologies that will achieve emission reductions. I will introduce R&D legislation of my own in the coming days, and I look forward to working with you as well as Senator Alexander, Chairwoman Murkowski, and other colleagues to get that across the finish line.

I know that you share my desire to get the funding for DOE right, and I look forward to working with you on that.

With that, Secretary Perry, thank you for joining us today and for all you do at DOE and for our country. I look forward to hearing your presentation.

The CHAIRMAN. Thank you, Senator Manchin.

Secretary Perry, it is indeed a pleasure to have you back before the Committee. We welcome your comments this morning and the opportunity to engage in a little bit of back and forth about this budget.

So you may proceed.

STATEMENT OF HON. RICK PERRY, SECRETARY OF ENERGY

Secretary PERRY. Madam Chair, thank you very much. Ranking Member Manchin and members of the Committee, it's an honor to appear before you today to discuss the President's FY 2020 budget request for the Department of Energy.

It continues to be a great privilege and an honor to serve as the 14th Secretary of Energy. It's a very exciting time to be at the helm of the DOE. I look forward to working with each of you on passing

a budget that invests in the nation's priorities in energy and science and national security while at the same time continuing our shared support of innovations that have led to America's world leading yet often overlooked progress in reducing energy-related emissions.

When I appeared before the Committee last year, I committed to rebuild and restore our nation's security to protect our critical electric grid and energy infrastructure from cyber threats, in particular, to improve the resilience and reliability of the nation's electricity system, continue to seek a federal disposal solution for the nation's nuclear waste, to invest in early stage, cutting-edge research and development and to advance our leadership in exascale and quantum computing.

I'm proud to report to you that since then DOE has advanced each of those goals. This budget request of \$31.7 billion seeks to build upon that great progress by making strategic investments that yield the best return on investment for taxpayers that benefit our country in the years to come.

This budget is a request by the American people through you, their representatives in Congress, to secure America's future through energy independence, scientific innovation, and national security. As such, it represents a commitment from all of us at DOE to honor the trust of our citizens with increased stewardship, accountability, and commitment to excellence.

This request supports the Department's vast mission in a fiscally responsible way. It makes clear that success will be measured not by the dollars spent, but by the results achieved on behalf of the American people by investing in reliable, affordable energy, transformative innovation, and national security.

We're approaching the dawn of what I call the New American Energy Era, a time of energy abundance, security and, yes, I will say, even independence. American energy independence, it used to be a sound bite, but thanks to innovation, today it is a reality.

The Department's world leading science and technology enterprise generates the innovations we need to fulfill our mission through support of our cutting-edge research at our 17 national labs and, I might add, over 300 universities, many of whom or I should say, a number of them in your home states. We are expanding the frontiers of scientific knowledge and accelerating the pace of discovery to address our greatest challenges.

This past fall I fulfilled a commitment to visit all 17 of our national labs and got to witness firsthand the brilliant work that's performed by these dedicated individuals. These labs have a rich history of science and innovation and together they have bettered countless lives around the globe.

I'm especially proud of the work the labs are doing in collaboration with others to harness the power of our world-class supercomputers to maintain America's leadership in high performance computing, advanced exascale computing, and push for breakthroughs in artificial intelligence.

To do so, this budget proposes investments in early stage research and development that will focus the intellectual prowess of our scientists and engineers on the development of technologies

that the private sector can convert into commercialized applications to improve the lives and the security of all Americans.

This budget also requests significant funding to modernize the nuclear security enterprise, further our non-proliferation efforts, propel our nuclear navy at sea as well as simply to power the fleet of the future. As we work to include America's nuclear energy industry in our all-of-the-above strategy, we see great promise in next generation advanced reactor technologies.

In the coming weeks and months I look forward to working with you, your colleagues and excellent staff here in Congress on the specific programs mentioned in the testimony and throughout the Department.

Congress has an important role in the path forward. I met with many of you already. I look forward to deepening our partnership for the benefit of the people that we serve.

On a final note, I would be remiss if I didn't take the opportunity to express my sincere gratitude to both of you, in particular, and the Committee as a whole, for approving our four remaining nominees. Our Senate confirmed key positions of leadership: nuclear energy, Office of Science, ARPA-E and my general counsel. Thank you. I never thought I'd be sitting in front of a Committee saying thank you for getting me a lawyer——

[Laughter.]

——but after two and a half years without a lawyer, thank you very much for doing that.

So anyway, I look forward to working with you in this new, I said this earlier, this New American Energy Era. And you have my pledge that at DOE we're going to continue to run the place efficiently, effectively, and to accomplish our mission driven goals of advancing energy security, economic security and national security for the American people.

So with that, Madam Chair, thank you for your time and your partnership as we go forward. Certainly, Joe, thank you, Governor, for your whole friendship, and I look forward to continuing our work together.

Thank you.

[The prepared statement of Secretary Perry follows:]

**Testimony of Secretary Rick Perry
U.S. Department of Energy
Before the
U.S. Senate Committee on Energy and Natural Resources
April 2, 2019**

Chairman Murkowski, Ranking Member Manchin, and Members of the Committee, it is an honor to appear before you today to discuss the President's FY 2020 Budget Request ("Budget Request" or "Budget") for the Department of Energy ("the Department" or "DOE").

It continues to be a great privilege and an honor to serve as the 14th Secretary of Energy.

This Budget is a request to the American people through their representatives in Congress to secure America's future through energy independence, scientific innovation, and national security.

As such, it represents a commitment from all of us at DOE that we will honor the trust of our citizens with increased stewardship, accountability, and commitment to excellence. For too long, government success has been measured by how much we spend on it. This Budget Request makes clear that success will be measured by how effectively and efficiently government is able to manage the precious resources entrusted to them by the American taxpayer to achieve its mission.

When I appeared before this Committee last year, I committed to protect our critical electric grid and energy infrastructure from cyber threats; improve resilience and reliability of the Nation's electricity system; make progress on the Federal Government's responsibility to dispose of the Nation's nuclear waste; focus resources on early-stage, cutting edge Research and Development (R&D); advance exascale and quantum computing; address responsibilities for the cleanup and disposition of facilities; and, rebuild and restore our Nation's security.

This FY 2020 \$31.7 billion Budget Request for the Department of Energy ("Budget") focuses on advancing these commitments – from opening a New American Energy Era to sustaining our recent historic economic growth by investing in reliable, affordable energy, transformative scientific innovation, and national security.

The Department's world-leading science and technology enterprise generates the innovations needed to fulfill our missions. Through support of cutting-edge research at our 17 National Laboratories and at over 300 universities across the Nation, we are expanding the frontiers of scientific knowledge and laying the groundwork for new technologies to address our greatest challenges.

When I became Secretary of Energy, I made a promise to visit all 17 of the Department's National Laboratories. I am pleased to report that I have fulfilled that promise and have witnessed first-hand the innovative and brilliant work performed by the dedicated individuals at each of these sites across the Nation. The National Laboratories are doing outstanding work in many areas. Each has a unique, rich history of innovation across a broad scope of scientific expertise, and the record of collaboration across the National Laboratory system – which makes its impact greater than the sum of its parts – has bettered the lives of millions across the globe.

For example, in 2018, the National Laboratories won 32 of the prestigious R&D 100 Awards, including technologies regarding new materials, protecting the environment, incorporating renewable energy reliably to the electric grid, and sophisticated cybersecurity tools. These are just a few examples of the work the National Laboratories have done just last year to push the boundaries of research, development, commercialization, and national security.

I am especially proud of the work the National Laboratories are doing in collaboration with other federal agencies, universities, doctors, and researchers to harness the power of our world-class supercomputers to maintain America's leadership in High Performance Computing (HPC), advance Exascale computing, and push for breakthroughs in Artificial Intelligence (AI).

To do so, this Budget proposes nearly \$11 billion in early-stage R&D that will focus the intellectual prowess of scientists and engineers on the development of technologies that the ingenuity and capital of America's entrepreneurs and businesses can convert into commercial applications and products to improve the lives and security of all Americans. The Budget also invests in laboratory infrastructure and test beds for future breakthroughs in energy. It prioritizes funding to maintain the world-class nature of national laboratory facilities and better facilitate private sector demonstration and deployment of energy technologies.

Securing Against Cyber Threats

In addition to nuclear security, our national security also depends on a resilient electric grid and successfully countering the ever-evolving, increasing threat of

cyber and other attacks on networks, data, facilities, and infrastructure. Among the most critical missions at the Department is to develop science and technology that advances these aims.

At stake is continued U.S. economic competitiveness and leadership, as well as the overall safety and security of the nation. We need to understand the increasing and evolving natural and man-made threats and develop the tools to respond to those threats across our energy infrastructure.

To that end, the Budget provides \$157 million for the Office of Cybersecurity, Energy Security, and Emergency Response (CESER) to develop tools needed to protect the U.S. energy sector against threats and hazards, mitigate the risks and the extent of damage from cyberattacks and other disruptive events, and improve resilience through the development of techniques for more rapid restoration of capabilities.

Securing against cyber threats means we must also protect against threats to the Department's own infrastructure in science, technology, and nuclear security. This Budget takes major steps to safeguard DOE's enterprise-wide assets against cyber threats. It provides \$71 million for the Chief Information Officer directed funding to secure our own networks, modernize infrastructure, and improve cybersecurity across the DOE IT enterprise. Funding for cybersecurity in the National Nuclear Security Administration (NNSA) is increased to \$208 million to enhance security for our nuclear security enterprise. In the Environmental Management program, we provide \$37 million for cybersecurity at seven cleanup sites.

This Budget provides the resources we require to secure DOE systems and energy infrastructure.

Improving Grid Resilience

As we protect our energy infrastructure from cyber threats, we also must improve the resilience and reliability of the nation's electricity system. The Budget provides \$183 million for the Office of Electricity to support transmission system resource adequacy and generation diversity. The Budget will explore new architecture approaches for electric transmission and distribution systems, including the development of the North American Energy Resilience Model that will provide unique and ground-breaking national-scale energy planning and real-time situational awareness capabilities to enhance security and resilience. The Budget continues to advance energy storage through the Advanced Energy Storage Initiative (AESI), including

development of a new Grid Storage Launchpad aimed at accelerating materials development, testing, and independent evaluation of battery materials and systems for grid applications. In addition, the Budget supports R&D at DOE's National Laboratories to develop technologies that strengthen, transform, and improve energy infrastructure so that consumers have access to reliable and secure sources of energy.

Addressing the Imperative of Nuclear Waste Management

The Budget includes \$116 million, of which \$26 million is in defense funds, to move ahead in fulfilling the Federal Government's responsibility to dispose of the Nation's nuclear waste. This request is dedicated to resuming regulatory activities concerning Yucca Mountain and initiating a robust interim storage program.

The Budget Request supports functions necessary to support regulatory activities, including legal support to represent the Department as well as responding to litigation and other legal matters. The Budget also provides for technical and scientific work necessary to support and respond to any challenges in the regulatory process. Resuming regulatory activities at Yucca Mountain and committing to a robust interim storage capability for near-term acceptance of spent nuclear fuel, our Budget demonstrates the Administration's commitment to nuclear waste management and will help accelerate fulfillment of the Federal Government's obligations to address nuclear waste, enhance national security, and reduce future burdens on taxpayers. This also will increase public confidence in the safety and security of nuclear energy, thus helping nuclear energy remain a significant contributor to the country's energy needs for generations to come.

Energy Independence and Innovation

The Budget requests \$2.3 billion in funding for energy independence and innovation. Within the applied energy program offices, the FY 2020 Budget focuses resources on early-stage, cutting-edge R&D conducted by the scientists and engineers at our 17 National Laboratories who are striving to develop the next great innovations that will strengthen American competitiveness and transform society as these breakthroughs reach the private marketplace.

The Harsh Environment Materials Initiative (HEMI) is a new coordinated effort within the Offices of Fossil Energy R&D (FE), Nuclear Energy (NE), and Energy Efficiency and Renewable Energy (EERE) to use common investments. This effort will coordinate interrelated R&D in materials, sensors, and component manufacturing R&D for advanced thermoelectric power plants between FE and NE.

For example, NE's budget includes \$23 million for the Nuclear Energy Enabling Technologies (NEET) Transformational Challenge Reactor program, which enhances the development of breakthrough technologies that provide the ability to manufacture small/micro advanced reactor components using additive manufacturing techniques. Investments will also be aligned with EERE's Advanced Manufacturing Office R&D in materials and manufacturing process research, as well as flexible combined heat and power systems.

The AESI is a coordinated effort across DOE that will accelerate the development of energy storage R&D as key to increasing energy security, reliability, resilience, and system flexibility technologies. The ASEI will focus DOE's efforts to take a broad, more holistic view of energy storage as a set of capabilities with temporal flexibility in the conversion of energy resources to useful energy services. The initiative will develop a coordinated strategy for aligning DOE R&D for cost competitive energy storage services.

The Budget supports, and makes for more efficient, programs focused on bringing technologies to the market in the Office of Technology Transitions, requesting a 7% increase from the FY 2019 enacted level. Through coordination with our Labs, these efforts will reduce costs to the taxpayer while at the same time providing an enhanced technology transfer program to transfer breakthroughs from the National Laboratories to the private sector.

Nuclear Energy

The Budget for Nuclear Energy focuses funding on early-stage R&D, such as the Nuclear Energy Enabling Technologies program, which includes \$23 million for the Transformational Challenge Reactor, at Oak Ridge National Laboratory, to continue to develop an advanced manufacturing technique to demonstrate a new approach to nuclear design, qualification, and manufacturing of advanced reactor technologies.

The FY 2020 Budget includes \$215 million for the Reactor Concepts Research, Development and Demonstration program. Within this total, the Budget provides \$100 million to put DOE on a path to construct the Versatile Advanced Test Reactor, a facility that would enable development and testing of advanced fuels and materials for the next generation of commercial nuclear reactors. This is one of the highest priorities for the Department. The Budget also provides \$85 million for early-stage R&D on advanced reactor technologies, including \$10 million for the Advanced Small Modular Reactor R&D subprogram.

Within the Fuel Cycle R&D program, the Budget requests \$40 million for the high-assay low-enriched uranium (HALEU) Civil Nuclear Enrichment subprogram. This three-year cost-shared subprogram is designed to demonstrate a specific U.S. enrichment technology that could produce HALEU. We understand that multiple reactor designs under development by U.S. advanced reactor developers will require fuel containing HALEU. In addition, the Budget requests \$36 million for the Fuel Cycle R&D program's early-stage R&D work in support of industry's development of light water reactor accident tolerant fuels.

Finally, the Budget for Nuclear Energy also supports a safeguards and security program with funding at \$138 million for protection of our nuclear energy infrastructure and investments at Idaho National Laboratory facilities.

Fossil Energy Research and Development

The Fossil Energy Research and Development (FER&D) program advances transformative science and innovative technologies needed for the reliable, efficient, affordable, and environmentally sound use of fossil fuels. Fossil energy sources currently constitute over 81 percent of the country's total energy use and are critical for the nation's security, economic prosperity, and growth. The FY 2020 Budget focuses 89 percent, or \$501 million, on cutting-edge fossil energy R&D to secure energy dominance, further energy security, advance strong domestic energy production, and support America's coal industry through innovative clean coal technologies.

FER&D will support early-stage research in advanced technologies, such as materials, sensors, and processes, to expand the knowledge base upon which industry can improve the efficiency, flexibility, and resilience of the existing fleet of coal fired power plants. The request also focuses funding on early-stage component research that will enable the next generation of high efficiency and low emission coal fired power plants that can increase the resiliency and reliability of the electric grid by providing low-cost reliable power 24/7.

Funding is also provided to support competitive awards with industry, National Laboratories and academia geared toward innovative early-stage R&D to improve the reliability, availability, efficiency, and environmental performance of advanced fossil-based power systems. For example, the Advanced Energy Systems subprogram will focus on the following six activities: 1) Advanced Combustion/Gasification Systems, 2) Advanced Turbines, 3) Solid Oxide Fuel Cells, 4) Advanced Sensors and Controls, 5) Power Generation Efficiency, and 6) Advanced Energy Materials. While the primary focus is on coal-based power

systems, improvements to these technologies will result in spillover benefits that can reduce the cost of converting other carbon-based fuels, such as natural gas, biomass, or petroleum coke into power and other useful products in an environmentally-sound manner.

Energy Efficiency and Renewable Energy

The Energy Efficiency and Renewable Energy budget requests \$696 million, including the use of \$353 million in prior year balances, towards maintaining America's leadership in transformative science and emerging energy technologies in sustainable transportation, renewable power, and energy efficiency.

The Budget emphasizes early stage R&D and other activities, which private industry does not have the technical capability to undertake. Knowledge generated by early-stage R&D to facilitate U.S. industries, businesses, and entrepreneurs to develop and deploy innovative energy technologies, and to gain the competitive edge needed to excel in the rapidly changing global energy economy.

The request funds \$105 million for the AESI, which takes a holistic approach to energy storage and develops electric grid technologies to create flexible generation and load, thereby increasing the reliability and resilience of the U.S. electric grid.

The request supports DOE's Grid Modernization Initiative, which includes reliably integrating an increasing amount of variable generation into the electric grid through R&D infrastructure investments at the National Renewable Energy Laboratory (NREL) to accelerate the conversion of the National Wind Technology Center (NWTC) campus into an experimental microgrid capable of testing grid integration at the megawatt scale.

Strategic Petroleum Reserve

The Department of Energy is responsible for the Nation's energy security, and the Strategic Petroleum Reserve (SPR), one component of that effort, protects the U.S. economy from disruptions in critical petroleum supplies and meets the U.S. obligations under the International Energy Program. The Budget includes \$174 million to support the Reserve's operational readiness and drawdown capabilities. The Department is requesting authorization to deposit into the SPR Petroleum Account up to \$27 million in proceeds from the sale of one-million barrels of

refined petroleum product (gasoline blendstock) from the Strategic Petroleum Reserve to fund the cost of drawdowns.

The Budget also proposes to disestablish the Northeast Home Heating Oil Reserve (NEHHOR). In its two decades of existence, the NEHHOR has not been used for its intended purpose, and the Administration believes the continued taxpayer-funded expense of maintaining the reserve is unwarranted, particularly as the existing commercial storage contracts are up for renewal in March 2020. The Budget also proposes to disestablish the Northeast Gasoline Supply Reserve (NGSR). The NGSR has not been used since its establishment, and is not considered to be cost efficient or operationally effective. Proceeds of the combined sales of the NEHHOR and NGSR (estimated at \$130 million in receipts, net of the \$27 million retained for mandatory sale drawdown costs) will be contributed to deficit reduction.

Power Marketing Administrations

The Budget includes \$78 million for the Power Marketing Administrations (PMAs). The Budget proposes the sale of the transmission assets of the Western Area Power Administration (WAPA), the Bonneville Power Administration (BPA), and the Southwestern Power Administration (SWPA) and to reform the laws governing how the PMAs establish power rates to require the consideration of market based incentives, including whether rates are just and reasonable. The Budget also proposes to repeal the \$3.25 billion borrowing authority for WAPA authorized by the American Recovery and Reinvestment Act of 2009.

Leading World-Class Scientific Research

The Department of Energy is the Nation's largest Federal supporter of basic research in the physical sciences, and the President's FY 2020 Budget provides \$5.5 billion for the Office of Science to continue and strengthen American leadership in scientific inquiry. By focusing funding on early-stage research, this Budget will ensure that the Department's National Laboratories continue to be the backbone of American science leadership by supporting cutting-edge basic research, and by building and operating the world's most advanced scientific user facilities, which will be used by over 22,000 researchers in FY 2020.

Support for Core Research and Facilities

We provide \$921 million for Advanced Scientific Computing Research, a decrease of \$15 million below the FY 2019 enacted level. This funding will continue supporting the Nation's world-class high-performance computers that make possible cutting-edge basic research, while devoting \$500 million in the Office of Science to reflect the Department's plan to deploy an exascale computing system in calendar year 2021. The FY 2020 Request also supports quantum computing R&D and core research in applied mathematics and computer science, and high-performance computer simulation and modeling.

The Budget also provides \$1.9 billion for Basic Energy Sciences, supporting core research activities in ultrafast chemistry and materials science and the Energy Frontier Research Centers. We will continue construction of the Advanced Photon Source Upgrade at the Argonne National Laboratory, and initiate the Advanced Light Source Upgrade project at the Lawrence Berkeley National Laboratory, and the Linac Coherence Light Source-II High Energy project at SLAC National Accelerator Laboratory. The operations of the light sources across the DOE science complex and supporting research across the Nation maintain U.S. world leadership in light sources and the science they make possible. The Budget also supports continued construction for Spallation Neutron Source Proton Power Upgrade and Second Target Station at Oak Ridge National Laboratory.

The Budget requests \$768 million for High Energy Physics, including \$100 million for construction of the Long Baseline Neutrino Facility and Deep Underground Neutrino Experiment at Fermilab, \$30 million below the enacted FY 2019 level. We will continue to fund ongoing major items of equipment projects, including three new projects at the Large Hadron Collider: the High Luminosity Large Hadron Collider Accelerator Project; the High Luminosity ATLAS; and the High Luminosity CMS detector upgrade projects. By supporting the highest priority activities and projects identified by the U.S. high energy physics community, this program will pursue cutting-edge research to understand how the universe works at its most fundamental level.

The Budget for the Office of Science provides \$403 million for Fusion Energy Sciences, including \$296 million for domestic research and fusion facilities and \$107 million for the ITER project to continue to support delivery of the highest priority in-kind hardware systems contributions. For Nuclear Physics, the budget provides \$625 million to discover, explore, and understand nuclear matter, including \$40 million for continued construction of the Facility for Rare Isotope Beams and operations of facilities. For Biological and Environmental Research,

the Budget includes \$494 million to support foundational genomic sciences, including the Bioenergy Research Centers, and to focus on increasing the sensitivity and reducing the uncertainty of earth and environmental systems predictions.

Advancing Exascale Computing

As I discussed last year, the Department's leadership in developing and building the world's fastest computers faced increasingly fierce global competition over the last decade. Maintaining the Nation's international primacy in high-performance computing is more critical than ever for national security, economic prosperity, and a continued leadership role in science and innovation.

I am proud to say that, as of the present day, the Department is actively sustaining America's leadership in this vital area. As of November, the world's two fastest supercomputers were located at DOE National Laboratories – Summit at Oak Ridge and Sierra at Lawrence Livermore. In fact, the Summit system achieved the global number one ranking as the world's fastest system in June 2016, was delivered nine months ahead of schedule and \$13.5 million below budget, and is another example of the DOE lab continued project management excellence. In all, the Department currently owns five out of the world's top ten supercomputers. In addition, teams from DOE's Oak Ridge and Lawrence Livermore National Laboratories captured the 2018 Gordon Bell Prize, the most prestigious award for achievement in high performance computing software and applications. These coupled achievements in both hardware and software are significant, since it is by sustaining integrated capabilities in hardware, software, algorithms, and applications – along with basic research in applied mathematics – that America will maintain leadership in this critical field.

To cement America's leadership position, the Budget includes \$809 million to accelerate development of an exascale computing system, including \$500 million in the Office of Science (Science) and \$309 million in NNSA. This reflects the Department's plan to deploy an exascale machine for the Office of Science in calendar year 2021 at Argonne National Laboratory, a second machine with a different architecture in the 2021-2022 timeframe at Oak Ridge National Laboratory, and provides support for the procurement of and site preparation for a third exascale system, architecturally similar to the second machine at Oak Ridge, delivered to NNSA at Lawrence Livermore National Laboratory in FY 2023.

To achieve these goals, the Science/NNSA partnership will focus on hardware and software technologies needed to produce an exascale system, and the critical DOE

applications needed to use such a platform. This world-leading exascale program will bolster our national security by supporting the nuclear stockpile, while also supporting the next generation of scientific breakthroughs not possible with today's computing systems.

Quantum Information Science

Even as we prepare to deploy exascale systems, we are pursuing research in Quantum Information Science (QIS), an emerging multidisciplinary area that has the potential to define the next frontier in information processing and a range of other fields. Our QIS effort is genuinely interdisciplinary, a \$168 million investment involving all six major DOE Office of Science program offices: Advanced Scientific Computing Research (ASCR), Basic Energy Sciences (BES), Biological and Environmental Research (BER), Fusion Energy Sciences (FES), High Energy Physics (HEP), and Nuclear Physics (NP).

The potential of QIS to contribute to a wide range of disciplines is striking. Quantum computing promises the capability to attack large problems that elude classical computing and to provide new insights into materials and chemistry through accurate modeling and simulation of quantum systems. In addition, QIS holds the potential of developing exquisitely sensitive quantum sensors, for applications ranging from biology to the effort to detect Dark Matter. Finally, QIS may hold the key to ultra-secure networking, at a time when cybersecurity is a mounting concern.

The Budget provides \$40 million to ASCR, BES and HEP to establish a new QIS center, which would integrate universities with National Laboratories, through investments across all six Science program offices. We are seeking to sustain U.S. leadership in this important and highly competitive area.

Artificial Intelligence/Machine Learning

Artificial Intelligence (AI), including Machine Learning (ML) defines another critical cross-disciplinary activity, with the potential to contribute to advances across multiple fields. This is another rapidly developing area in which it is vital for America to maintain a leadership role.

In a world awash with data, AI holds the promise of harnessing and deriving new insights from massive data sets. The massive quantities of data generated by DOE Office of Science user facilities such as X-ray lights sources are believed to provide a major opportunity for the development of new AI applications for data analysis. It

is also believed that AI may provide a pathway to improving the performance of particle accelerators and other key facilities. The FY 2020 Budget provides \$71 million for AI/ML spread across all six Science program offices for both the application of AI/ML to research and the development of new AI/ML approaches and algorithms as well as \$48 million requested in the FY 2020 Budget for NNSA for AI.

Microelectronics

By virtue of its leadership in supporting high-performance computing, as well as its longstanding sponsorship of research in materials science, the DOE Office of Science has been a major contributor over the decades to the development of microelectronics. Science has helped lay the fundamental scientific foundation for advances in these technologies, while partnering with industry in the development of new systems requiring new chips. This role is becoming increasingly important as we approach the end of Moore's Law and stand at the threshold of what is likely to be a new era in microelectronics. In an important new initiative, the FY 2020 Budget provides \$25 million for redoubled research efforts on microelectronics. The research will benefit from groundwork laid at an October 2018 DOE workshop on "Basic Research Needs in Microelectronics," bringing together top experts and co-sponsored by ASCR, BES, and HEP.

Biosecurity

As mentioned, back in 1986, the Department provided the original impetus and idea for the Human Genome Project, and later partnered with the National Institutes of Health, to successfully complete the sequencing of a human genome in 2000. Since then the Department's Office of Science has remained on the cutting-edge of genomics-based system biology, making major contributions to the continued advancement of the relevant technologies. These dual use technologies have now advanced to a point where they pose new and unprecedented security challenges. To address this growing challenge, the FY 2020 Budget includes \$20 million for BER for research related to biosecurity.

Isotopes

One of the Department's important contributions to medicine and industry is the Isotope Development & Production for Research and Applications Program, known more simply as the DOE Isotope Program. The program, managed by Science's Office of Nuclear Physics, supports the production and development of production techniques, as well as radioactive and stable isotopes that are in short supply for

research and applications. In doing so, it provides a vital contribution to research, medicine, and industry. The Budget provides \$5 million to initiate a construction project for a U.S. Stable Isotope Production and Research Center at ORNL.

Fulfilling Legacy Cleanup Responsibilities

The mission of the Department's Environmental Management (EM) program is to complete cleanup of legacy nuclear weapons development and research sites. It is the largest program of its kind in the world and represents one of the top financial liabilities to the American taxpayer. EM is working collaboratively with regulators, federal, state, and local governments, and others toward a future that drives cleanup toward completion safer, sooner and at a responsible cost. As EM is put on a sustainable path forward, the FY 2020 Budget Request provides the resources necessary to build upon recent successes and bring a renewed sense of urgency to the program for meaningful and measurable progress at projects and sites throughout the cleanup complex.

The Budget Request includes \$6.5 billion for EM to address its responsibilities for the cleanup and disposition of excess facilities, radioactive waste, spent nuclear fuel, and other materials resulting from five decades of nuclear weapons development and production and Government-sponsored nuclear energy research. To-date, EM has completed cleanup activities at 91 sites in 30 states and Puerto Rico, and is responsible for cleaning up the remaining 16 sites in 11 states – some of the most challenging sites in the cleanup portfolio.

The Budget Request includes \$1.4 billion for the Office of River Protection at the Hanford Site for continued work at the Hanford Tank Farms and to make progress on the Waste Treatment and Immobilization Plant. This budget will continue progress toward important cleanup required by the Consent Decree and Tri-Party Agreement to include a milestone to complete hot commissioning of the Low Activity Waste Facility by December 31, 2023. The Budget also includes \$718 million to continue cleanup activities at Richland. The Budget continues River Corridor decontamination and decommissioning activities including remediation of the highly contaminated 300-296 waste site under the 324 Building. For Savannah River, the Budget provides \$1.6 billion, \$91 million above enacted FY 2019, to support activities at the site. This will include the Liquid Tank Waste Management Program, completing cold commissioning beginning operation of the Salt Waste Processing Facility, continued construction activities for Saltstone Disposal Unit #7 and #8/9 design and construction activities for Saltstone Disposal Unit #10-#12, and funding to support design and construction of the Advanced Manufacturing Collaborative facility.

The Waste Isolation Pilot Plant (WIPP) is essential for the disposition of transuranic defense-generated waste across the DOE complex, and the Budget provides \$398 million to safely continue waste emplacement at WIPP. The Budget Request will continue WIPP operations, including waste emplacements, shipments, and maintaining enhancements and improvements, and progress on critical infrastructure repair/replacement projects, including \$58 million for the Safety Significant Confinement Ventilation System and \$35 million for the Utility Shaft (formerly Exhaust Shaft). These steps will increase airflow in the WIPP underground for simultaneous mining and waste emplacement operations.

The Budget Request includes \$348 million to continue cleanup projects at the Idaho site, such as the Integrated Waste Treatment Unit, and to process, characterize, and package transuranic waste for disposal at offsite facilities. It provides \$429 million for Oak Ridge to continue deactivation and demolition of remaining facilities at the East Tennessee Technology Park, continue preparation of Building 2026 to support processing of the remaining U-233 material at the Oak Ridge National Laboratory, and support construction activities for the Outfall 200 Mercury Treatment Facility at the Y-12 National Security Complex and design for a new On-Site Waste Disposal Facility to support cleanup.

For Portsmouth, the Budget Request includes \$426 million to continue progress on the deactivation and decommissioning project at the Portsmouth Gaseous Diffusion Plant, safe operation of the Depleted Uranium Hexafluoride Conversion Facility, and construction activities at the On-Site Waste Disposal facility. At Paducah, the Budget Request includes \$277 million to continue ongoing environmental cleanup and depleted uranium hexafluoride (DUF6) conversion facility operations at the Paducah site. In addition, the FY 2020 Budget Request supports activities to continue the environmental remediation and further stabilize the gaseous diffusion plant.

The Budget continues funding of \$128 million to address specific high-risk contaminated excess facilities at Lawrence Livermore National Laboratory.

Together, these investments for EM will make significant progress in fulfilling our cleanup responsibilities while also beginning to address our high-risk excess facilities at NNSA sites.

**National Security through Nuclear Security: Sustaining and Modernizing the
Nuclear Stockpile and Infrastructure**

Our national security rests upon the foundation of the Nation's nuclear security enterprise and the deterrent it provides. The Budget funds the overdue modernization of the nuclear stockpile and the aging infrastructure that supports it; strengthens key science, technology, and engineering capabilities that support stockpile modernization; reduces global nuclear threats through nonproliferation and counterterrorism initiatives; and designs and maintains safe and effective nuclear propulsion systems for the U.S. Navy for years to come.

The Budget fulfills the President's vision of rebuilding and restoring our Nation's security through investments in the Department's nuclear security mission. The Budget provides \$16.5 billion for the National Nuclear Security Administration (NNSA). Of this amount, the Budget Request includes \$12.4 billion for Weapons Activities. This \$1.3 billion increase supports maintaining the safety, security, and effectiveness of the nuclear stockpile; continuing the nuclear modernization program; and modernizing NNSA's nuclear security infrastructure portfolio in alignment with the Nuclear Posture Review.

The Budget includes \$2.1 billion for our ongoing Life Extension Programs (LEP), Major Alteration, and Modifications, a \$197 million increase. I am pleased to report that the W76-1 LEP completed its last production unit in December 2018. Final deliveries to the Navy will be completed by the end of this fiscal year. The W76-2 Modification, the low-yield variant of the W76, is on schedule, on budget, and will be completed consistent with Nuclear Weapons Council (NWC) direction. Funding for the B61-12 LEP and the W88 Alteration 370 will keep us on schedule to deliver the first production units in FY 2020. The Budget also supports the Air Force's Long-Range Stand-Off program through an increase of \$244 million from the FY 2019 enacted level for the W80-4 LEP to deliver the first production unit in FY 2025 of the cruise missile warhead. The request includes \$112 million for the W87-1 Modification Program, which will replace the W78, one of the oldest warheads in the stockpile, by 2030.

The Weapons Activities Budget request also includes \$309 million for NNSA collaboration with the Office of Science on the development of exascale computer systems; \$778 million for the protection of personnel, facilities, nuclear weapons, and materials across the Department's nuclear security enterprise; and \$232 million for information technology and cybersecurity protection.

The infrastructure portion in Weapons Activities increases investments to modernize our nuclear infrastructure, improve working conditions of NNSA's aging facilities and equipment, and address safety and programmatic risks through facility and equipment recapitalization and the stabilization of deferred maintenance. In this Budget is \$745 million for construction of the Uranium Processing Facility, which is needed to replace deteriorating facilities at the Y-12 National Security Complex, as well as \$123 million for the High Explosives Science and Engineering Facility at Pantex, \$27 million for a Tritium Finishing Facility at the Savannah River Site (SRS), and \$32 million for a Lithium Processing Facility at Y-12. The Budget also includes \$168 million to support the Department's commitment to finishing the Chemistry and Metallurgy Research Replacement Facility Project, which is necessary to support the pit production mission and other actinide activities at Los Alamos National Laboratory (LANL).

The highest NNSA infrastructure priority is re-establishing a plutonium pit production capability to meet military requirements, supported by numerous studies and analyses, of no fewer than 80 war reserve pits per year by 2030. Last May, the NWC endorsed NNSA's recommended alternative calling for plutonium pit production at LANL and SRS. This two-site approach bolsters the nuclear security enterprise's responsiveness and resiliency.

The Budget also includes \$2.0 billion for the Defense Nuclear Nonproliferation program to reduce global threats from nuclear weapons. This critical national security program prevents the spread of nuclear and radiological materials, and technologies, advances technologies that detect nuclear and radiological proliferation worldwide, and eliminates or secures inventories of surplus materials and infrastructure usable for nuclear weapons.

The Budget invests \$774 million at SRS in FY 2020, a 76 percent increase over FY 2019. NNSA will continue termination activities for the orderly and safe closure of the Mixed Oxide Fuel Fabrication Facility Project. The Budget will also continue to pursue a dilute and dispose strategy to fulfill the U.S. commitment to dispose of 34 metric tons (MT) of plutonium and modernize SRS infrastructure to support the tritium supply chain.

The Budget provides \$372 million for Nuclear Counterterrorism and Incident Response, \$53 million above the FY 2019 enacted level, to work domestically and around the world to improve our ability to respond to radiological or nuclear incidents, in conjunction with other agencies in a broader U.S. Government effort.

In the NNSA's Office of Naval Reactors, the Department has the ongoing

responsibility to provide militarily effective nuclear propulsion plants for the Navy and to ensure their safe, reliable and long-lived operation. The Budget provides \$1.6 billion to support the operation of the Navy's nuclear-powered fleet, the continuation of the *Columbia*-class reactor plant design, refueling of the land-based prototype reactor, and the construction of the Naval Spent Fuel Handling Facility.

Today, nearly 45% of the Navy's major combatants are nuclear powered. The Department's role in propulsion plant design, spent fuel handling, and recapitalization is critical to the Navy's ability to conduct its missions around the globe.

Finally, the Budget includes \$435 million for Federal Salaries and Expenses at the NNSA. This \$25 million increase is essential to ensuring our world-class workforce of dedicated men and women can effectively oversee NNSA's critical national security missions.

Focusing Priorities on Core Missions

The Budget continues to focus the Department's energy and science programs on early-stage research and development at our National Laboratories to advance American primacy in scientific and energy research in an efficient and cost-effective manner.

Also, in line with Administration priorities, the Budget terminates the Advanced Research Projects Agency-Energy, known as ARPA-E, and the Department's Loan Programs, while maintaining necessary federal staff to oversee existing awards and loans. Termination of these programs will save over \$850 million in FY 2020 alone while significantly reducing financial risk to the taxpayer moving forward.

Conclusion

In conclusion, I reaffirm my pledge that the Department of Energy, along with our National Laboratories, will continue to support the world's best enterprise of scientists and engineers who create innovations to drive American security, prosperity, and competitiveness. The President's FY 2020 Budget Request for the Department of Energy reflects the priorities to enhance our energy, economic, and national security today, while making strategic investments to accelerate the breakthroughs that will fuel America's tomorrow.

In the coming weeks and months, I look forward to working with you and your

colleagues in Congress on the specific programs mentioned in this testimony and throughout the Department. Congress has an important role in the path forward on spending decisions for the taxpayer, and I will, in turn, ensure DOE is run efficiently, effectively, and that we accomplish our mission-driven goals. Thank you, and I look forward to answering your questions.

The CHAIRMAN. Mr. Secretary, thank you.

I know members have a host of different questions. Let me begin by asking a question that I raise in every Committee that I am privileged to serve on when I have a member of the Cabinet in front of us. And this is the issue of the Arctic because we recognize, perhaps not every day, but I certainly recognize that we are an Arctic nation.

We are an Arctic nation because of my state, but this is not Alaska earmarks. This is not just Alaska we are talking about. We are talking about the role that the United States of America plays with its other Arctic partners.

Whether it is on issues of environment or research or development or indigenous peoples or defense, this is a significant part of the globe and I am trying to make sure that from the government perspective we recognize that there is a role there.

As you know, we had previously, within the Department, an Arctic Energy Office. We, in the Appropriations Committee, certainly moved to help advance that last year. My hope would be that that is something that within the Department there is some recognition or consideration of reopening that Arctic Energy Office.

We know that it is not just one office though that can constitute a policy initiative. When you were up in the state and, again, I thank you for the visit that you made, but shortly after you left, we had a conference at the University of Alaska Fairbanks. We hosted the National Lab Day. We had many of the directors of our national labs, and it was a great reminder of the collaboration that goes on with our labs and our universities. That is certainly one way that we can help to facilitate and do more when it comes to shining the light on Arctic issues.

I raised, last week at the Appropriations hearing, the fact that we have only two Indian Energy Office employees in the whole State of Alaska. We would like you to take a look at that.

But can you tell me, from the perspective of the Department of Energy, how you are prioritizing or recognizing the role that we play in the Arctic?

Secretary PERRY. Senator, thank you.

I think it's important to come and to put boots on the ground, so to speak, to be there to see what all is going on in a particular part of the country. Being, you know, from a relatively tropical part of the United States and my history being in Texas and what have you, although I had been to Alaska a number of times, both as an Energy Committee member back as a state house member, to be there with you to go not only up on the North Slope but also to go into the community of Old Harbor and sit and talk to the Burns Family about the challenges that they have there and recognize that the United States is an Arctic nation. And I think that's sometimes very important for us to recognize that the United States is an Arctic nation.

So the commitment to that region and to recognize the valuable resources that are encompassed in that area and the unique challenges that that has. Kevin Foster, who runs our Office of Indian Affairs, is very, very familiar with that area and let's expand the conversation about the office up there and the personnel side of it. But I want to make sure that the people of Alaska know that num-

ber one, we understand the challenges and the uniqueness of it but there are a lot of pieces of this puzzle, if you will. The architecture of the Arctic is part of the DOE's mission.

So, you know, developing those resources, the rare earth minerals that are in that area and the innovation. You and I have talked about advanced reactors and how they can play a unique role up to and including microreactors out on the Adak peninsula for some defense needs out there and, frankly, for some of the private sector needs as well.

We're going to assure you that the Department, through its partners and its activities, will continue using those Arctic energy resources in a very productive way.

NETL's Arctic Energy Office is going to continue to coordinate with academia and other government agencies to demonstrate the value of Alaska's fossil fuel resources as well as hopefully some of our nuclear, obviously what you're doing on wind that we saw and the battery storage side of this.

And I will just make mention that I think in the last two years this country has increased its solar energy production by 90 percent. So an all-of-the-above strategy of which the Arctic is going to play an important role is not lost on us.

The CHAIRMAN. Well I appreciate that and I would welcome further conversations about the specifics and, again, my continued interest in an Arctic Energy Office, recognizing that this goes far beyond just Alaska.

But I know that you have been invited, certainly by the Arctic Circle Assembly, this is an annual gathering in Iceland, of those that are interested in all things Arctic but for you to speak to the level of innovation is something. It is a conference that I have attended on numerous, numerous occasions. I believe Senator King has joined as well, but it is something that you might want to consider. I will look forward to further discussions on that.

Let's go to Senator Manchin.

Senator MANCHIN. Madam Chairman, I am going to defer to Senator Stabenow who has another pressing committee meeting.

Senator STABENOW. Well, I appreciate the courtesy of my colleague and leader. And thank you to both of you, and welcome, Secretary Perry.

This is the third time you have been before the Committee in terms of the budget. And while it is good to see you, I have to say that while you are talking about a New America Energy Era, unfortunately what I see in the energy budget is a budget that guts programs that support American ingenuity and our global preeminence in fields like advanced manufacturing, clean vehicle and energy technologies, and cutting-edge research.

Now I will say there is an exception to that. I want to thank you for your continued support because this budget does include funding for what we call the FRIB project at Michigan State University, which I have talked to you about a number of times—the Facility for Rare Isotope Beams which will be the world's most powerful radioactive beam facility and will advance new defense, environmental, and medical technology. So I am very appreciative that this project is continuing and the support is in here for that.

But frankly, when I look at the rest of the budget, it is very concerning to me. I know that you said this is a starting point for discussion and that you are committed to working with us, but the budget is a clear statement about what the Administration does and does not prioritize.

What we have is an overwhelmingly prioritized budget on fossil fuels at the expense of clean energy and advanced vehicle technologies and domestic manufacturing.

When you look at the budget calling for the repeal of the tax incentives for electric vehicles, renewable energy and energy efficiency, I am really glad Senator Lamar Alexander and I are putting in the bill in the next few days that would actually extend the cap so that we could have more consumer tax credits for electric vehicles. This budget does away with that.

You cut the Office of Energy Efficiency and Renewable Energy by 86 percent; advanced manufacturing by 75 percent; vehicle technologies by 79 percent; eliminate ARPA-E that you talked about earlier; Title XVII; the advanced vehicle loan program. I mean, just on and on and on. And yet, renewable energy is the fastest growing source of U.S. electricity and the future of transportation as we know it is in electric vehicles and alternative fuels, which we need to be working with the industry on to help them to be able to get there.

And then finally, I have to underscore that we have the disastrous effects of carbon pollution right in front of our face every single day now—the atmosphere heating up as a result of carbon pollution and what is happening in the swings in snow, rain, drought, wind, and fires. In fact, we are now working on the Floor on a disaster package that is a result of not tackling carbon pollution.

So while I come from a state, I am very proud to say, that really led the industrial revolution, and we certainly benefited from the power of fossil fuels, we better be paying attention now to what is happening here or our kids and grandkids, frankly, are never going to forgive us for what is going on.

Given the clear market trends, as well as what is happening here all around us, the science says we have 12 years to curb our emissions to avoid catastrophic global warming and the significant investments of our global competitors in clean energy, led by China. Why then is this Administration proposing to do the exact opposite, to really take us backward? I appreciate what you said, but the budget takes us backward. And how will this benefit us going forward with what we need to do in terms of jobs, clean energy, and tackling carbon pollution?

Secretary PERRY. Senator, absolutely.

One of the things that I talk about on a fairly regular basis is the progress that the United States is making when you look at the emissions side of it.

And I want to address directly your question about advanced manufacturing and what we're doing at Oak Ridge and the work we're doing there. As a matter of fact, I think it was last year, I drove up and down Independence Avenue in a vehicle that was made out of a carbon fiber that was hydrogen fueled. And that's the type of work that's coming out of our national labs.

Senator STABENOW. With all due respect, I just want to say, I know. That's great. But you're not supporting the consumer tax credits to be able to allow people to purchase those vehicles until we get to a point where there's enough volume that the price comes down so that people can afford them. And that is my concern because I agree with you, there's incredible technologies that are going on, but the capacity to support their integration into the economy and for consumers having access is my concern.

Secretary PERRY. Well, and again, one of the things that I will share with you, as I did the last two times I was in front of this Committee, is the good news for me is I was an appropriator once upon a time and I've been a chief executive and I humorously say that my budget generally ended up as a pretty good doorstep when I was the Governor of Texas.

I'm not making any comparables here, I'm just saying that I understand how this process works. And we're here to work with you, the members of this Committee, to come up with a budget that prioritizes what's important.

And we can quibble about maybe what the amounts are, but I think we do share, we have a shared interest, in not only American technology leading and being sent around the world, whether it's, you know, carbon capture utilization technology that could go to China and into India to start making some real progress. American LNG into the European to push away from older, inefficient, dirtier burning power plants. That's the type of progress that we've seen in the United States. We've had the greatest reduction in emissions in this country in history, according to the IEA.

So I think we're headed in the right direction. Are we going as fast as some people want us to? Probably not. But the DOE and our continued innovation in our national labs, Senator, I think, are going to play a very important role as we go forward in that. And we'll commit, obviously, to continue to work with you to find the ways that American technology, American innovation, you know, American vehicles are leading that charge to address the issue of emissions and obviously, creating good paying jobs in the United States.

Senator STABENOW. Well, thank you.

Thank you, Madam Chair.

And I would just say I think this budget would make a good doorstep.

Thank you.

[Laughter.]

The CHAIRMAN. Thank you.

Let's go to Senator Cassidy, please.

Senator CASSIDY. Hello, Mr. Secretary.

Dr. Birol, the IEA Director, testified before the Committee a few weeks ago telling us that carbon capture, utilization, and storage (CCUS) is the most critical technology we can do to lower our emissions aside from maybe the continued use of more natural gas and renewables. And you have been committed to that. I appreciate that.

But I guess as we are looking at this kind of nexus, if we are looking at carbon capture, utilization, and storage, I think most of

the research has been with coal. And yet, natural gas is an increasing amount of our feedstock for our grid.

So to what degree is the research being done on CCUS being directed toward the increased use of natural gas on our grid?

Secretary PERRY. Okay.

Senator, we've got a couple, just to be really specific, we've got a couple of funding opportunities here of about \$60 million—\$30 million of that from some front-end engineering and design on carbon capture systems and then we've got a FOA that's out at this particular point in time for the same amount, \$30 million, to continue the Carbon Storage Assurance Facility Enterprise (CarbonSAFE).

And you know, one of the first projects I went to not only observe but to officially open as the Secretary of Energy was just outside of Houston, the Petra Nova project. It was coal. It was a coal plant taking 95 percent of the emissions out and then taking those emissions, shipping them some 75 miles away to a crude oil field where it was used for, excuse me, tertiary recovery and had a pretty massive effect on that oil field.

So the stories that are out there and the real-life examples of this, I think, have a great role to play, not just in the United States, but particularly getting outside of the U.S.

Senator CASSIDY. I agree with that, but what I understand is that, for example, the oxygen content of natural gas emissions is higher so that presents a different issue than if it is just coal. In that sense, the BTU per carbon footprint is so much better with natural gas than coal that you actually have less CO₂ being spun off so that in itself presents challenges.

Secretary PERRY. Correct.

Senator CASSIDY. And so, to what degree is the research and yet we have seen that the percent of feedstock that natural gas represents in terms of generating electricity continues to climb. I guess my question is, to what degree is the research being promoted by the Department of Energy recognizing that natural gas has its unique issues and that it is an increasing amount of the grid so therefore the research needs to be specific for the natural gas product, if it will?

Secretary PERRY. Senator, let me get back with you with any specificity about what the Department is doing on the specific issue of what you asked about on natural gas.

Senator CASSIDY. I am good with that.

Secretary PERRY. Great.

Senator CASSIDY. Next, let's talk about the SPR, Strategic Petroleum Reserve.

Secretary PERRY. Yes, sir.

Senator CASSIDY. Just your thoughts.

Obviously we have increased production in the United States and we still have this large storage of oil. What are your thoughts since we are producing so much more as to the continued need of and long-term outlook for the SPR?

Secretary PERRY. Yup.

Senator, I think it's really a timely discussion to have about the Strategic Petroleum Reserve, as everyone around the table and hopefully most of the public knows it was created right after the,

you know, after the mid-'70s and the oil and gas crisis that we had in that period of time.

It was put in place not only as a national security issue but as a reserve in case of a major national disaster. We tapped into it a number of times, our states having had hurricanes, certainly after Sandy. And having a national petroleum reserve, a Strategic Petroleum Reserve, makes sense.

Now the world has changed in the last 42 years since it was created. Number one, that the United States now is the number one oil and gas producing country in the world. Do we need that big of a reserve, particularly with the growth of the pipeline infrastructure that we have and the growth in that infrastructure that's going to occur over the next decade?

I mean, we're going to see massive amounts of pipelines being built around the country that can be part of a reserve. We have a requirement internationally to keep a certain amount of crude available for our international partners, but I think you're absolutely correct in having a public dialogue about this. Is the SPR the right size? Can we contract it? Can you rent part of it out to the private sector for storage?

I mean, I think all of this is an appropriate discussion. It's time to renew this, the focus on this and potentially, certainly, I leave it up to you members of Congress but I think you'll get it right. But it's time to have this conversation about do we need to modernize the Strategic Petroleum Reserve?

Senator CASSIDY. I am out of time, but I will say that I have an interest as well in the benefit to the federal taxpayer of leasing out some of that excess space.

Secretary PERRY. Yes, sir.

Senator CASSIDY. It would save a lot of future development.

But I yield back. Thank you. Thank you. Mr. Secretary.

The CHAIRMAN. Thank you.

I know that, certainly in this Committee, we focused on the need for that modernization to make sure that it was able to do what we expected and anticipated. I am trying to remember when we got that report but thanks for bringing that question up.

Senator Manchin.

Senator MANCHIN. Madam Chairman, I also defer to Senator Hirono who has another pressing meeting.

Senator HIRONO. Thank you very much, Senator Manchin.

Mr. Secretary, it is not unexpected that an Administration that does not acknowledge the science behind global warming would come up with a budget that continues a commitment to supporting the fossil fuel industry, even if the budget cuts 23 percent from the Fossil Energy Office. But when you look at the other cuts to the renewable energy side, you see either total elimination of programs or cuts along the vicinity of 86 percent, this is not really going in the right direction as far as I am concerned.

In the year since you testified to this Committee, California and New Mexico have joined Hawaii in requiring the states to get 100 percent of their electricity from carbon free resources by 2045. What Hawaii and other states need is a federal partner to work with states and businesses to solve the challenges involved in transitioning to 100 percent clean power.

If Congress provides more funding for renewable energy and energy efficiency than what you have put in the budget, will you commit to supporting the states' efforts to transition to 100 percent carbon free energy?

Secretary PERRY. Senator, you know——

Senator HIRONO. Yes would be a good answer.

Secretary PERRY. I am sorry.

[Laughter.]

Senator HIRONO. Go ahead.

Secretary PERRY. I apologize, Senator, you go ahead.

Senator HIRONO. No, I would just like a yes answer from you for that.

[Laughter.]

Secretary PERRY. I know——

Senator HIRONO. I long for a yes.

[Laughter.]

Secretary PERRY. ——I know what your yes answer——

[Laughter.]

——your answer you're looking for.

Having been a former governor, you know, I am very supportive of states, by and large, making their own decisions about what direction they want to go and I'm certainly going to respect that with those three states. Texas may have a different idea about which direction they want to go, and I'm going to respect that as well.

But let me just say that I'm going to follow the lead of this Committee from the standpoint of what you find is your funding priorities. We will take those dollars and we will spend them as efficiently and effectively as we can and hopefully to you, as a whole, will say that we followed your directions.

Senator HIRONO. That sounds like I could give you more money on the renewable side that you will work with the states to enable them to get to their goals. That's what it sounds like to me. So is that accurate? Yes?

Okay, going on to ARPA-E. ARPA-E, as you well know, is an innovative research model at DOE that has demonstrated remarkable success in its short life span. But once again, the Administration is proposing eliminating ARPA-E, an idea Congress has rejected the past two years.

Will you commit to dispersing funds to eligible ARPA-E projects within a reasonable time consistent with past practices and not withhold Congressionally-appropriated funds? Mr. Secretary?

Secretary PERRY. I'm sorry.

Senator HIRONO. Okay, so——

Secretary PERRY. I'm having a hard time hearing you, Senator. I apologize. I know we're on ARPA-E.

Senator HIRONO. Yes. The Administration wants to eliminate the program but there's already appropriated amounts——

Secretary PERRY. Right.

Senator HIRONO. ——in this program.

And my question to you is whether you will commit to dispersing the funds to eligible ARPA-E projects within a reasonable time——

Secretary PERRY. Yes.

Senator HIRONO. ——consistent with past practices? Good.

Secretary PERRY. Sorry.

Senator HIRONO. Getting back to renewable energy. For the third time in a row, the budget proposal goes in the wrong direction by slashing renewable energy and energy efficiency, this time with cuts of \$2 billion, or 85.6 percent, from the levels set last year when Republicans controlled both chambers of Congress.

This year's budget for the Energy Efficiency and Renewable Energy Office, EERE, includes \$353 million that Congress already gave EERE last year but that DOE has not yet awarded at the time the budget was being put together late last year. But the EERE Office, as Congress intended, has continued to allocate the funds to support energy efficiency and renewable energy research and development.

So, if Congress actually followed your recommendations, EERE would not only face a drastically smaller budget going forward but would also have to cancel funding already announced to support renewable energy efficiency research and development. Isn't that correct? You will actually have to cancel the funding if we went along with your budget.

Secretary PERRY. Senator, again, I kind of get the process here and I'm, you know, this isn't a take it or leave it budget that we've obviously laid out here in front of you and we're going to work with this Committee. So I'm going to tell you that the dollars that we have been placing out in the field are making a difference now.

We just announced the largest solar funding opportunity in the history of the Department, just this week, 150 or excuse me, \$130 million in new research in advanced early stage solar technology.

So I recognize the conflict between the budget that's laid out but I know what reality is and between 2016 and 2018 solar generation in this country increased by almost 90 percent and we also see wind energy, this coming year, surpassing hydro for the first time in history. So there's actually some pretty positive stories, Senator, that's ongoing and a substantial amount of that because of innovation that has come out of the Department of Energy. We're going to continue doing that.

And most importantly, I think for you, is that you appropriate these dollars and we're going to spend them as efficiently and effectively as we can to meet the directions that this Committee and Congress gives us.

Senator HIRONO. Madam Chair, there's going to be, there will be consequences if they have to cancel funding that's already been passed and announced by the DOE. I don't know that the Department has figured out what the consequences will be, but there will be some.

Thank you.

Secretary PERRY. Senator, just for the record. Any program, new project that we have committed to, we've got to finish the funding for it. So, I'm pretty sure that's statute.

The CHAIRMAN. That's the way we want it to be.

Senator Gardner.

Senator GARDNER. Thank you, Chairman, and thank you, Mr. Secretary, for your time and testimony today and your service to the country.

I think I appreciated the statement you just made. This is not a take it or leave it budget, I think is what you said to Senator

Hirono. I think you also talked about being able to work with Congress with whatever is budgeted, that Congress passes, the appropriations bills we move forward, that you will use those dollars appropriately, responsibly, and according to the law.

With that in mind, I think, I just wanted to highlight the National Renewable Energy Laboratory (NREL) in Colorado, estimated in 2017 the economic impact of more than \$1.1 billion nationwide for Colorado's economy. That was about \$750 million of economic impact.

So obviously the Office of Energy Efficiency and Renewable Energy, which is NREL's steward and primary funder, is a very important component for Colorado, and I think you have given me the assurance through the answers to others but would just like to hear it. Will you execute the budget Congress provides you so that we can continue to see these good returns on federal research investment as evidenced by this University of Colorado report that showed that \$1.1 billion economic impact?

Secretary PERRY. Yes, sir.

As a matter of fact, I think this budget actually includes an increase for NREL's facilities that you speak of.

Senator GARDNER. Yes and we are going to continue to push on NREL and others because, as you know, you and I had the chance to visit NREL. We had a great visit to the lab there. I think we painted some solar panels which was pretty incredible.

And congratulations to you on visiting all 17 national laboratories last year. They had a great employee visit town hall with the NREL staff and staff members.

In your testimony you talked about the work that NREL does and other labs do, the core research of these facilities. Could you talk a little bit more about your plans for the NREL Flat Irons campus for megawatt scale grid integration testing and cybersecurity?

Secretary PERRY. Well, that's obviously, there's a number of things that come together here. Obviously, the innovation that's coming out of labs like NREL with new technologies from the standpoint of—the Senator made reference to literally painting on to the surface of the top of a vehicle, for instance, a solar cell for lack of a better descriptive term.

Senator GARDNER. Yes.

Secretary PERRY. But the AI side of this, I think it's one of the things, Senator Heinrich, that we have the potential to change literally the world in these labs and the work that they do together. Our high-performance computing, our exascale computing and you know, hopefully very near in the future, the quantum computing capacity.

Argonne, we were up at Argonne two weeks ago. A computer there that does one billion, billion, transactions per second, a quintillion. I mean, that's the power of what we're having the ability to do.

So a lot of answers to questions on issues like energy, on emissions, on some things that really vex us today, we're going to have the potential to get answers to those in the not too distant future. And that's one of the exciting things about why focusing and,

frankly, having the flexibility to move these dollars around in the DOE budget is so important.

Senator GARDNER. In your testimony you also touched on the importance of energy storage, advancing energy storage through the Advanced Energy Storage Initiative, including the Grid Storage Launchpad and supporting the research at the national lab system itself. So I am not going to ask a question on this because I want to get to a different question, but I want to continue to work with you on ways that we can increase research, increase research opportunities to help decrease the cost of energy storage. That is important to us.

Secretary PERRY. It's the Holy Grail.

Senator GARDNER. Yes, it is.

Finally, I just wanted to talk about a bill that I have introduced to extend the life of the Grand Junction Disposal Cell. This is a particular issue in the Western Slope. This is a mill tailings disposal site in Grand Junction, Colorado, that can store as much as 230,000 cubic yards of additional material.

So the reason this is important. From 1950 to 1966, mill tailings which were predominately sandy material in this area were available to private citizens and contractors who used them as fill material, building roads, concrete, and mortar in this area of Colorado. The radioactive mill tailings, of course, were then hauled to more than 4,000 private and commercial properties in the Grand Junction area. It was not until later that the Federal Government realized this was not a very good idea, and it was hazardous to people's health. So we created this disposal cell site.

Can you talk about what steps DOE will have to start taking this year if the site's life span isn't expanded by Congress?

Secretary PERRY. Well obviously, under current law, the site is going to stop receiving material on September 30th, 2023, and obviously unless reauthorized by Congress this initial closure will have to begin as early as this year. So thank you for bringing it up. I mean, this is a timely issue.

Senator GARDNER. These are tailings that would not be properly disposed of that—

Secretary PERRY. Correct.

Senator GARDNER. —would be remaining on people's property that, yeah.

Secretary PERRY. And I mean, from a building construction standpoint, this could really be—have a negative impact on sites. You know, there are alternative location disposal sites in Utah and Texas. But this one that you speak about is really important for your part of the world. Anyway, we stand ready to work with you to find a solution on it, Senator.

Senator GARDNER. Thanks, Mr. Secretary.

Thank you, Chairman.

The CHAIRMAN. Thank you, Senator Gardner.

Senator Manchin, did you want to take your turn or turn to—

Senator MANCHIN. I am going to defer to Senator Heinrich. I have a lot of busy people on my side of it.

The CHAIRMAN. Alright, alright.

Senator Heinrich.

Senator HEINRICH. Thank you. Thank you, both.

Secretary, I was watching the President speak about energy last week and I learned something new. He said that if it doesn't blow you can forget about television for that night.

I thought given your experience as Governor of Texas, where ERCOT has such high levels of penetration of wind energy, in particular, that you might have some expertise in how you manage all of those angry constituents when their TVs don't work. How did you pull that off?

Secretary PERRY. I didn't have an issue with that.

Senator HEINRICH. So you had wind penetration levels well above 30 percent going on 40 percent and you did not have people calling up your office?

Secretary PERRY. You've got to remember Texas is a pretty big state, sir.

Senator HEINRICH. Okay.

You might want to share that perspective with the big boss in the White House.

Secretary PERRY. Absolutely.

Senator HEINRICH. We have similar experience in New Mexico. We don't have quite the level of generation, but we are going on two gigawatts and we are still growing. And everybody's TVs seem to be working just fine.

I want to ask you about, I am sure you are familiar with Urenco USA's nuclear enrichment facility that is just inside New Mexico on the New Mexico-Texas border. They have been up and running since 2010. They are currently meeting more than a third of the U.S. demand for utilities for enriched uranium.

I bring this up because, in your budget, there is well over \$100 million to demonstrate a domestic enrichment technology through a sole source contract for what effectively already exists in the private sector. Why should taxpayers be on the hook for a single dollar for something that is already up and running in the private sector?

Secretary PERRY. Senator, I'll see if I can get this as, you know, as simplistic as I can because for my purposes it is relatively straightforward. The company I think that you make reference to—and this is in your home state?

Senator HEINRICH. Centrix—Urenco is in New Mexico.

Secretary PERRY. Right.

Senator HEINRICH. I think Centrix is—

Secretary PERRY. That company is not a United States-owned company and that is the real key here. We need a domestic supply of this high-assay uranium product if we're going to have a fuel for advanced reactors. And I think, I hope, all of us are very much in favor of having these advanced reactors.

Senator HEINRICH. Why would you have that require—commercial reactors don't require that requirement. We—

Secretary PERRY. Senator, I'm just telling you that's—

Senator HEINRICH. They are already supplying reactors all over the United States. How is it different if you have a small modular reactor, a pebble bed reactor? How is that different than all of the other second generation, nuclear generation technology?

Secretary PERRY. Yes, sir.

And it has to do with the Department of Defense requirement into restore that market. So, you know, I think there's a clear understanding when you're talking about something as sensitive as a DoD-related type of a reactor that you want that to be——

Senator HEINRICH. Are we talking about DoD reactors or are we talking about private sector, next generation reactors?

Secretary PERRY. I'm talking about what they're doing with the advanced reactors may have a clear DoD nexus.

Senator HEINRICH. What does that look like?

Secretary PERRY. I'm not sure we can——

Senator HEINRICH. But it's clear?

Secretary PERRY. I don't know whether we can talk about it here.

Senator HEINRICH. That is convenient.

Alright, let's switch gears.

Secretary PERRY. I would invite you to come to sit down in one of our secure skiffs and have the conversation about DoD's requirement on the bills.

Senator HEINRICH. I would be happy to do that.

You were at CERAWEEK in Houston and you said that you had thrown a lot of jello at the wall trying to find some way to subsidize aging uneconomical coal generation. You had a study. You proposed it for a quarter and an emergency declaration, all of those have, sort of, gone by the wayside now. Are we done trying to prop up generation that is no longer economical in the current wholesale market?

Secretary PERRY. Well, here's what I would tell you, Senator.

If, you know, if the American people want to have one or two sources of energy that that's what they're going to rely upon and, you know, we have been blessed to have——

Senator HEINRICH. It seems like we have more sources and higher reliability than we ever had in our nation's history. So isn't this a little bit of a solution in search of a problem?

Secretary PERRY. No, sir. What it is, I think, is it's what's called leadership. It's about having a plan in place in case there are some things that happen. You know, we can have the defense of this country on the cheap if you want it.

Senator HEINRICH. I would suggest it is not about leadership; that it is about picking winners and losers.

Secretary PERRY. I mean, best I can tell, government picks winners and losers every day, sir. We certainly did in the State of Texas.

Senator HEINRICH. But we have a wholesale market that can do that based on the private sector.

Secretary PERRY. Yes, sir.

And when the lights go out in Dallas, Texas, because you haven't put the right mix in, I know who gets blamed for that and it's the leadership of your state, it's the leadership of your country. And I think that's the point that the President is making is that we need an all-of-the-above energy strategy in this country.

You bet, we have—we are blessed with natural gas right now and we love it, the State of Texas in particular likes that. But when you are blocking natural gas pipelines going to the Northeast, when you are literally limiting in Westchester County, New York, new gas hookups, because of the limitations that states are

making on that type, maybe it's time for us to have a conversation in this country. Do we need to have a stable baseload of energy? And those are things that are uninterruptible. And the best I can tell, the only things that are uninterruptible in the energy industry are coal and nuclear and hydro.

Senator HEINRICH. I will leave you with one last thing.

There are many coal-fired generating stations operating well below 40 percent capacity factors. That doesn't sound like baseload to me.

The CHAIRMAN. Let's go to Senator Barrasso.

Senator BARRASSO. Thank you, Madam Chairman.

Mr. Secretary, great to be with you again. You and I have discussed in the past, and I will bring up again today, my opposition to the Department's practice in the past of bartering excess uranium to fund the cleanup and decommissioning of the Portsmouth Gaseous Diffusion Plant.

GAO has repeatedly said that the barters are illegal. The barters have also contributed to record low uranium prices and put uranium producers in Wyoming and other states out of work.

In 2018 U.S. uranium production was at its lowest level in the United States since 1950. Now last year I received your commitment to suspend the Department's uranium barter because the Department's practices were illegal and harmful to our domestic uranium producers.

So I just ask, Mr. Secretary, can you again commit to suspending the Department's uranium barters and agree to working with Congress to fully fund the Portsmouth cleanup cost with Congressional appropriations?

Secretary PERRY. Senator Barrasso, I agree with you that, I think I've used the term, it's a pretty poor way to run a railroad and I still agree that the Congress needs to directly appropriate the money for Portsmouth and get out of the barter business.

Senator BARRASSO. The uranium plays such a vital role in maintaining America's national security. It powers nearly a quarter of the U.S. Navy's fleet. It keeps the lights on in around 20 percent of American homes and businesses.

State-owned and state-subsidized uranium producers though in Russia, in Kazakhstan, in Uzbekistan, they are using unfair trade practices to flood the U.S. with uranium to the detriment of producers in Wyoming and across the country.

Based on industry projections for 2019, American uranium producers estimate that they will supply less than one percent of American nuclear fuel. If this trend continues, we are likely to find ourselves wholly reliant on foreign suppliers of this critical element.

Last July the Department of Commerce launched a Section 232 investigation into whether uranium imports threatened to impair U.S. national security. The investigation is wrapping up and Secretary Ross will soon be delivering the findings of that investigation to the President.

So then, I ask you, Mr. Secretary, do you believe that maintaining uranium production in the U.S. is critical to our national security?

Secretary PERRY. Yes, sir, is the point I was making to Senator Heinrich.

Senator BARRASSO. And have you and your staff urged the Department of Commerce to take meaningful action to address Russia and Kazakhstan's unfair trade practices?

Secretary PERRY. We tried. We tried to relay to all of the agencies of government, remind them of the key role that the nuclear energy industry continues to play in our country as well as the key challenges that we have.

It is a very vital sector and whether it's the infrastructure of the nuclear energy side of things, the market valuation perspective that occurs and keeping that as a stable and viable entity is important in a number of areas, it's not just on the civil nuclear side, sir, but it's also on our ability to keep a trained workforce and a supply line on our ability to keep this country free with our nuclear enterprise.

Senator BARRASSO. Well, as we are here discussing this, upstairs I am chairing a hearing of the Environment and Public Works Committee where we are visiting with the Nuclear Regulatory Commission, all five members, and the issue that you just raised about the importance of a stable workforce is key to our agenda that we are discussing as well upstairs.

Secretary PERRY. Thank you, sir.

Senator BARRASSO. Do you know if you or anyone on your staff has had a chance to specifically speak with the Department of Commerce with regard to our concerns with the Section 232 investigations and where they are coming?

Secretary PERRY. Yes, sir, we have in the appropriate ways.

Senator BARRASSO. Thank you very much.

You know, emerging technologies such as carbon capture, using that carbon, storing it, using it productively, these have all been potential—we have to reduce emissions while allowing for the use of the affordable, abundant sources of energy such as coal.

If we can commercialize these technologies, we can protect the environment. We can ensure that coal plants remain in service and competitive in energy markets.

A recent report noted the increase in the construction of coal generation facilities in China. Last year, Chinese coal-fired power plant capacity under construction, just under construction, increased 12 percent.

It is important that we develop and deploy effective carbon capture technologies for use by growing economies. I appreciate your Department's support of carbon capture, utilization, and sequestration technologies.

Mr. Secretary, can I count on your continued support of the development and deployment of these carbon capture, utilization, and sequestration technologies in the next fiscal year?

Secretary PERRY. Yes, sir, Senator.

Prior to you coming in we talked about some of the projects that we're funding now. There was a full \$30 million that's gone out to Carbon Storage Assurance Facility Enterprise, and then there was another \$30 million on front-end engineering design (FEED) of carbon capture systems. So not only do you have that commitment, we're sending dollars out the door to do that as well.

Senator BARRASSO. Thank you, Mr. Secretary.

Thanks, Madam Chairman.

The CHAIRMAN. Thank you, Senator Barrasso.

Senator Manchin.

Senator MANCHIN. I am going to take a shot myself this time.

The CHAIRMAN. Alright.

Senator MANCHIN. First of all, I want to thank you, Secretary, for being here as always and being candid where you are coming from and how we can work with you.

Dr. Birol, Executive Director of the International Energy Agency, basically talked about carbon capture and sequestration.

Everyone has a different opinion on fossil, whether we should have it or not have it. The reality of what we are dealing with in the world is that it is going to be used for quite some time because of the age of the plants. They are not going to time the plants out in Asia any time soon.

We are decreasing our dependency on fossil. We see that, except we are increasing our demand for natural gas.

My State of West Virginia, like your State of Texas, has an ocean of energy under us, so we are blessed both ways. But with that, carbon capture and sequestration, something he said, "If you want to decarbonize, if you want to really help the planet, if you want to help global climate, you better find a way to capture carbon." So we are looking at a moonshot type of mentality. What type of a cost is that? We have people putting different types of costs. We have some people wanting to talk about using a carbon fee, and that is going to fix the problem. A carbon fee that goes to dividends, it is the first out among the populous, and does not fix the carbon problem.

If you care about the climate and you want to fix it, you better find out how. Just eliminating fossil is not going to work around the world.

And he has told us that basically if we eliminate it, the use of fossil for energy in the United States of America, it is going to make a blip on the radar screen compared to what Asia is doing for the next 30, 40 years. So we have to come to that reality.

What would it take and are you committed? Do you have the same feeling of that? Have you all talked to Dr. Birol, what is going on in the demand for energy, because the 2.3 percent increase has all been just about fossil. It has been an increase of demand of energy and meeting that demand has been through fossil more than anything else in other parts of the world, which is where most of the demand is coming from.

Secretary PERRY. Senator, we, at the Department, we agree by and large with your assessment that I think by 2040, 70 percent of the energy developed in the world will still come from fossil fuels.

America has always been the place where innovation has come from, and unless we kneecap ourselves and by taking our ability to create the wealth that pays for the innovation, you know, American innovation will continue to be where people look, where we take and push out our ideas.

When we're working with our Indian friends—I was in India last year, and we talked to them about our technology going over there,

both CCUS, LNG, all of those, the project that we went and looked at in Morgantown, right outside of Morgantown, West Virginia, on the——

Senator MANCHIN. Yes—coal-fired plant that was basically, that was using extreme heat.

Secretary PERRY. —HELE plant there, the low emission, highly efficient, low emission plant there, pulverizing the coal and incredibly clean technology. That's what the world needs to see. We need to be able to deliver that type of technology and, you know, there may be some projects going on in different places around the world. I don't see it.

As Germany is transitioning away from, you know, both nuclear power and shutting down coal plants, that was their goal. They've actually increased their emissions. While the United States is lowering their emissions, and we're lowering our emissions partly because of innovation, partly because of our transition to LNG, so.

Senator MANCHIN. I am going to——

Secretary PERRY. That's—we can help the world get there but if we put ourselves at a competitive disadvantage——

Senator MANCHIN. Yes.

Secretary PERRY. —from an economic standpoint, we'll never be able to——

Senator MANCHIN. Well, my thing is that, basically, if you really want to fix the problem, the way we did with the Clean Air Act back in the '80s and '90s, we made the people that were emitting the particulates responsible for cleaning it up and fixing the new technology. I think it is going to take the same thing here.

For every \$1 of a carbon fee that has been recommended, that would produce \$5 billion in revenue. They are saying a \$40 fee is \$200 billion, so that is \$5 billion.

I don't know what it is going to take for a moonshot to get people to act sooner than later, but we have got to do something that fixes the problem, not basically exacerbates the problem because you're turning your head.

Real quick, you and I talked about a Category 5 hurricane coming up the Houston channel, and what it could do to devastate our energy production for the United States of America because most of it is in that corridor. You and I have also talked, Mr. Secretary, about potential for having diversification in the mid-Atlantic region where we have an abundance of propane and ethane. We have an abundance of natural gas coming from Marcellus and Utica. Rogersville is going to come on strong.

What I would say is, to ensure that we have resiliency and redundancy built into our natural gas liquid sector in the event the Gulf Coast would get hit, are you all looking at that seriously advancing that as quickly as we possibly can to have that back up for security? And how does it play into the national security of our country?

Secretary PERRY. Senator, you and I have talked about this at length and, frankly, it's not happening as fast as I'd like to see it.

Senator MANCHIN. No.

Secretary PERRY. Because I think there's extraordinary potential in those four states and the Appalachian region—Pennsylvania,

West Virginia, Kentucky, Ohio—sitting on top of the Utica and on top of the Marcellus. I mean, just amazing resources there.

Senator MANCHIN. We have a deeper one too. We have Rogersville we just found.

Secretary PERRY. And I think it's Shell is building a big cracker plant just north of you. PTT has a plant that is still waiting on their final investment decision to be made, but I think that's going to happen, so—

Senator MANCHIN. We are talking about the storage hub, you know, because we've got to keep that wet product.

Secretary PERRY. Yes, sir.

Senator MANCHIN. And we have other countries coming at us so strong and so hard—

Secretary PERRY. Yes.

Senator MANCHIN. —speaking of Russia and China, that wants to buy every, every ounce—

Secretary PERRY. Yeah.

Senator MANCHIN. —of ethane and propane, take the wet properties out of the jurisdiction of the United States—

Secretary PERRY. And adding value to that gas, the jobs that get created, and great point you make about having a duplication of the petrochemical footprint in this country—

Senator MANCHIN. Right.

Secretary PERRY. —in case there is a Category 5 hurricane up the Houston ship channel and it knocks that out for some period of time, you have an alternative there.

This is a win-win for America. This is about American energy security. It's about American jobs. And you know, I hope we, collectively, the Administration, Congress, Democrats, Republicans, both look at this and go, this makes sense for America. It's the type of infrastructure we need to build.

Senator MANCHIN. We need your help, sir.

Thank you.

The CHAIRMAN. Thank you, Senator Manchin.

Senator Daines.

Senator DAINES. Thank you, Madam Chair.

Secretary Perry, good to have you here. I want to thank you for your commonsense, balanced approach as we think about America's energy portfolio going forward.

I want to look at the budget for the Fossil Energy Research and Development. Your budget calls for 24 percent reduction in that budget.

This office had funded a groundbreaking—the Petra Nova plant in your home State of Texas. I want to complement Texas, by the way, on being a great example of an all-of-the-above energy state and what you do there and did as Governor in Texas.

More recently, Congress has previously funded this office in a significant way, and I hope we can do that again. I also want to make sure that money is spent where it is needed most.

As we have spoken before, Mr. Secretary, the Colstrip power plant in Montana is one of the largest coal-fired plants west of the Mississippi. It is one of the largest economic drivers in Montana, and it is very well-suited for DOE investment. Over 2,000 megawatts of power, 350 highly paid workers there, annual payroll

\$52 million, \$104 million paid in state and local taxes. I can tell you that is a big number as we look at the revenue streams in the State of Montana.

We noticed this winter that we had a really cold February and an unusually cold March. It was 40 below one morning. It was a Monday morning in March, and I was trying to fly back to Washington, DC, out of Bozeman. Deicing fluid doesn't work when it gets to 25 below or colder. We were sitting for two and a half hours waiting for the temperature to warm up to minus 25.

It was interesting to see what happened on the grid in Montana when we were hitting this cold snap. I can tell you without certainty if we did not have the Colstrip power plant running then because the wind power had stopped at minus 23 because of issues with the composites and structural challenges. They shut them down at minus 23 or colder. It was the coal-fired plants that kept the lights on for Montana during that cold snap.

The challenge, if we lose Colstrip, it is baseload power, we risk hard-working jobs that boilermakers have, miners, other laborers, who call our beautiful state home.

And Mr. Secretary, we are a state that still relies on hard-working Montanans where moms and dads, grandmas and grandpas can go down to Walmart and buy an elk tag over the counter for \$20.

Secretary PERRY. Yeah.

Senator DAINES. The youth tag is \$8 if you are 12 to 14 years old, because it is something that all Montanans love to do or most Montanans do. We want to preserve that so it is not just the rich and famous that are locking up our state to a balanced approach to natural resources.

Forty percent of that power flows to Washington State, and Governor Inslee continues to put politics between high paying jobs in my state, high paying jobs on the Indian reservations, and affordable baseload electricity. He is pressuring owners to get away from carrying coal-fired electricity as if electrons knew the difference.

While I realize it is Texans are using power from Petra Nova, Colstrip is still very similar. That plant received over \$190 million from DOE. Like Petra Nova, Colstrip is located near an EOR field that will require pipeline construction for carbon capture to help offset the economic costs of CCUS. And while we are making strides improving the economics of carbon capture, like the Section 45Q tax credit, I believe the future of this plant demands more investment from your Department.

With that as background, I would like to get your thoughts on what you are doing to protect coal plants like Colstrip. It is baseload. It is jobs. It is tax revenue. It is the franchise for Montana right now, Mr. Secretary.

Secretary PERRY. Let me just briefly say that the 2020 budget that is laid out in front of you is not at a level that would support a commercial scale operation for Colstrip that's, as you mentioned, similar to Petra Nova. And Petra Nova had received \$190 million in stimulus funding from DOE and that was a \$1 billion project which means the partners provided about an 80 percent cost share.

But we recently released an FOA for carbon capture at power plants. It's \$30 million for FY'19, and that was directed by Congress and certainly could be of interest.

It's the Administration's policy for us to be, DOE, to be focused on these early stage research and development opportunities, particularly where there's the potential for them to be commercialized and the technology to be demonstrated.

So I think you know our commitment to the technology. I think, more importantly in a broader—just let me say as I wrap up here quickly, you're absolutely correct that we've got to have a portfolio that is broad in this country, that if we just make decisions about the economics, you know, there are cheaper ways to deliver energy in the country. Right now, we're blessed with an abundance of natural gas and God, I mean, thank God we've got that. But you never want to have that phone call that comes in and says, you know, we got people that are losing their lives in part of the state because we weren't willing to pay for a diversity to make sure that we had an all-of-the-above energy strategy.

It would be like saying that we're going to keep America free but we don't need x numbers of hundreds of thousands of soldiers, we can do it on with this many, we really don't need a—let's just have a 100 ship Navy because, you know, that's cheaper and we can use these dollars for something else. You can keep America free for some period of time on the cheap, but I'm not willing to bet the future of this country on it. And I hope that the people of this country aren't willing to basically say, we're going to have an energy strategy, a national security strategy, in this country that's just based on cost.

Senator DAINES. Thank you.

My follow just is, can I get your commitment to work with me on ways to accelerate the DOE investment at Colstrip?

Secretary PERRY. Yes, sir.

Senator DAINES. Thank you.

The CHAIRMAN. Thank you, Senator Daines.

Senator Cortez Masto.

Senator CORTEZ MASTO. Thank you.

Hello, Secretary Perry, I guess you know what I am going to talk to you about.

Let me ask you this. In the President's budget, you request \$116 million to restart licensing activities for the proposed Yucca Mountain Nuclear Waste Repository, which would ultimately bring high level nuclear waste to Nevada.

Secretary PERRY. Okay.

Senator CORTEZ MASTO. Do you want me to give you some time to get to—

Secretary PERRY. No, no, no, I'm set now. I'm ready.

Senator CORTEZ MASTO. Okay.

And so, as you know, this is something that, for purposes of the State of Nevada, we have been fighting against. We are united from Republican and Democratic governors to our Congressional delegation. It is not safe for the storage in Nevada. And the concern we all have is the end run around the science.

So let me ask you this, because I think it is still happening.

On March 21st, 2019, the Defense Nuclear Facilities Safety Board sent you a report saying they are concerned that the Department of Energy has not adequately addressed the seismic hazards for the Device Assembly Facility (DAF) at the Nevada National Se-

curity Site (NNSS) and that a seismically induced, high explosive, violent reaction could result in unmitigated dose consequences to the offsite public. Predominately, the report states that DOE has not evaluated the impact of the increased seismic hazard on safety-related structures credited to protect public health and safety during a seismic event at the Nevada National Security Site. In fact, the most recent U.S. Geological Survey taken in this area lists the region to be a moderate to high seismic hazard.

So my question to you is, have you taken these seismic hazard reports into consideration as you continue to push to open Yucca Mountain?

Secretary PERRY. Let me respond to your first observation which is the letter that you make reference to, and we certainly appreciate their input related to the need to update the seismic analyst, analysis rather, for the systems and the equipment that supports nuclear explosive operations at the Device Assembly Facility.

Senator CORTEZ MASTO. You have incorporated some analysis into this new seismic activity report that is coming in? We have it every single day coming into the University of Nevada Reno to show that there is moderate to high seismic activity there. Are you incorporating that into your analysis for reopening Yucca Mountain?

Secretary PERRY. I feel quite certain that we would, Senator.

Senator CORTEZ MASTO. That you would or you have not yet?

Secretary PERRY. That we would.

Senator CORTEZ MASTO. Okay.

Secretary PERRY. Yeah.

Senator CORTEZ MASTO. So what I would like to know is specifically what you are incorporating into your analysis? If you can share that with me, that would be helpful.

The next question I have for you is, you may not know this but a handful of red flag exercises are held at Nellis Air Force Base, which is over at the Nevada Test and Training Range, in close proximity to Yucca Mountain. The purpose is to give our service members realistic training with real hardware and ammunition. Even former Air Force Secretary Heather Wilson has stated that, "transportation of nuclear waste near the range could impact testing and training."

Do you think it is safe to store waste nearby, even with the threat that errant ordinance or any other mishap near Yucca Mountain could have an extremely negative impact on the neighboring public?

Secretary PERRY. I think it's safe, Senator. As a matter of fact, what I'd like to do is—

Senator CORTEZ MASTO. So can I see your analysis, instead of your opinion.

Secretary PERRY. —invite you to come out.

Senator CORTEZ MASTO. I have been there. I have been there, sir.

Secretary PERRY. You've been to the DAF?

Senator CORTEZ MASTO. I have been there. And let me just say this, I would like to see your analysis as to why you think this is safe when the Secretary of the Air Force does not.

And so, not only have I been there for the red flag exercises, I have been to Yucca Mountain. I have been to those facilities.

Secretary PERRY. But you've been to the device——

Senator CORTEZ MASTO. So I would like to see some analysis.

Secretary PERRY. ——because what we're talking about here is the, just so we're clear about what we're talking about because the Nevada site is a massively big piece of land.

Senator CORTEZ MASTO. Secretary Perry, I don't have much time, but you don't have to tell me that. I grew up in Las Vegas. I have family and friends who work out there. I have been out there.

Secretary PERRY. But I'm asking you, Senator, have you been to the DAF?

Senator CORTEZ MASTO. So I would like to sit down and go through this with you and show you why it is not safe and there are concerns about the safety there.

I am running out of time.

Let me ask you this. On October 20th, 2018, President Trump said to a Reno news station, regarding Yucca Mountain, and I quote, "I think you should do things where people want them to happen. So I would be very inclined to be against it." That would be Yucca Mountain and opening it. "And we will be looking at it very seriously over the next few weeks. And I agree with the people of Nevada who do not want Yucca Mountain to be a long-term, permanent repository." So my question to you is, does President Trump no longer agree with the people of Nevada when he expressed his opposition to Yucca Mountain?

Secretary PERRY. Senator, what I think we all have to recognize here is that Yucca Mountain is the law. And I'm going to follow the law. I think the President is going to follow the law. His opinion of whether or not the people of Nevada like it or not doesn't have anything to do with what the statute says. And the statute says that we are to continue with the licensing process for the Nuclear Regulatory Commission to make the decision on whether or not this is a safe site or not. It's not an issue of what someone thinks or what someone necessarily desires. I'm going to follow the law.

Senator CORTEZ MASTO. So let me ask you this, Secretary Perry, because I hear you say that constantly. I hear you say that constantly even though the previous Administration took a different path toward that in the Blue Ribbon Panel which has been disregarded by this Administration.

But let me just follow up with this because you say this constantly. "You're just following the law." And I just want to take a moment with respect to this issue.

The CHAIRMAN. Very briefly please.

Senator CORTEZ MASTO. Thank you.

I think it is important for people to know that this law was not born out of rational decision-making. It was intentionally created to do an end run around the science, compromise public participation, and was created intentionally to disregard Nevada at the expense of other states.

And just very briefly, in 1982 the Nuclear Waste Policy Act directed DOE to study many sites to ultimately construct two repositories, the first one in the West and then one in the East. It limited the amount of waste the western repository would keep to ensure that the western location would not be the sole facility. By 1990, a second repository site was to be named amongst a short list of

five other identified locations; however, DOE's list of sites for the second repository drew intense opposition from all of the affected states. And in 1986, the Reagan Administration announced a halt to work on a second repository.

When confronted with intense political pressure and high cost, Congress passed the NWPA amendment in 1987, which not only canceled the second repository program, it nullified the creation of a temporary storage facility that was supposed to be placed in Tennessee until after the licensing of the final repository and it statutorily designated Yucca Mountain as the site. Mr. Secretary, this historical context is key and it shows that extreme political influence was used to scapegoat the State of Nevada.

All I am asking is for some reasonable people to come to the table to address this issue and recognize that, scientifically, this is not safe for Nevada. We need a consent-based siting—

The CHAIRMAN. Senator—

Senator CORTEZ MASTO. —for everyone to be involved and not use Nevada as a scapegoat.

Thank you.

The CHAIRMAN. Thank you.

Senator CORTEZ MASTO. I appreciate the indulgence.

The CHAIRMAN. I am very generous with my time.

Let's go ahead to Senator Wyden.

Secretary PERRY. Senator, let me just wrap it up by saying that I hope you and I make the parameter for reasonable people, and I will work with you in any way that I can. And again, I want to offer you the opportunity to come out to the NNSS with me and let's continue the conversation and put boots on the ground at the site.

Senator WYDEN. Thank you, Madam Chair.

Mr. Secretary, I want to ask you about two matters, primarily Bonneville, but just a quick matter on Hanford, where Senator Cantwell is going to zero in and is very knowledgeable in this area.

You all are up to two things at Hanford. The first is you are looking at taking the high-level radioactive waste, which is the worst stuff, and calling it something less hazardous. And so, there is this, kind of, a name change. And you are adding budget cuts to it. So we have two bad things going on up there.

Senator Cantwell, as I said, will get into all the details, but I would just like to ask for purpose of my first point, not a question, but I would like you to provide the Committee, particularly Senator Cantwell and myself, an explanation of how the types of budget cuts you are proposing, in addition to the reclassification operation, are going to let you achieve the milestones of the tri-party agreement. This is just yes or no. Will you get me an answer within ten days on that?

Secretary PERRY. Yes, sir.

Senator WYDEN. Thank you.

Second, I want to get into Bonneville. So you all want a privatized Bonneville. And on this matter, Secretary, I want to give you an opportunity for some candor.

You and I have had plenty of differences, but I have always found you to be candid when I have asked you about these kinds of issues. And a little bit ago, one of your Office of Management

and Budget people who handles energy issues said that the Trump Administration is still going to propose auctioning off Bonneville to the highest bidder.

Now this steals from every man, woman and child in the Pacific Northwest, our ratepayers, and is particularly bad for the rural areas. In other words, Senator Cantwell in Seattle and myself in Portland. The cities have a lot of, you know, opportunities, but these rural areas are just going to be hammered. And privatizing Bonneville would just amount to garden variety robbery for families in the Northwest, particularly the ones walking on an economic tightrope, balancing the food bill and the fuel bill and the fuel bill against the rent bill. They are already stretched very, very thin without the Administration trying to raise their monthly utility bills.

I would like to give you an opportunity for that kind of Perry candor that we have been able to achieve a little bit from time to time in the office and give you the chance to take this colossally bad idea off the table this morning, privatizing Bonneville. Because I would just like to walk out of here and say, you know, something meaningful has been achieved this morning for the people that I have the honor to represent in the United States Senate, particularly in the rural areas.

I am heading home for the break, going to have Town Hall meetings in these rural areas.

Mr. Secretary, privatizing Bonneville hits everybody in the Northwest, steals from the families, but for the rural areas it hits them like a wrecking ball. It just clobbers them.

So can we, for purposes of this morning, can we take this colossally bad idea to privatize Bonneville off the table with a little bit of Perry candor, and have you tell us we don't have to have people all up in arms in those rural communities I am going to be visiting here shortly?

Secretary PERRY. I will be as candid as I can, Senator, and I'll try to replicate my answer from previous questions on this and my past visits to the Hill. My position, relative to having been an appropriator, having been a chief executive and how these, this budget process works is still the same. I will suggest to you that this line item will end up like it's ended up in every previous Congressional—

Senator WYDEN. Freeze-frame with that right now. And you are fine with it ending up on the cutting room floor?

Secretary PERRY. Senator, I know how this process works and the budget process is going to be decided by those of you sitting on that side of the dais. I'm sitting on this side. I'm going to do what you tell me to do. You'll make the decision on whether or not. I'm sure there are a number of places on our budget that you and I may not agree 100 percent or even 50 percent, but you're going to make that decision about where the appropriations are going to be.

I'm going to—

Senator WYDEN. I am over my time.

We are going to make sure it ends up on the cutting room floor, and I just hope you won't be trying to revive it after we do.

Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator Wyden.

Senator King.

Senator KING. Thank you, Madam Chairman.

Governor, Secretary, you have a very tough job coming into a hearing like this defending a budget that I think has some real problems.

I think, first, and this goes to Senator Wyden's question and you have answered this several times, but I just want to have it absolutely clear. Will you commit to diligently and responsibly administering the budget that is passed for your Department by Congress?

Secretary PERRY. Yes, sir.

And I hope that the activities and our work that we've done together is a pretty good reflection of that over the last two years.

Senator KING. Well, I actually checked on that and my impression is that that is the case, that you have pursued and funded those programs that were authorized and appropriated by Congress, even though they were not in the original budget. And I take it your commitment is that you will continue that policy.

Secretary PERRY. I respect this process, sir.

Senator KING. Thank you.

Now there are some good things in the budget, and I think there are some things that should be recognized. One is an initiative on energy storage. This is one of the most important energy issues that faces this country. I am a little concerned I don't have much detail, but I hope that you can supply, perhaps for the record, a little more background about what that intention is and what the funding level will be, because I think that is a very important initiative.

The CESER Office is a good initiative. I understand that is going to have an increase, the cyber office. I think that is important.

Senator Manchin talked about carbon capture. I think that is important.

My concern though is, and I think you understand this, basically you have said a couple of things today that indicate that you do. When we cut R&D, when we cut the kind of basic research that really only the Department of Energy can do because it is too early stage for the private sector, we are really hurting this country's future.

I wrote down a couple things you said. Pretty positive stories due to innovations coming out of Department of Energy programs. Yes. So let's not cut the programs that have created those positive stories. The other thing you said is, "America has always been the place where innovation comes from."

And as you well know, the fracking revolution, which is one of the great energy innovations of our lifetimes, came out of, in part, funding from the Department of Energy research and development fund.

I understand that you are constrained by the budget that the Administration wants to submit, but please don't diminish your commitment to those R&D programs. That is where the future of this country hangs in the balance. And I think I understand the new initiatives, and I think they are important, but that R&D is important. And I am sure you recognize that.

Secretary PERRY. Yes, sir. We do.

And all the way back to, again, my days as a chief executive in Texas creating offices that did just that.

One of the things that we've done here, recognizing that we have, you know, parameters in the budget that we have, is to be able to do some crosscutting work, if you will, creating a Chief Commercialization Office at the Department to be able to oversee these projects, a technology transfer side of this too.

And in my remarks, Senator, I talked about that, you know, I hope I don't get judged, I hope the agency doesn't get judged just on the amount of money that we spend on a line item, but on the results that we get from that.

So, and I know, listen, I'm not Pollyanna here. I understand your concerns about particular line items and the reductions that are there, but I hope that you see in our performance from the last two years whether it's on the renewable side of things which folks, you know, were concerned about are you going to be funding these types of programs, that you're seeing those types of efforts, that you're seeing the commitment to an all-of-the-above energy strategy whether it's CCUS, whether it's wind, whether it's—

Senator KING. Well, my problem isn't—you can make adjustments and you are talking about adjustments, but in the Office of Energy Efficiency and Renewable Energy, essentially there is an 85 percent cut. That is not a trim. When I put my rat in your trap, I expect him to lose his tail but not up behind his ears.

Secretary PERRY. Yeah.

Senator KING. And that kind of cut is, that just, it doesn't bear out. So that is the area that I hope we can work at.

Budgets are policy, and essentially one of the things this budget says is we are not really interested in R&D and the future of those investments, except in certain areas.

So I hope, again, to go back to the very beginning, that you will be diligent and fully responsive to the mandates of this Congress in terms of what—

Secretary PERRY. Yes, sir.

Senator KING. —what the programs are, how they will be funded and how they should be administered.

Secretary PERRY. We will, Senator.

Senator KING. Thank you.

Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator King.

Senator Cantwell.

Senator CANTWELL. Thank you, Madam Chair.

Secretary Perry, this—

Secretary PERRY. Ready to go.

Senator CANTWELL. I am letting you get to your tab there.

Secretary PERRY. I'm there. I'm on you.

Senator CANTWELL. Well, this hearing is interesting this morning because, obviously, you are responding to this overall budget and many of my colleagues have different viewpoints on the President's proposed budget. You, as a skillful ex-Governor, now Secretary of Energy, are coming here and basically telling us don't worry. I get it, like you guys are going to write a budget and you are going to have your day.

I guess the challenge with all of that is that I think we live in a new world where getting consensus is the best way to move forward. I didn't coin that, somebody else did. Basically, in an economy where there is so much innovation and information, those people move ahead when they get around a table and get consensus around that science and information.

The reason why I am asking you that is because when the people out at Hanford did the budget and said this is what it takes to comply with the tri-party agreement, they came up with numbers that now the Administration is ignoring.

And so I am just trying to understand, if we are going to move forward on science and information, how can we have our own people out at Hanford come up with a number—I think the River Protection Compliance Budget was \$1.8 billion—and the President's budget proposal only has \$1.4 billion? The Richland Office Compliance Budget was \$1.3 billion and the President's budget came up with \$708 million. So the people on the ground who are working for you are putting numbers on the table and then the Administration or someone is making a decision that is different than that. And these are the people who have to meet the milestones of compliance.

Now I know you have heard me say many times here, and I truly believe it, I am ready for an energy secretary for life or until Hanford is cleaned up.

Secretary PERRY. Yeah.

Senator CANTWELL. Why? Because I think every single energy secretary gets in your slot, they basically have to deal with the White House and they look at the Hanford budget and they think, oh, my gosh, it's in the billions of dollars. We can't possibly do that. I can come up with a better way, and I can figure out how to get it done. And I guarantee you, every one of those energy secretaries and White Houses have been thwarted on that.

Why? Because it is the largest cleanup site in the entire world, and the complexity is off the charts. But that is what it is going to take to live up to our responsibility, having people scrub the numbers in the local community and submit them.

And so I am just asking kind of the same question a lot of my colleagues are asking, how do we get around a table and get consensus on numbers that we all believe in as opposed to this continued back and forth? And I get it, I get what you are saying.

Secretary PERRY. Yup.

Senator CANTWELL. You are skillful at saying it. You are skillful at saying, yeah, I get it. Congress will end up writing this budget. But in the meantime, we actually have a legal document in the tri-party agreement that we have to live up to and we asked the people in the community, what does it take to live up to it? And their numbers are very, very different than what you and the White House are proposing. So I am just asking, how do we get on the same page here?

Secretary PERRY. Yeah.

Senator, you bring up a really interesting point, and by the way, I am not going to be Secretary of Energy for life. Let me, kind of, go on the record.

Senator CANTWELL. That was a softball. That was a softball.

I let—

Secretary PERRY. Here's what really concerns me is that we went back and the previous Administration, the best I can tell, didn't give you or this Committee or this Congress or, you know, the previous seven, eight years' worth of Congresses, the updated numbers on what Hanford was going to cost. We just got those for you, and those are stunning numbers. I mean, they are.

And so my point, Senator, is that and you've got every right to be really upset that you haven't been given the right numbers of what's this really going to cost.

Senator CANTWELL. I think the local community did. I am saying that the Administration is—

Secretary PERRY. But I'm telling you—

Senator CANTWELL. The Administration is now saying they don't believe that is what it takes to meet compliance. And so, unlike my colleagues, I am not exactly here with an emphatic voice. Why? Because I know the voice of experience. I have sat here with energy secretary after energy secretary, and I do know the outcome. I know the outcome. And I know that in the end we will prevail.

We have got to get on the same page because I guarantee you Hanford is never going to be done on the cheap, never. It is just not. And it is complex.

Secretary PERRY. You're absolutely correct.

Senator CANTWELL. And we have to get—

Okay, my time is expired, and I don't want to use everybody's time.

On the quantum issue, if you could just think about this. Obviously, the Chinese competition is so great. We, I think, authorized \$1.2 billion. Your budget has money for one center.

We were just out in Seattle with some of your team on a conference on this, and the one thing that struck me is that if you want to keep competitive—there are various aspects of quantum. There is the chemistry side. There is the algorithm side. There is the material side. I am just saying, I don't know if we can do our competitive aspect on quantum with just one Center of Excellence. I hope, as this Committee envisioned, we would have many Centers of Excellence, and that DOE would think about that and go back to what it is going to take for us to catch up on this issue.

Secretary PERRY. I think you're correct, Senator. And let's spend some time talking about it.

Senator CANTWELL. Thank you. Thank you. Thank you.

The CHAIRMAN. Thank you, Senator Cantwell.

I know that with the push that we have made here in the Committee on quantum and the priority that you are making it, I understand that there is more that is coming out for research on computing software out of the Department of Energy.

I don't know if you have any updates that you want to share on that, but know that that is something that we certainly support.

Secretary PERRY. Yeah, we were just at Argonne three weeks ago basically announcing the computer that will be named Aurora. And I think I mentioned to the Committee the speed of that is a billion billion acts per second and gets us, that's the first exascale computer in, I think, 2021. It comes on board in 2021.

So the U.S. has the number one fastest at Oak Ridge. Number two fastest out at Lawrence Livermore and when this computer comes on board, it will take that number one spot. So with all of that said, if we think for a moment that the Chinese are taking a pass here, we are very mistaken.

The CHAIRMAN. You are not—

Secretary PERRY. We'll need to be spending substantial amounts of money and watching our technology very closely as they try to collect it and use it to get back in the lead in quantum or get the lead exascale in route to quantum computing.

The CHAIRMAN. Well, Mr. Secretary, I know you have repeated, numerous times throughout the course of this morning's hearing, that you know how this budget process works, that we on the Committee have a very significant role in helping further define legislative priorities. Not only on this Committee, but in the other Committee which several of us serve on, on Appropriations for Energy and Water and helping to facilitate that. I do hope that you have heard very clearly some of the priorities that have been outlined here.

Secretary PERRY. Indeed.

The CHAIRMAN. Whether it is Senator Cantwell's effort on the cleanup at Hanford, something that she has repeated year after year after year, whether it is the need to ensure that ARPA-E continues to do its good work, the efforts within the Office of Energy Efficiency and Renewable Energy, there's good strong support here for that. Support for the national labs.

I have just introduced, along with many on this Committee, legislation that relates to nuclear and our advanced nuclear power. This is our NELEA bill. We are certainly hoping that within the Department we will have many of your fine team helping us as we seek to regain leadership, world, global leadership when it comes to nuclear technologies and really that nuclear workforce.

I mentioned in my opening the weatherization and the state programs again as priorities. Indian energy. Many have mentioned energy storage, the quantum initiative, the nuclear waste policy. So I think your folks and you have clearly heard where some of our priorities are in this area, and know that we will continue to work with you to help advance that.

Senator Manchin.

Senator MANCHIN. One quick question, and I know Senator King has one more too.

I just want to clarify, Mr. Secretary, the budget that we have in front of us is one that needs to be worked on, as you know, both Democrats and Republicans have concerns. You have been great to work with. Your office has been great to work with. We all acknowledge that. You will continue because right now the signal being sent from this budget—I think that Senator King will mention also and Chairman Murkowski has mentioned—that it gives them a lot of concern, consternation.

Whether it be the, you know, the low-hanging fruit of energy efficiency. That is a low-hanging fruit. I have had thousands of homes in West Virginia benefit, and 200 jobs are associated with it. They think that is going away. I want to make sure that we reassure them that this is a program and process in work, and you will con-

tinue administering what you have until you have a direction from Congress on how that spending will work out in your budget process. So there is no need for alarm right now. Should we send that signal that all is well and stable and we are on course?

Secretary PERRY. Sir, I would suggest that I hope we are sending the same signal that we sent a year ago.

Senator MANCHIN. Yes.

Secretary PERRY. That, you know, sometimes you support a particular line item with a lot more zeal than you do another one.

Senator MANCHIN. I got it.

Secretary PERRY. But—

The CHAIRMAN. That is very politically correct.

Secretary PERRY. —more importantly, we are going to be open to all the members as they lay out their concerns about the budget. And at the end of the process we will take your directions and with as efficient and as responsible way as we can, to deliver on that, obviously staying within the statutory requirements of the law.

The CHAIRMAN. We appreciate that.

Senator Hoeven, we are just wrapping up, but Senator King, you wanted to have a final comment and then we will let Senator Hoeven wrap.

Senator KING. Thank you, Madam Chair.

Just a quick suggestion on quantum. I sit on a couple of other committees dealing with national security. There are lots of people in the United States Government working on quantum, like the intelligence agencies and the Defense Department. I have a suggestion. You might convene a quantum council to be sure that there is a high level of coordination so we are not duplicating, because this is expensive and important work.

Secretary PERRY. Yes, absolutely.

Senator KING. So to the extent you can appoint yourself Quantum Tsar to bring together the—

Secretary PERRY. I appreciate your confidence. There may be somebody even substantially better to do that, but I'm pretty good about getting people together.

Senator KING. Well, you understand the point.

Secretary PERRY. Absolutely.

Senator KING. You can perform a convening function.

Secretary PERRY. Yup.

Senator KING. And I think it is important, because this is a major initiative of the United States Government—

Secretary PERRY. Yes, sir.

Senator KING. —that is taking place, I know, in three or four or five different places and probably others. I hope you can look into that.

Secretary PERRY. We have three national labs that focus on that now. But you are absolutely correct—

Senator KING. But there are other people, NNSA—

Secretary PERRY. NNSA, DoD, DARPA, all the other agencies of government out there that have—

Senator KING. Let's get them in the same room just occasionally, every quarter, perhaps, to talk about, okay, what are you doing? What are you doing? So that we are—

Secretary PERRY. Good idea, sir.

Senator KING. Thank you.

Secretary PERRY. We're on it.

Senator KING. Thank you, Madam Chair.

Secretary PERRY. Thank you.

The CHAIRMAN. Senator King, I think the quantum initiative legislation that we passed has some of what you are talking about. I don't think it designates a Quantum Tsar, though, so we will have to go back and take a look at that.

[Laughter.]

Senator Hoeven, we have had a good exchange with the Secretary here.

Senator HOEVEN. Thank you, Madam Chairman. I appreciate it.

Governor, good to see you.

Secretary PERRY. Hey, gov.

Senator HOEVEN. You are looking well.

Secretary PERRY. How's Mikey?

Senator HOEVEN. Doing good, doing good.

How is Anita?

Secretary PERRY. She's really good, thank you.

Senator HOEVEN. Yeah, yeah. Good to see you.

Thanks for all you are doing.

This time of year it starts to get pretty warm in the Virginia-DC area and it gets pretty hot down in Texas, but a nice cool place to go this time of year, where they just have great weather as well as fabulous people is my home State of North Dakota.

The CHAIRMAN. I thought this was another invitation to the Arctic. I just teed him up for that.

Senator HOEVEN. Exactly.

The CHAIRMAN. So——

Senator HOEVEN. See, I mean, we have a great Chairman, you know, who thinks the right way about things.

And so, on your way up to Alaska——

[Laughter.]

——you would want to stop in North Dakota and we had you out there and, of course, you did a great job, saw some of the things we are doing out there, but we didn't get you over to Grand Forks to the Energy Environmental Research Center.

Secretary PERRY. Yeah.

Senator HOEVEN. Which you need to see because they are doing amazing stuff, and it is something that is near and dear to what you worked on for a long time and that is carbon capture and sequestration.

And so, I have worked on the Approps side to make sure that we have research funding on this carbon capture and sequestration piece, both for fossil fuels but also on the renewable side. We have projects going on out there.

Project Tundra where, you know, we are capturing it off the coal-fired electric plants and we've got, like you down in Texas, we have the latest technology in the coal field and we both have lignite coal. But we actually have to start capturing and sequestering it, and commercial viability is the key which is why it is not just the company is putting up money, but the State of North Dakota is putting up money just like the State of Texas did and DOE. Then we also have ethanol plants that want to capture CO₂ and put it down a

hole as well so they can meet some of the low carbon requirements like on the West Coast and that kind of thing for renewable fuel.

The first question is, can we get you out there to take a look at this stuff and anything else you want in oil and gas? You know, we are up to 1.4 million—we are chasing Texas hard—we are up to 1.4 million barrels a day now.

Secretary PERRY. I talked to Governor Burgum yesterday—

Senator HOEVEN. I know he was here.

Secretary PERRY. —about some projects that we can talk about offline. But I mean just you guys have some amazing potential there and in an all-of-the-above energy strategy with taking the associated gas that's actually restricting some of your crude production now and finding a way to get that sent to the, you know, the most likely, the West Coast and then you put your CCUS into that field, you get the associated gas off, you get the secondary and tertiary push from the emissions off of that carbon capture. I mean, the energy production in North Dakota can be stunningly powerful for the United States.

Senator HOEVEN. Well, it is an economic win, it is an environmental win, and it is a national security win.

But we have to get to commercial viability for the carbon capture. Technologically we can do it, but we have to get these projects going.

And I want to commend you. You just announced your regional initiative to accelerate carbon capture at \$20 million for that project. That is something we put in Approps, and now you announced the criteria so that folks can come forth and start utilizing it.

Secretary PERRY. Yup.

Senator HOEVEN. And then the other one is the CarbonSAFE program, Regional Carbon Sequestration Partnership, RCSP.

So both Project Tundra, which is a group of the latest, greatest coal-fired electric plants, the State of North Dakota and University of North Dakota, EERC are working on that. So we are not coming to you and saying, hey, fund us. We are coming to you and saying, be our partner.

And then the same thing—we are a microcosm of what the country sees as a whole where we have to get traditional fossil fuel energy working with the renewable world together.

These programs are involved, both biofuel and ethanol, as well as the oil and gas.

It is the kind of thing where if we can get it done, it is an economic win, it is an environmental win, and it is a national security win. It is the same thing our country is doing on a macro level, you know, we are trying to crack that code. Same thing with hydraulic fracturing. When I started as Governor, we produced less than 100,000 barrels a day. Now it is 1.4 million because we cracked the code on hydraulic fracturing. Same thing in Texas, right?

But we need you out there. We need you, because we have been talking about carbon capture and storage but we are not doing it. We are not at commercial viability. When we get commercial viability, we will have cracked the code, not just for here, but you know, we will get China.

Secretary PERRY. Yup, around the world.

Senator HOEVEN. Exactly.

So we need you out there. We need you to help us with these. We need to help take that next step from the R&D to commercial viability. And you are the guy, I mean, this is right in your wheelhouse. So we need your help with it.

Secretary PERRY. You just mentioned two projects that we're working on that funded, one of them we're funding, the other one we've got a FOA out on it so—on the carbon storage assurance facility. So I think we're headed in the right direction.

Senator HOEVEN. Yes.

Secretary PERRY. And then more importantly, we'll follow your lead, sir.

Senator HOEVEN. And obviously, we have been working with our Chairman and others, then we have just got to find a way.

Whether you want traditional energy or renewable energy, we have got to have transportation. We have to have pipelines. We have to have transmission lines. We have to have LNG facilities. We have to build that stuff, and it is not just stronger or better environmentally, it is safer. We are taking, we are replacing old infrastructure with the latest, greatest, safest infrastructure. It is a safety issue too.

Secretary PERRY. And Madam Chair, I would be remiss if I didn't remind you that exactly what Senator Hoeven is talking about and getting a full contingent on FERC. And that, of course, will come through your Committee.

Thank you for all the work that you've done to get our members, but I don't think there's anything more important in light of what you talk about on infrastructure, than get a fully functioning Federal Energy Regulatory Commission and getting those permits done and letting Americans get to work and get this product to the world market.

Senator HOEVEN. So, you will come?

Secretary PERRY. Yes, sir.

Senator HOEVEN. Thank you.

Secretary PERRY. Yes, sir.

Senator HOEVEN. And thanks for all you are doing, your leadership.

Secretary PERRY. It's still the coolest job I've ever had, sir—

Senator HOEVEN. Well, you are the right guy to do it.

Secretary PERRY. —not the best one—

Senator HOEVEN. We appreciate it.

Secretary PERRY. —but the coolest.

[Laughter.]

Senator HOEVEN. I know what the best one was.

Secretary PERRY. Yeah, I know—

[Laughter.]

—same one you had.

The CHAIRMAN. Well, Secretary Perry, thank you.

Thank you for being here. Thank you for, as Senator Wyden would put it, your Perry candor, which is appreciated.

I understand that sometimes defending the budget at a time when everybody is looking to make sure that we are making necessary cuts and sometimes very, very hard cuts, that sometimes,

specific provisions are really hard to defend and yet, that is your job.

Secretary PERRY. Yes, ma'am.

The CHAIRMAN. You have been deft this morning, and I appreciate that.

Secretary PERRY. Thank you.

The CHAIRMAN. But I fully appreciate, again, your reminder to us that you know the drill around here and we look forward to working directly with you, directly with your team to help accomplish some of the goals and really significant initiatives where we feel that we can make a difference when it comes to this new energy reality that we have been blessed with here in this country.

So thank you——

Secretary PERRY. Thank you.

The CHAIRMAN. ——for your time and your leadership.

Secretary PERRY. Thank you, Madam Chair.

The CHAIRMAN. With that, we stand adjourned.

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

APPENDIX MATERIAL SUBMITTED

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QUESTIONS FROM RANKING MEMBER JOE MANCHIN III

- Q1. The nuclear fleet faces a number of challenges, some of which are technical. And the road to commercialization of the advanced materials and fuels that can be used for existing reactors must be expedited. The Department of Energy (DOE) and the National Laboratories play an important role in developing these advanced materials and fuels that can lower operating costs and ensure the safety of reactors throughout the duration of their operation. However, the proposed budget would delay the development of critical technologies that are needed right now. Significant cuts have been proposed to the Fuel Cycle R&D program, Nuclear Energy Enabling Technologies program, and to the facilities where the bulk of this work is performed.
- Q1a. This budget sends the wrong message to Congress and the country and lacks a sense of urgency. Please explain what your position is on the need to develop technologies to continue the operation of our nuclear fleet?
- A1a. The Department of Energy (DOE) is committed to enabling the development of technologies that support both the continued operation of our nuclear fleet and the deployment of new reactors in the United States (U.S.). The Office of Nuclear Energy's (NE) efforts focus on technology development to enable industry advancement and the FY 2020 Budget focuses funding on early-stage R&D where the federal role is strongest.

In 2018, the U.S. nuclear industry reached a milestone through the submittal of the first set of Subsequent License Renewal applications to the Nuclear Regulatory Commission to operate nuclear reactors for an additional 20 years. Recent research and development (R&D) investments at our National Laboratories have are focused on potential materials aging, degradation, and mitigation concerns. However, while the main materials concerns associated with the existing fleet are being addressed, the industry's economic challenges still need to be addressed through science and technology-based solutions. NE is helping to accomplish this by focusing its early-stage R&D investments on industry's highest priority needs and ensuring results are widely available to best enable growth and competition in the industry. In doing so, NE employs the unique capabilities of the National Laboratory complex and leverages private-public partnerships awarded

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competitively through an NE Industry Funding Opportunity Announcement (Industry FOA).

These competitively-selected, cost-shared projects develop the technologies needed to ensure the domestic nuclear fleet continues to provide safe, reliable, resilient, and economical power. Recently awarded projects include developing enhanced plant maintenance capabilities to reduce operations and maintenance costs, initiating three accident tolerant fuels awards that are expected to further enhance nuclear fuel reliability and safety, and producing replacement parts for the existing fleet's obsolete parts with a very short turn around. The NE Industry FOA allows industry-led teams, including participants from federal agencies, public and private laboratories, institutions of higher education, and other domestic entities, to further advance the state of the U.S. commercial nuclear capability.

Further, the NE Nuclear Energy Enabling Technologies (NEET) program continues to make strategic investments in research capabilities to develop innovative and crosscutting nuclear energy technologies to resolve nuclear technology development issues. Under the NEET Crosscutting Technology Development subprogram, NE will continue multi-year awards on Advanced Methods for Manufacturing to accelerate innovations that reduce the cost and schedule of construction by making fabrication of nuclear power plant components faster, more economical, and more reliable. Also, research in Advanced Sensors and Instrumentation will be initiated to address critical technology gaps for monitoring and controlling existing and advanced reactors and supporting fuel cycle development. In FY 2020, the Nuclear Energy Advanced Modeling and Simulation subprogram will conduct focused computational activities on the issues of highest impact to the existing fleet – accident tolerant fuels, radiation-induced materials damage, and two-phase flow modeling.

- Q2. I was disappointed to see a 24% decrease in funding requested for Fossil Energy R&D, and I'm concerned about the impact this will have on the R&D underway at NETL. While I'm glad to see there seems to be support for all of NETL's three locations, rather than another proposal for consolidation, a \$10 million cut to NETL's research and

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operations budget means projects in NETL's labs may be eliminated at a time when we need leadership on carbon capture technologies more than ever.

- Q2a. Can you explain how the proposed restructuring of the CCUS program would impact CCUS R&D?
- Q2b. Can you confirm that consolidation of NETL offices is no longer being considered?
- A2a. The proposed restructuring of the CCUS program provides greater flexibility for the CCUS R&D program by integrating all of the key elements of the CCUS value chain into one budget line. The proposed restructuring also ensures the CCUS program is operated in a consistent manner as other Coal R&D programs, such as the Advanced Energy Systems and Crosscutting Programs.
- A2b. Consolidation of NETL offices is not under consideration. Each NETL site has research competencies and capabilities that are brought to bear on its mission to discover, integrate, and mature technology solutions to enhance the Nation's energy foundation and protect the environment for future generations.
- Q3. The President's budget request once again eliminates the Weatherization Assistance Program. I understand that the Administration wants states to pick up the tab for this critical weatherization work.
- Have you consulted with states like West Virginia to determine their ability to replace this federal support?
- A3. The Administration's focus for the Office of Energy Efficiency and Renewable Energy is on early-stage applied research and development. DOE is focused on higher-risk activities that are more appropriately performed by the federal government, versus those that are more appropriately left to the private sector, states, and local governments. The Department has not consulted with West Virginia about alternative funding sources for the Weatherization Assistance Program. DOE works actively with states through technical assistance and state energy planning. DOE also understands congressional interest in these programs, and continues to manage them consistent with statute and execute appropriated funds in an expeditious manner.

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West Virginia (WV) has been allocated \$3,587,126 for WAP in fiscal year 2019 funds, which is set to be awarded by the July 1st start date of the WAP program year. As for the State Energy Program (SEP), WV was allocated \$533,540 in fiscal year 2019 funds, which is set to be awarded by the October 1st start date of their SEP program year.

- Q4. The Title XVII loan program was created by a Republican Congress, on a bipartisan vote, and signed into law by a Republican President. Over the years it has maintained bipartisan support. Its default rate is lower than most conventional banks, and it has actually made money for taxpayers. Most importantly, it has helped commercialize advanced energy technology solutions that have enabled the U.S. to lead the world in energy innovation. Last year, the Senate Committee on Energy and Natural Resources reported my bill that would have expanded the program (S. 1337). Most importantly, there are billions of dollars in unused loan authority that DOE could use to help build the next generation of energy infrastructure and promote public-private partnerships.

How can we utilize the Title XVII Loan Program more effectively, and continue its history of commercializing innovative energy technologies?

- A4. The Department's Loan Programs Office (LPO) continues to review applications submitted under currently open solicitations across the Title 17 Innovative Technology Loan Guarantee Program, Advanced Technology Vehicles Manufacturing Loan Program, and Tribal Energy Loan Guarantee Program. LPO will continue to work with applicants and conduct due diligence consistent with current law.
- Q5. The United States is far too dependent on other nations for our supply of rare earth elements (REEs). These elements are integral components used in consumer products we rely on and take for granted everyday such as cell phones, televisions, and medical equipment – not to mention equipment used by our service members on the front lines. These elements are increasingly the subject of national security concerns because we are entirely dependent on foreign countries, namely China for our supply of some rare earth elements. That wasn't always the case. It's time we took a hard look at how to redevelop a domestic industry for rare earth elements. West Virginia University (WVU) is doing a lot of great work on this very issue. Just last summer WVU researchers opened up a new facility to continue their research on advanced separation technologies of REEs from coal and coal byproducts. This is an important milestone towards developing a domestic market for rare earth elements, which was made possible partially through a grant from the NETL rare earth program. In FY 2019, we included an \$18 million increase for R&D into the extraction and recovery of rare earth elements and minerals from U.S. coal and coal byproducts.

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- Do you share the national security concerns associated with our foreign dependence for these elements?
- How would you address these concerns in the context of this budget, which would put constraints on this type of research?

A5a. The supply of critical minerals and the resiliency of the supply chains are essential to the economic security and national defense of the United States. The United States is heavily dependent on foreign sources of critical minerals and on foreign supply chains, resulting in a strategic vulnerability to both our economy and military. The United States imports most critical mineral commodities. Specifically, the U.S. is import-reliant (imports are greater than 50 percent of annual consumption) for 31 of the 35 minerals designated as critical by the Department of the Interior. The U.S. is dependent on foreign sources of critical minerals, of which 14 lack domestic production and 29 are more than 50% import-reliant. Others lack downstream domestic processing and manufacturing capabilities.

A5b. The program will continue under the current budget and we will continue to expand our knowledge and understanding of advanced separation technologies. New awards under future funding opportunities could be more limited, but currently funded research projects will continue.

Q6. The mission of the Office of Energy Efficiency and Renewable Energy is to create and sustain American leadership in the transition to a global clean energy economy. A cut of over 85%, which is proposed in the President's budget request, would be a major setback to this transition. Also concerning is the proposal to supplement the proposed request with another \$353 million from previous years that should have already been spent on research activities.

- Please list program by program prior year funds included in this \$353 million.
- Is \$353 million still unobligated, or has some of it been obligated since the budget was proposed?
- Why have these prior year funds not been spent according to Congressional direction?

A6. The offset of \$353 million was proposed as a combination of prior year balances from 2005 – 2018. The initial sources of the offset were offered as a snapshot in time as of

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December 2018. The amount of available balances and office distribution changes regularly as EERE continues to award our FOAs. EERE did not place any of the funds on reserve and continues to execute them in accordance with Congressional direction. Since December 2018, EERE obligated over \$140M of prior year funds and expects to obligate additional funds in the next few months as negotiations on FY18 awards are completed. For context, since 2015, EERE has carried forward between \$400 million and \$750 million in unobligated balances each year.

- Q7. Work on advanced nuclear reactors has had important bipartisan cooperation over the past few years. Last Congress, both the Nuclear Energy Innovation Capabilities Act and the Nuclear Energy Innovation and Modernization Act were enacted. There are a number of companies based here in the U.S. that want to bring these technologies to market because of the important role they can play in the global economy. High temperature nuclear is critical to enabling industrial processes that require temperatures above 300 degrees Celsius. If we wish to truly decarbonize the economy, we need to realize that non-electrical uses of energy are the world's largest segment of carbon emissions. The global economy will continue to produce plastics, fertilizers, petrochemicals, and other high energy products, which currently rely on carbon-intensive technologies. This is why I cosponsored the Nuclear Energy Leadership Act, introduced by Chairwoman Murkowski, because I believe in continuing U.S. leadership in this incredibly important technology and not ceding ground to China or Russia.
- Q7a. What are you doing to support advanced nuclear, and to ensure that the DOE is equipped with adequate resources to continue R&D for these advanced reactor designs?
- A7a. Enabling the development of advanced nuclear energy systems will preserve and expand America's largest domestic source of clean energy. DOE's work is aimed at ensuring long-term U.S. nuclear energy leadership. The Office of Nuclear Energy (NE) supports development of innovative next generation nuclear energy systems and provides the science and technology base, including supporting important R&D infrastructure like the Versatile Test Reactor, for United States (U.S.) innovators of advanced nuclear energy systems. NE investments are focused on early-stage research and development (R&D), while providing industry access to the National Laboratory infrastructure for testing. NE activities employ R&D to bridge

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technology gaps to help enable industry's deployment of advanced nuclear energy systems.

A key implementing strategy to achieve this goal is the NE Industry Funding Opportunity Announcement (Industry FOA), a multi-year funding opportunity to support innovative, nuclear reactor technologies that have high potential to improve the overall outlook for nuclear power in the U.S. Through the Industry FOA, the Department enters into cost-shared early-stage R&D projects that will enable foundational knowledge development for the industry and help revitalize and expand the U.S. nuclear sector. Collaboration with the robust capabilities of U.S. National Laboratories and universities is strongly encouraged to fully support these U.S. industry-driven concepts.

Appropriate U.S. Government investments will accelerate development of advanced reactor designs and technologies to enhance global competitiveness. Funding for the Industry FOA is provided through multiple existing NE programs currently conducting innovative R&D activities.

The FY 2020 Budget Request also supports competitively-awarded investments in U.S. university-led research via the Nuclear Energy University Program that allocates up to 20 percent of the NE research funding to university-led research projects that address the full range of the NE portfolio. Also, U.S. industry, universities, and National Laboratories will be provided significant support via competitively-awarded projects that provide access to the unique federal and partner research capabilities and assets maintained by the Nuclear Science User Facilities.

Materials research within the Advanced Reactor Technologies (ART) subprogram focuses on R&D priorities identified by industry that could provide wide benefits across many different advanced reactor concepts, which is particularly relevant to high-temperature nuclear applications. In FY 2020, the Department will continue graphite irradiation and analysis, as well as continue American Society of Mechanical Engineers

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(ASME) code qualification of a structural alloy for high temperature reactors. The ART subprogram also continues high-priority irradiation testing and examination of tristructural-isotropic (TRISO) fuels – a fuel form that has been identified by a number of advanced reactor developers as their preferred fuel choice.

- Q8. Chairman Murkowski and I have made clear our intention to pursue pragmatic solutions to climate change. Part of our conversation to date has focused on establishing the facts about climate change, its impacts, and the solutions to it. Every state now faces extreme weather events and other climate impacts, including flooding, hurricanes, fires, or melting sea ice. The DOE plays a role in climate science through its computing and research efforts. The 30% cut proposed for the Office of Science's Earth and climate research in Biological and Environmental Research (BER) concerns me. Earlier this year, I said in our first climate hearing that it's important we are all operating from the same set of facts, and we need the data and analytical tools that these programs provide us to get there.
- Given the need to understand risks and prevent them where possible, will you commit to supporting and strengthening climate science across the Department?
- A8. Yes. The FY 2020 President's Request supports climate science within the fiscal limits. I will commit to supporting and strengthening climate science across the Department as appropriated by Congress.
- Q9. In the context of climate change, Chairman Murkowski and I are focusing on pragmatic solutions, and I believe that innovation regarding all energy sources is critical to that end. The DOE and the National Laboratories have a critical role in innovation and – in fact – the technologies that have come out of DOE and the Labs have already contributed significantly to reducing GHG emissions. So, I have concerns regarding cuts to programs that have historically achieved great steps toward commercializing and deploying much-needed energy technology innovations.
- How do you plan to increase the Department's efforts in each of the applied energy offices, the Loan Programs Office, and ARPA-E to develop and commercialize the technologies needed to address climate change?
- A9. The Department of Energy is committed to fostering scientific endeavors, spurring discovery and innovation at our National Laboratories, and ensuring that America retains its preeminent place in scientific research and technological commercialization in an increasingly competitive world. The President's Fiscal Year (FY) 2020 Budget continues

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to focus the DOE's energy and science programs on early-stage research and development with a renewed focus on cutting-edge innovation and transitioning those breakthroughs to the private marketplace. This Budget Request is designed to connect the intellectual prowess of our scientists and engineers with the ingenuity and capital of our innovators and entrepreneurs.

- Q10. I want to congratulate you on helping to reassert America's global leadership in computing power. The United States' ability to out-compute China and other economic powers translates into our ability to out-compete them as well. Accessing and using these computing abilities will open new frontiers for clean energy, understanding the climate and other scientific endeavors, and enhancing our national security. It will also invite increased competition from other countries in every field and industry in which these resources are applied.
- With the goals for exascale computing and the new initiative on quantum computing, how does the Department plan to apply this research to solve pressing challenges, such as climate change, while maintaining a competitive advantage for the U.S.?
- A10. The Exascale Computing Project (ECP) component within the Department's Exascale Computing Initiative enables continued U.S. global strategic advantage in science and technology, which is the foundation of future revolutions in technology development, energy security, scientific discovery, and national security. ECP includes the development of applications, and is focused on significant mission-critical applications including the stewardship of today's nuclear weapons stockpile and the threat of potential adversaries defeating U.S. weapons, developing clean energy systems, improving our infrastructure resilience, designing new materials and manufacturing techniques, and designing smaller high-intensity accelerators for use in medicine and industry. These are just a few examples of Exascale applications under development. The ECP climate change application is focused on adapting to regional water cycle changes with development of accurate regional impact assessments in Earth systems to forecast water resources and severe weather with increased confidences and address food supply changes.

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The Advanced Scientific Computing Research (ASCR) program in the DOE Office of Science has established early research programs to advance basic research in quantum algorithms and quantum computer science. These programs, modeled on ASCR's successful Scientific Discovery through Advanced Computing activity, support interdisciplinary teams of quantum information science experts, applied mathematicians, and computer scientists to develop the methods and tools needed to connect the Department's mission to current and future quantum computing hardware.

- Q11. By the Department of Energy's own estimate, 1.5 million new energy jobs will need to be filled by 2030. And 200,000 of those workers will need STEM skills. It is critical that the Department of Energy take a leadership role in establishing training programs to close this skills gap, but we must ensure that any and all training programs target and recruit from groups that are often neglected, like women and veterans, as well as communities like those in West Virginia where the downturn in coal has left people struggling to make ends meet.
- What specific plans does DOE have to recruit, train and re-train our energy workforce, and how can the DOE help to encourage these jobs to come to communities that are being left behind?
- A11. The Department of Energy supports a broad range of programs focused on the education and training in science, technology, engineering, and mathematics (STEM) fields that are critical to advancing the DOE's mission in science and innovation, energy, and national security. These opportunities range from hands-on research and training opportunities in all of DOE's mission areas at the National Laboratories, to internships at DOE sites specifically targeting veterans and individuals from Minority Serving Institutions (MSIs). For example, the DOE Office of Science (SC) supports over 1,000 internships annually for undergraduates, including those from community colleges, for research and technical training opportunities at all 17 DOE National Laboratories in scientific and technical areas that span the DOE mission, not just the SC program areas. Of note, SC's Community College Internships Program, as well as its Visiting Faculty Program that includes student participants, have approximate MSI participation rates of 20% and 40%, respectively.

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Programs like DOE's Federal Energy Management Program offer STEM training opportunities targeted towards veterans. Likewise, programs such as the National Nuclear Security Administration's Minority Serving Institutions Partnership Program and the Office of Environmental Management's Minority Serving Institutions Partnership Program are supporting STEM training opportunities for students and faculty from MSIs through partnerships with DOE National Laboratories and other academic institutions and broaden participation in DOE mission work.

DOE was a partner agency in the development of the White House's 5-year Federal Strategic Plan, *Charting a Course for Success: America's Strategy for STEM Education*, which was released in December 2018. Significant objectives of this plan include building stronger public-private partnerships for work-based learning, the development of a skilled technical workforce in the U.S., and reaching underrepresented populations, including those from rural areas. The implementation of this new Federal Plan through the White House interagency Committee on STEM Education (CoSTEM) serves as an opportunity for Federal agencies to develop more effective mechanisms to partner with the private sector as well as academic and technical training institutions to address America's critical workforce training needs, including in an evolving energy sector. DOE is very much engaged in these efforts.

- Q12. With projections pointing towards fossil fuels being part of the global generation mix well into 2040, it is critical that the U.S. position itself to lead the world in developing the next generation of coal technologies that will lower carbon emissions. For that, the DOE is ground zero, and we'll need increased investment for this much needed R&D. Today there is only one Clean Coal Power Initiative project in operation – Petra Nova. I visited this plant recently and was encouraged by its successes but note that the plant is not using a U.S. capture system. I believe that the 45Q tax credit legislation that we enacted last year will be helpful in getting more of these important carbon capture projects up and running. But, I understand that China is constructing a number of similar facilities right now, with schedules and costs reported to be on target.
- This work is, by nature, speculative. But what plan is in place to ensure that federal dollars yield a positive return on the investment?
 - How do we ensure the U.S. maintains the ability to construct the large, complicated projects that we need?

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- A12a. DOE launched the Coal FIRST (Flexible, Innovative, Resilient, Small, and Transformative) program, which will work with the power industry to design critical components of a prototype next generation power plant that will place the U.S. in a leadership position. The new designs will be nimble and fast to respond. A related positive outcome of Coal FIRST is that it could help to reestablish the power generation industrial manufacturing base here in the United States. Unfortunately, too much of our previous industrial leadership in this area has migrated to Asia where the customer base is established. We feel the long needed change in that dynamic will occur, and American manufacturing jobs will grow.
- A12b. By investing in the development of key components that make up the next generation power plants and working with stakeholders, DOE is ensuring that the United States maintains the ability to construct future power plants. R&D investments by DOE help minimize the risk for new, more efficient designs and make it easier for them to be adopted for commercial use.
- Q13. The Advanced Manufacturing Office (AMO) leverages the expertise housed at our national labs – like NETL – to help support and expand the manufacturing sector. The AMO's Industrial Assessment Centers (IACs) are housed at 28 universities nationwide, and assist small businesses by performing energy assessments and supporting workforce training efforts. These types of partnerships between the federal government and the entities on the ground, who know what our communities need, are critical to bridging the employment gap, and ensuring that we bring our manufacturing industry in to the 21st century. I think expanding those partnerships with AMO would be beneficial to the work of this office.
- Q13a. How can we expand the scope and number of partnerships between the AMO and state-based entities?
- A13a. More than 80 percent of current IACs formally collaborate with their utilities in both the targeting and conduct of assessment activities. IACs also routinely engage and/or partner with state energy offices to raise awareness of energy efficiency incentive programs or with the state-based Manufacturing Extension Partnership centers on issues such as cybersecurity. AMO has tasked all of the existing IACs to develop formal Stakeholder

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Partnership and Engagement Plans, not only for utilities (who are the most common stakeholders) but also for state energy offices, utility stakeholder advisory groups, local governments, and other non-governmental organizations (such as local chapters of AEE, ASHRAE, NAM). Final plans are due in July 2019 and include: identification of stakeholder contacts; description of services provided/roles; schedules for structured stakeholder engagement; definition and description of opportunities for collaboration with each stakeholder and the benefits derived; development of a detailed action plan for each stakeholder; and documentation of progress and success stories.

Q13b. Under your proposed cut of 75% to this office, how would existing partnerships be affected?

A13b. Reflecting AMO's shift in focus to early-stage R&D, no funding is requested for the IACs in the FY 2020 budget request; however, \$6 million is requested for partnerships between National Laboratories, universities, and the private sector to develop information and energy management tools and technologies intended to validate research results and inform future research direction in energy productivity. The request also includes \$2 million for student-led research projects at National Laboratories in areas relevant to energy management for advanced manufacturing technologies.

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QUESTION FROM SENATOR RON WYDEN

- Q1. Secretary Perry, as we discussed at the hearing, the cleanup efforts at Hanford must have the Department's full attention. However, two recent actions by the Department give me great cause for concern. First, the Energy Department has proposed a 25 percent cut to Hanford's cleanup program at Richland, and a 12 percent cut to the Office of River Protection, which is responsible for 56 million gallons of radioactive waste. Second, the Energy Department proposed reclassifying high-level radioactive waste, which will undoubtedly have wide-ranging implications for Hanford cleanup, and potentially mean that less waste is treated and stabilized.

Please submit an explanation to the Committee within 10 days of how the budget cuts you are proposing, combined with the reclassification proposal for high-level waste, will allow the Department to achieve cleanup of Hanford, and to achieve the milestones of the Tri Party Agreement.

- A1. The Department is committed to providing the best return on taxpayer dollars. We are currently assessing opportunities to increase efficiencies, and will use Richland Operations Office and Office of River Protection funding to achieve the FY 2020 Tri-Party Agreement milestones.

The FY 2020 Budget Request positions the Department to continue to make significant progress at Hanford, including progress on the project to move cesium and strontium capsules from wet to dry storage, continued pump and treat activities to remediate contaminated groundwater, preparation for soil remediation under Building 324, and initiation of commissioning activities for the portions of the Waste Treatment and Immobilization Facility needed to support the Direct Feed of Low Activity Waste (DFLAW) approach.

No decisions on implementation of a revised interpretation of the definition of high-level radioactive waste (HLW) have been made and this risk-based interpretation does not impact the Department's ability to meet FY 2020 Tri-Party Agreement milestone obligations. The Department's comprehensive understanding and experience in the safe and technically sound disposal of many types of radioactive waste will inform the next steps regarding the interpretation of the statutory definition of HLW. As stated in the

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June 10, 2019, *Federal Register Notice* (84 FR 26835), DOE interprets the statutory definition of HLW as set forth in the Atomic Energy Act of 1954, as amended, and the Nuclear Waste Policy Act of 1982, as amended, such that some reprocessing wastes may be classified as not HLW (non-HLW) and may be disposed of in accordance with its radiological characteristics. This will allow for safe disposal of the waste based radiological characteristics at a disposal facility in compliance with the standards and requirements for that type of waste ensuring the protection of public health and the environment.

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QUESTIONS FROM SENATOR MARIA CANTWELL

Hanford Budget Cuts

- Q1. This year, you have proposed to cut the Hanford budget by \$416 million, from the \$2.4 billion Congress provided in Fiscal Year 2019. This budget would stall progress and would result in the Department missing Tri-Party Agreement milestones.

Secretary Perry, as you know, the Tri-Party agreement requires DOE to submit a budget request for an amount that includes the estimated funding levels required to achieve full compliance with the Agreement.

The Office of River Protection's FY 2020 compliance budget request was \$1.853 billion. The President's budget provided \$1.4 billion.

The Richland Operations Office's FY 2020 compliance budget request was \$1.398 billion. The President's budget provided \$718 million.

- Q1a. Do you support the Tri-Party Agreement?
- A1. The Department is legally committed to the Tri-Party Agreement.
- Q1b. Can you detail exactly how the Administration's budget cut would, in your words, be enough to comply with the Tri-Party Agreement when the two DOE Offices charged with cleanup have said they need more to be in compliance?
- A1b. The Department's FY 2020 Budget Request will enable continued achievement of important cleanup progress required by the Tri-Party Agreement. The request supports DOE's approach to beginning tank waste treatment at Hanford by the Amended Consent Decree deadline of 2023 through the Direct Feed Low Activity Waste (DFLAW) approach; allows DOE to initiate commissioning of those sections of the Waste Treatment and Immobilization Plant necessary to implement DFLAW to include the Low Activity Waste Facility, Analytical Laboratory, Effluent Management Facility, and the Balance of Facilities; and will enable DOE to maintain safe operations and site-wide services at the site, continue groundwater pump-and-treat operations, and continue waste site remediation in the River Corridor.
- Q1c. Will the \$416 million cut impact Hanford workers?

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- A1c. We will continue to maximize progress utilizing the existing trained Hanford Site workforce.
- Q1d. Can you guarantee the proposed budget cuts will not impact worker safety? If so, how?
- A1d. The Department places the highest priority on ensuring worker and public safety. The FY 2020 Budget maintains safe operations and supports important cleanup progress. Worker and public safety will always be the Department's highest priority.
- Q1e. Secretary Perry, will the Department need to extend or pass deadlines to complete milestones, like the legal deadlines the Department has extended and missed on the Plutonium Finishing Plant?
- A1e. The Department has 66 milestones due in FY 2020. For those few milestones that may be at risk, DOE will follow the provisions in its cleanup agreements for making notifications and working with federal and state regulators to make appropriate adjustments. Such discussions will include a joint evaluation of risk, alternative approaches, and appropriate trade-offs while maintaining worker and public safety.
- Q1f. Secretary Perry, can you guarantee the proposed budget cuts will not impact worker safety? How?
- A1f. The Department places the highest priority on ensuring worker and public safety. The FY 2020 Budget maintains safe operations and supports important cleanup progress. Worker and public safety will always be the Department's highest priority.
- Q1g. Secretary Perry, is the budget based on past progress or is it based on expected future progress within this fiscal year or future years? Can you explain how the Department can guarantee the completion of this future work?
- A1g. The Department's budget maintains a safe and secure posture at all sites, while continuing to meet our ultimate goal of getting cleanup done. We have realized significant accomplishments at Hanford during my tenure as Secretary, and this Administration is focused on crafting real solutions to the clean-up challenges present at Hanford. Our efforts to accomplish the cleanup tasks at Hanford include robust

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discussions with our workers, our regulators, and our stakeholders about alternative approaches to completing our work safely, on cost and schedule.

- Q1h. Secretary Perry, similar to what I have asked you many times, how can the Washington delegation, the Tri-Cities community and importantly, the Hanford workers, trust that you will honor the commitments you have made to the Hanford mission?
- A1h. The Department takes its regulatory commitments seriously and we are actively working to safely meet all of our Hanford cleanup commitments.

Renewable Energy Generation Costs

- Q2. Renewable electricity development and integration has grown rapidly over the last decade. In fact, according to the Energy Information Administration, renewable generation will surpass nuclear in 2020 and coal in 2025.

Over the past decade the cost of wind generation has declined 69 percent. Solar PV costs have declined by 88 percent. And new wind power purchase agreements continue to set new records for low-cost power, putting downward pressure on electricity markets nationwide.

That's why I'm so mystified by the Administration's proposals to radically cut and in many cases eliminate these incredibly successful programs that have contributed to hundreds of billions in economy activity and millions of new jobs.

- Q2a. Secretary Perry, should we be interpreting your proposal to slash the Energy Department's Office of Energy Efficiency and Renewable Energy budget by over two thirds, and lay off a quarter of the expert staff, as a sign you believe they have completed their mission and are no longer needed?
- A2a. The FY 2020 budget request focuses resources on early-stage R&D, where the Federal role is strongest, and reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies. Through investments in DOE labs, industry, and academia, EERE's technology offices will continue to lead the world in developing domestic, clean, reliable energy choices in power generation and energy efficiency, which strengthen the U.S. economy while increasing energy security. EERE will continue to conduct cutting-edge R&D to improve the affordability of clean energy technologies. At the same time, EERE is focusing

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resources on the emerging challenges of grid integration and energy storage. For example, the FY 2020 request includes funding for the Advanced Energy Storage Initiative, an integrated R&D effort across the applied energy offices to develop storage technologies that enhance flexibility of generation and consumption to support grid reliability.

- Q2b. Secretary Perry, do you agree that significant credit for these remarkable price declines are due to incredible work done at the Energy Department and our national labs in areas as varied as fundamental R&D, to technology development and testing, to pilot projects, to loan guarantees, to supporting innovative new business models? Please specify if you believe any of these efforts provided a relatively larger return on investment of taxpayer dollars than another.
- A2b. Research and Development (R&D) work conducted at the Energy Department and our National Laboratories has led to significant performance improvements of energy technologies. For example, one [study¹](https://www.energy.gov/sites/prod/files/2014/01/f7/solar_pv.pdf) has documented that over a period of three decades (1978-2008), DOE's R&D and technology development and testing for solar photovoltaic (PV) modules accelerated solar industry progress by an estimated 12 years. The solar PV production cost per watt would have been \$5.27 in 2008 rather than \$1.92 over that period. Continued R&D has led to additional declines in installed utility scale PV costs, which have decreased over 80% since 2009 from \$6/W to approximately \$1/W in 2017. EERE-supported R&D has also reduced the projected high-volume production cost of electric vehicle batteries to \$197/KWh as of September 2018, a 60 percent reduction from the 2012 baseline of \$485/kWh.

The Energy Department recognizes the need for an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies by fostering collaboration between National Labs, universities and companies, as well as our state and local partners, and the need for innovative funding models to accelerate and ease technology development and commercialization of cutting edge research and innovation.

¹ https://www.energy.gov/sites/prod/files/2014/01/f7/solar_pv.pdf

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In addition to streamlining and making flexible the various mechanisms available to the National Labs for collaboration with partners to mature R&D, the Energy Department administers several programs specifically targeting the transitioning of technologies from the Labs toward the finish line. Some examples of activities supported by DOE programs which foster moving innovative technologies toward commercialization include: the [Technology Commercialization Fund \(TCF\)](#), [Energy I-Corps](#), [Lab Partnering Service \(LPS\)](#), and [InnovationXLab Summits](#).

- Q2c. Secretary Perry, with the costs of renewables like wind and solar in most cases significantly cheaper than any other new generating source today --even gas fired generation costs at today's record low natural gas prices—why is the Administration so focused on technologies like nuclear and carbon sequestration that will cost consumers so much more?
- A2c. The Administration will continue to pursue a broad portfolio of energy technologies and promote American energy innovation in all forms, including renewables. America has been blessed with vast natural resources, including wind and solar, and supporting the technology to utilize them efficiently is the Department's role. I am committed to helping provide stable, reliable, affordable, diverse, and secure sources of American energy.
- Q2d. Secretary Perry, the CEO of NextEra --the largest U.S. electricity company in the world by market capitalization-- told investors recently that solar and wind plus storage will be cheaper than coal, oil, or nuclear. And that's true even with federal tax credits already winding down and expiring completely in the next year or two. Do you agree with his conclusions?
- A2d. Today, some solar, wind, and storage projects appear to be competitive with conventional generators in certain geographies, recognizing that they benefit from existing federal tax incentives. Recent solar plus storage project price announcements suggest that the price adder for storage has fallen to ~\$5/MWh, down from ~\$15/MWh just a year ago for a similarly configured solar plus storage project². A number of developers are regularly

² <https://emp.lbl.gov/utility-scale-solar>, <https://emp.lbl.gov/wind-technologies-market-report>

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offering it as a viable upgrade to standalone solar projects. While few examples of renewable plus storage systems have been deployed to date, this nominal cost adder would still make projects lacking storage competitive given recent signed contract prices.

Assuming that adding storage to a wind or solar project continues to add an additional \$5 to \$15/MWh onto the cost of a project, it is likely that in many geographic areas projects will be competitive with new coal, oil, or nuclear facilities after the tax credits expire³.

While batteries, wind, and solar technologies have all declined in cost in recent years, it is important to recognize that a solar or wind plus storage system provides a different set of services than a coal, oil, or nuclear generator, and comparing these technologies on cost alone does not capture the value of the services provided. For example, common lithium-ion battery systems provide 0.5 to 4 hours of storage, which can serve peak hours of the day, but cannot provide generation around-the-clock.

- Q2e. Secretary Perry, your predecessor Secretary Steven Chu recently said that the cost of electricity generation from renewable energy at the very best sites will reach 1.5 cents per kilowatt hour. Do you agree with his predictions, and how do you think at such a price level will impact the U.S. generation mix?
- A2e. The future is difficult to predict. Ten years ago, few people would have predicted that the U.S. would be the world's leading producer of oil and natural gas, or that wind, solar, and battery costs would fall as fast as they did. That said, the National Renewable Energy Laboratory annually evaluates the potential impact of a low-cost renewable scenario. A report published in 2018⁴ contains a low-cost renewables scenario where the very best resource sites for solar photovoltaics and land-based wind approach 1.5 cents per kilowatt hour by 2030.

³ https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

⁴ <https://www.nrel.gov/docs/fy19osti/71913.pdf>

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- Q3. The President is again proposing to sell off the Power Marketing Administrations' transmission assets, including Bonneville Power Administration's transmission. He is also proposing to end cost-based rates. According to the Northwest Power and Conservation Council, privatizing BPA will increase electricity rates as much as 40 percent. This will hurt Washington state businesses, families and our economy.

Secretary Perry, will you commit to me that the Department of Energy will not pursue the proposal to auction off PMA transmission lines, including those owned by Bonneville, or abandon cost-based rates?

- A3. Under current law, DOE is responsible for the supervision of the PMAs. DOE has no authority to sell or otherwise divest of PMA transmission assets. Similarly, under current law, the PMAs establish rates on a cost-based system. Any changes to those laws would require congressional authorization.

Grid Storage Technologies

- Q4. We are very excited about the potential for advancing grid storage in Washington state. Secretary Perry, what is your plan for advancing this technology as we move forward? Does your plan involve the expertise of our National Labs?
- A4. DOE sees tremendous opportunity to accelerate the development and validation of new grid storage solutions by utilizing the expertise of its National Laboratories. DOE identified a need to ensure new grid storage technologies are better able to enter the market with a demonstrated ability to provide reliable grid applications through early-stage research and development (R&D). To help accomplish this goal, DOE's Office of Electricity (OE) initiated the development of a National Laboratory-led Grid Storage Launchpad (GSL) to ensure the next generation of technologies developed in laboratories, universities, and small businesses can be cost competitive and have the necessary validation to compete with existing technology. National Laboratories, such as the Pacific Northwest National Laboratory (PNNL) in Washington State, have a history of developing and advancing grid storage technologies that will play a critical role in the ultimate success of GSL.

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The FY 2020 budget also proposes \$158 million for an Advanced Energy Storage Initiative (AESI) that aims to bring together energy storage and system flexibility R&D efforts across the Department. AESI will build an integrated DOE R&D strategy and establish aggressive, achievable, and measurable goals for cost-competitive energy storage technologies, services, and applications. The National Laboratories will play a critical role in this effort.

These plans build upon existing collaborations between DOE, DOE's National Laboratories, and Washington State on both battery and pumped storage hydropower (PSH) technologies. Support from the Washington State Department of Commerce's Clean Energy Fund (WA CEF) enabled the first commercial deployment of a new vanadium redox flow battery technology development by OE at PNNL. Data from the WA CEF-supported energy storage deployments in Pullman, Everett, and Glacier, Washington, have allowed OE to create higher fidelity analytical tools that better capture the optimal performance and value of field deployed storage systems.

EERE's Water Power Technologies Office (WPTO) has supported recent funding opportunities to reduce PSH costs in FY 2016, and to develop new PSH technology concepts and modeling capabilities in FY 2018. Ongoing work under the FY 2016 funding opportunity includes the Hydro Battery Pearl Hill Project located near Bridgeport, WA. This proposed concept would use a corrugated steel tank as the upper reservoir, and a flexible plastic membrane as the lower reservoir, creating a closed-loop PSH facility that could avoid some of the environmental impacts of open-loop PSH facilities. WPTO also competitively selected two proposed PSH sites to receive technical assistance from the National Laboratories, including PNNL, in performing techno-economic analysis of the value their projects could provide to the grid. One of these proposed projects is the Goldendale project located on the Oregon-Washington border. Building on these technical assistance efforts, the DOE National Laboratory team will develop a PSH valuation guidebook that can inform other PSH developers, regulators, and the broader community.

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- Q5. In 2017, American consumers spent a smaller share of their household budgets on electricity than ever before. I am concerned that Administration efforts to prop up on competitive coal and nuclear plants will raise electricity rates in some markets.

Secretary Perry, do you think recent retirements of uncompetitive coal and nuclear plants have helped reduce electricity prices in some U.S. markets?

Secretary Perry, in July 2018 the well-respected Brattle Group released an analysis that estimated the Trump administration's coal and nuclear support plan could cost between \$9.7 billion and \$17.2 billion annually. Do you agree with their conclusions? If not, please detail your specific objections to their findings.

Secretary Perry, are you or anyone in the Administration currently developing any sort of proposal that would effectively favor one generating fuel or technology over another?

- A5. Electricity prices are affected by multiple factors in any given market. Dispatch reliability is an important criterion for the overall energy mix for resiliency, along with cost and other considerations on which the energy mix should be based. The Department of Energy will continue to promote American energy in all forms, using all available fuels and technologies. America has been blessed with vast natural resources and the technology to utilize them. The Administration is committed to helping provide stable, reliable, resilient, affordable, and secure sources of American energy, and to support developing all forms of fuels and technologies through continued innovation.

Price on Carbon

- Q6. It seems hard to imagine that any nuclear or existing carbon capture and sequestration technologies will be cost competitive with existing fossil fuels, even with the huge tax incentives for new nuclear plants and carbon sequestration we approved last year. This is not to mention, declining wind and solar and possibly other renewables will be a fraction of the cost of new nuclear or CCS.
- Q6a. Secretary Perry, I know you are a big booster of these technologies so I'm interested in hearing about what you think it would take to diversify our nation's energy sources and bringing online technologies like CCS?

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- Q6b. Secretary Perry, how important is a price on carbon to getting these sort of new technologies to the marketplace?
- Q6c. Secretary Perry, how do you think the electricity marketplace would react to a policy mechanism like a predictable price on carbon versus more intangible policies like DOE R&D?
- A6a. Deployment of CCUS requires both market pull and technology push. Market pull through financial incentives such as the 45Q tax credit provide incentives for business and industry to invest in these technologies. Technology development efforts for CCUS, such as DOE's R&D programs, helps further drive down the cost of these technologies to make them increasingly affordable and reliable for commercial deployment.
- A6b. A level and open competitive market, where provided energy services are fairly and appropriately compensated, is essential to allow new technologies to realize their full potential. Our current energy markets are skewed by a variety of policy mechanisms, some with unintended consequences including energy security and reliability concerns. An appropriate role for government is to catalyze new technology deployment, not to subsidize favored technologies over long timeframes. A level and open competitive market will allow our country to balance energy security, economic growth, and environmental performance, including our carbon footprint. New solutions for baseload units, including the development of CCUS technologies, are essential to ensuring a competitive energy mix that meets all of these attributes and continues providing dispatchable electricity.
- A6c. The best way to achieve our Nation's energy security, economic growth, and environmental performance goals is to enable a fair and appropriately regulated competitive electricity market to make strategic investment decisions based on the best available technologies. Advanced energy technologies are essential to meet our combined goals, and DOE's role is to perform the appropriate R&D required to efficiently and effectively progress a broad portfolio of energy technologies, including advanced fossil fuel and CCS technologies.

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Climate Change Science

- Q7. On November 23, 2018, thirteen federal agencies, including the Department of Energy jointly issued the Congressionally- mandated quadrennial National Climate Report.

Secretary Perry, do you agree or disagree with the following conclusion from the National Climate Report:

“There are no credible alternative human or natural explanations supported by the observational evidence.”

Secretary Perry, do you agree or disagree with the following conclusion from the National Climate Report:

“Climate change is transforming where and how we live and presents growing challenges to human health and quality of life, the economy, and the natural systems that support us.”

Secretary Perry, do you agree or disagree with the following conclusion from the National Climate Report:

“Future impacts and risks from climate change are directly tied to decisions made in the present.”

Secretary Perry, do you have recommendations on legislation the Senate Energy and Natural Resources Committee should develop and enact that could help address the growing threat of climate change?

- A7. I believe the climate is changing, and it is both naturally occurring and also caused by manmade activity. The question is, how do we address it in a meaningful way that doesn't compromise economic growth, the affordability of energy, or American jobs.

When it comes to climate change, the Department of Energy is committed to making decisions based on sound science, while also taking into account economic impact. Through Department of Energy programs that are focused on research and development, energy efficiency, renewable energy, nuclear energy, and a variety of clean energy and clean vehicle technologies, we are working on real solutions to help address emissions and mitigate the manmade impact on climate change.

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QUESTION FROM SENATOR STEVE DAINES

- Q1. Last year President Trump signed legislation sponsored by Chairman Murkowski, myself and others on the committee, to promote Quantum Computing research. It is vital that the U.S. lead the world in quantum research and I hope that DOE prioritizes this in their budget. The bill also required the creation of Quantum Information Science Research Centers. Montana, and Bozeman in particular, is becoming a tech hub in the U.S. and is doing high-level quantum research. Can you update me on the Department's search and process for establishing these centers?
- A1. The FY 2020 President's Budget Request includes funds in the Advanced Scientific Computing Research (ASCR), Basic Energy Sciences (BES), and High Energy Physics (HEP) programs within the Department's Office of Science (SC) to establish and fully fund at least one Quantum Information Science (QIS) Research Center. Recognizing that broad scientific community involvement is critical to defining the QIS research centers, SC invited attendees at SC's first QIS Principal Investigators meeting in January 2019 to present their ideas for Centers. Using that information as input, ASCR, BES and HEP plan to release, in late Spring, a Notice of Intent (NOI) to release a Funding Opportunity Announcement (FOA) for QIS Research Centers, subject to availability of funds, coupled with a Request for Information (RFI) inviting interested parties to provide input on possible topic areas, organization, requirements, review criteria, and assessment process to be considered and incorporated in a forthcoming FOA. The FOA for the QIS Research Centers would be released in early FY 2020.

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QUESTIONS FROM SENATOR BILL CASSIDY

- Q1. Last Congress, I introduced a bill to create a commercial leasing program for unused SPR capacity in upcoming years as a result of congressionally mandated SPR drawdowns. The Department has provided an informal estimate of \$400-\$700M to prepare SPR sites for potential commercial leasing but will have a more formal estimate in its forthcoming Post-Sale Configuration Study.

When does the Department plan to finalize and publish this study?

- A1. The Department is drafting an SPR Post-Sale Configuration Study that will not only recommend a configuration for a much smaller SPR as a result of Congressionally mandated sales that continue through FY 2028, but also analyze the costs of making 3 of the 4 SPR storage sites available for commercial storage more specifically. The Department estimates this study will be available for review by OMB within the next few months.
- Q2. Recently, I introduced the Small Scale LNG Access Act of 2019, which would give the Caribbean and Central America greater access to American liquefied natural gas (LNG). This legislation mirrors rulemaking finalized by the Department last July. This bill benefits American workers, the American economy, American geopolitics, and lowers greenhouse gas emissions. In the past, colleagues raised concerns over the possible impact this legislation would have on domestic natural gas prices. According to the CIA World Factbook, the entire energy demand of all Caribbean nations combined is roughly 3% of that of the United States.
- Q2a. What has been the impact on the energy markets in the Caribbean and Central America since the Department finalized this rule?
- A2a. Since the implementation of DOE's final rule, small scale exporters have been entering the market. However, while the amount of U.S. LNG delivered to the Caribbean and Central America has been increasing, there has not yet been an impact to energy markets. Through January 2019, the U.S. has exported over 26 billion cubic feet of LNG to Central America and the Caribbean, including large scale exports to the Dominican Republic, Jamaica, and Panama, and small-scale shipments to Barbados and the Bahamas. Small scale shipments from the U.S. are also currently serving Puerto Rico.

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- Q2b. Given only small volume projects are eligible to benefit from the legislation and the relatively small Caribbean energy demand, what do you believe will be the impact of this legislation on domestic natural gas prices?
- A2b. Given the volume constraints of the small-scale rule, DOE does not anticipate these exports will have any practical impact on the U.S. supply or prices of natural gas. Even a small scale applicant applying for the maximum quantity permitted under the rule – 51.75 billion cubic feet per year, (Bcf/yr), – would be using less than two-tenths of one percent of the current U.S. production, which, according to the latest projections from the Energy Information Administration's Short-Term Energy Outlook, will be over 33,116 Bcf or 33.1 trillion cubic feet (Tcf) in 2019 and 33,587 Bcf or 33.6 Tcf in 2020.
- Q3. In September of 2017 the Office of Fossil Energy generated a report on Accelerating Breakthrough Innovation in Carbon Capture, Utilization, and Storage. The Capture panel focused on developing the in-depth understanding of the myriad of chemical and physical interactions that occur in the interfaces of gases, liquids and solids.
- Q3a. Clearly the Office of Fossil Energy is doing important work to understand the differences between emissions from coal and natural gas generations sources. What is DOE doing to prioritize natural gas CCUS research given the expanded use of natural gas for electricity generation?
- A3a. The CCUS research on carbon capture for coal-fired power plants is applicable to natural gas-fired systems. For example, they share many common goals such as reducing capital and operating costs and decreasing the energy penalty. For natural gas systems, some adjustments may be necessary to optimize the system for different flue gas conditions, such as higher oxygen content, lower carbon dioxide concentration (CO₂), and temperature differences when compared to coal-derived flue gas. The DOE program allows technology developers to test their capture materials and systems on natural gas as long as the results are also applicable to coal. In addition, the National Carbon Capture Center is installing a natural gas fired boiler that will allow technology developers the option to test on both coal and natural gas flue gases. Finally, all of the work conducted in the utilization and storage programs can be leveraged for any source of CO₂, including coal and natural gas power plants, industrial sources, and CO₂ captured from the atmosphere.

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QUESTION FROM SENATOR HEINRICH

- Q1. There are two pending applications at the NRC to site consolidated temporary storage facilities for commercial spent nuclear fuel. One would be in southeast New Mexico. I continue to be concerned that without an approved site for permanent geologic disposal, any proposed “temporary” storage facility could easily turn out to be *de facto* “permanent” storage.

Do you support the recommendation of the Blue Ribbon Commission to require state approval of any temporary consolidated storage facility for spent nuclear fuel and high-level waste?

- A1. I agree that there are numerous challenges in managing the storage and disposal of the nation’s spent nuclear fuel (SNF). The FY 2020 Budget provides for both repository licensing as well as the implementation of a robust Interim Storage activities. I believe that State and community involvement is an important element in managing the nation’s SNF.

- Q2. You are familiar with URENCO USA’s Nuclear Enrichment Facility in Eunice, New Mexico that has been operating since 2010, and currently meeting more than a third of the U.S. demand from utilities for enriched uranium. Though URENCO is the nation’s only NRC-licensed commercial uranium enrichment facility, you have stated that the US requires a separate taxpayer-supported domestic enrichment capacity for advanced reactors. In particular, you stated the Department of Defense might require a U.S.-origin enrichment technology option using U.S.-origin fuel for certain advanced micro-reactor applications at military facilities.

What is the specific statutory, regulatory or legal requirement that DoD or related entities use only U.S.-origin enrichment technology for general power production, and thus precludes DoD’s use of any uranium fuel enriched by URENCO at its facility in New Mexico?

- A2. DOE respectfully suggests that questions about Department of Defense authorities and requirements be directed to that department.
- Q3. Your prepared testimony describes NE’s HALEU Civil Nuclear Enrichment subprogram as a three-year cost-shared demonstration program. According to NE’s budget request, \$30.2 million was provided for FY19 and an additional \$40 million is requested for FY20. The Federal Government’s cumulative cost share contribution for this project is capped at \$115 million. By law, cost sharing for all demonstration projects shall be in accordance with sec. 988(c) of EPLA05, which

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directs the secretary to require not less than a 50% cost share from a non-federal source. Please provide the year-by-year levels of non-federal cost share funding from the private sector for the HALEU Civil Nuclear Enrichment demonstration program; if the non-federal cost share is below 50%, please provide a copy of the required secretarial determination and the basis for the reduction.

A3. The Department of Energy (DOE) signed a letter contract with American Centrifuge Operating, LLC, on May 31, 2019. However, this contract is not finalized and DOE is still participating in final contract negotiations related to final terms and conditions. We anticipate the contract will be finalized in the fall of 2019, and DOE will provide a copy of the contract to your office once it is completed. DOE is committed to requiring the contractor to provide the required 50% cost share for the HALEU Civil Nuclear Enrichment demonstration project.

Q4. I continue to be a strong supporter of efforts to improve technology transfer from the national security laboratories. I am pleased your budget request fully funds the Office of Technology Transitions. However, one of the barriers I continue to hear from Sandia and Los Alamos National Laboratories in New Mexico is the difficulty in providing required non-federal matching funds to support tech transfer.

What are your specific plans to create a more robust technology program at DOE's national laboratories?

A4. The Department of Energy ("DOE") is committed to spurring discovery and innovation at our National Laboratories ("National Labs"), and ensuring that America retains its preeminent place in scientific research and technological commercialization in an increasingly competitive world. DOE recognizes the need for an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies by fostering collaboration between National Labs, universities and companies, as well as our state and local partners, and the need for innovative funding models to accelerate and ease technology development and commercialization of cutting edge research and innovation.

Appointment of DOE's First Chief Commercialization Officer

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We have elevated DOE's technology transition mission by promoting the Director of OTT as our first Chief Commercialization Officer (CCO) in November 2018, to better coordinate and enhance efforts across the Department. The CCO works to get the best possible return on investment and impact for the American people from the groundbreaking technology developed in our National Labs and DOE Research and Development (R&D) programs. The CCO coordinates across the Department to review and improve DOE's ability to successfully transfer new energy technologies to the private sector, in alignment with P.L. 115-246, Section 106. The CCO is actively working to more proactively engage potential partners (both traditional and non-traditional), promote the current transition efforts, and address gaps in the policies and mechanisms aiding commercialization.

Commercialization Inventory

OTT has collected information from across the DOE complex on commercialization programs, initiatives, and activities. By analyzing these efforts across the Department and the National Labs, OTT plans to map out our efforts for communications with our stakeholders, extract trends in programming, and identify gaps and potential areas of opportunity. Our analysis of this inventory also supports DOE's leadership role in the National Science and Technology Council's subcommittee on Lab to Market (L2M) by developing and prioritizing cross-agency goals that: 1) improve the transition of federally funded innovations from the laboratory to the marketplace by reducing the administrative and regulatory burdens for technology transfer and increasing private sector investment in later stage R&D, and 2) develop and implement more effective partnering models and technology transfer mechanisms for Federal agencies.

DOE Technology Transfer Working Group

The DOE Technology Transfer Working Group ("TTWG"), overseen by the CCO per the Energy Policy Act of 2005, consists of representatives from the National Labs and DOE, coordinates technology transfer activities occurring at the National Labs and makes recommendations for improvements. The Chair of the TTWG rotates among the

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National Labs and is currently a representative from Sandia National Laboratory. Some recent accomplishments of the TTWG include the development of a Mentor Matchup Program and an Alternate Cooperative Research and Development ("CRADA") Clause Library.

- **TTWG Mentor Matchup Program** – The TTWG has launched this opportunity for early-stage and mid-career technology transfer professionals to establish one-on-one relationships with seasoned experts in licensing and sponsored research to promote professional development and expertise among the National Labs. Mentee participants are given dedicated access to a seasoned technology transfer professional mentor with relevant experience and technical networks. Mentors have the opportunity to share their expertise with the next generation of technology transfer professionals, thereby advancing the field of technology commercialization within the National Labs to promote the impact of DOE R&D investments.
- **Alternate CRADA Clauses Library** – The TTWG, in coordination with OTT, developed an Alternate CRADA Clauses Library to streamline the negotiation of CRADA terms and conditions not covered by DOE's Official CRADA Policy and Guidance. This library provides optional language proposed by various laboratories, submitted to and reviewed by the OTT, Field Patent Counsel, and HQ Office of the Assistant General Counsel for Technology Transfer and Intellectual Property. With local DOE Patent Counsel concurrence and Site Office approval, the optional language listed in the library may be useful in appropriate circumstances to streamline negotiations.

OTT Strategic Programs

The CCO also leads OTT in managing several programs that improve availability of and streamline access to the expertise, facilities and technologies of the National Labs:

- **The Energy I-Corps** program, modeled on the successful National Science Foundation's I-Corps program, trains National Lab researchers to assess the commercial viability of their technology through extensive engagement with private sector companies. Through the Energy I-Corps program, the DOE Office of

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Technology Transitions equips researchers and scientists across disciplines with skills and knowledge to engage industry; helps the National Labs attract, train, and retain talent; and accelerates the transfer of DOE technologies to the market.

- **The Lab Partnering Service (“LPS”)** serves as a single access point to the National Labs for investors, innovators, and institutions allowing advanced and user-friendly online search capabilities across numerous technology areas within the Department. By enabling more streamlined access to DOE expertise, information and capabilities, LPS catalyzes connections needed to combine technologies and form partnerships for collaboration with businesses and universities and allow maturing technologies to succeed. LPS can be accessed online: <https://www.labpartnering.org/>

InnovationXLab Summits

DOE also conducts outreach to the private sector to increase awareness of DOE’s technical expertise and portfolio of technologies and facilitates private sector collaboration and partnerships with the National Labs. With this goal in mind, DOE is leading a series of Summits called InnovationXLab. These Summits are designed to increase the engagement of the National Labs with the private sector on high-impact, and potentially transformative, innovations and technologies. At these Summits, we both highlight research from the National Laboratories that is approaching commercial application and, just as importantly, hear from industry about its current and emerging technical challenges, risk appetite, and investment criteria. Our first InnovationXLab Summit highlighted energy storage technology, and our second addressed grid modernization and cybersecurity. Our next InnovationXLab Summit will be held in May 2019 and will address advanced manufacturing.

Regulatory Reforms

In November 2018, DOE announced the approval of the Laboratory Agreement Processing Reform initiative, which is designed to streamline the ability of contractors at our National Labs to enter into certain lab partnering agreements within a DOE-approved portfolio of routine work. We anticipate that this will significantly reduce the processing

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time for agreements in the approved portfolio, enabling the National Labs to concentrate on more complex, potentially higher-impact transactions. DOE also announced a Liability Reform initiative, which provides more flexibility for the National Labs to address indemnity requirements. Indemnity requirements are a common barrier to engagement with the private sector, so we anticipate that this liability reform will increase the ability of potential partners to work with the National Labs by tailoring associated risk to specific circumstances.

Technology Commercialization Fund

The Technology Commercialization Fund (TCF), which is authorized in section 1001 of the Energy Policy Act of 2005, allows funding from the applied energy programs to be made available for mature promising energy technologies with the potential for high impact. It leverages funding from the Department's applied energy research and development budget for each fiscal year from the Office of Electricity, Office of Energy Efficiency and Renewable Energy, Office of Fossil Energy, Office of Nuclear Energy, and Office of Cybersecurity, Energy Security, and Emergency Response with matching funds from private sources, as required by statute, to achieve two goals. First, it is designed to increase the number of energy technologies developed at the National Labs that graduate to commercial development and achieve commercial impact. Second, the TCF enhances the Department's technology transitions system with a forward-looking and competitive approach to lab-industry partnerships.

OTT released a Request for Information ("RFI") in November 2018 to gain public input on how OTT might improve the TCF through changes to the program and its structure. Two recurring themes seen through the RFI submissions were recommendations for expanding participation to the TCF beyond the applied energy programs authorized by the Energy Policy Act of 2005, and to change the amount of required cost share. OTT is currently evaluating these recommendations.

- Q5a. Do you have any concern that the national laboratories will not continue to attract and retain the nation's best scientists?

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- A5a. The Department of Energy's National Laboratories are considered to be the premier and unmatched set of research facilities throughout the world and continue to attract top level scientist and engineers from across the globe. Access to these research capabilities, as well as the opportunity to work on compelling research challenges for the Nation, is a powerful draw to the DOE National Labs. Like any top-tiered organization, the National Laboratories compete for the best and brightest with other top-tiered universities and private entities. While all the National Laboratories are owned by the Federal Government, 16 of 17 are operated by non-Federal entities (e.g., universities, university-based LLCs, and private companies), which allows them additional flexibilities that can help when competing for these scientists and engineers. In addition, many of the National Laboratories have direct affiliations with top-tier universities, which helps with recruiting and retention by enabling the laboratories to offer potential employees the opportunity to be associated with both the laboratory and the university. Finally, the Department continues to update its policies and practices to enable the National Laboratories to offer comparable benefits to individuals coming from private and university sectors when competing for the top level scientists and engineers. These efforts are all geared toward enabling the National Laboratories to attract and retain the scientists and engineers needed to effectively carry out the Department's missions, and both DOE and laboratories are constantly looking for new ways to ensure we continue to do so.
- Q5b. Do you agree that the Lab-Directed Research and Development program, or LDRD, is a valuable tool for the labs to recruit and retain the talent the nation needs to address cutting-edge issues in technology and national security?
- A5b. Yes. LDRD is a vital tool for the laboratories in recruiting and retaining top-notch scientists and engineers to carry out the critically important national missions of the Department of Energy. LDRD provides the laboratory with the means to support a number of scientists and engineers to conduct cutting-edge research that is not currently funded by a Federal program, yet pushes the forefront of scientific discipline that is

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critical to the laboratory's strategic priorities or underpins the development of a future core capability for the lab. The research opportunities offered through LDRD support is extremely attractive to both potential new recruits and current laboratory scientists. It provides laboratory scientists the opportunity to pursue novel and creative ideas that are outside a current Federally-funded program but within the bounds of the LDRD program requirements for their laboratory. It also provides a clear benefit to the Federal Government by giving these talented scientists the opportunity to generate scientific breakthroughs that could lead to new directions of research and/or innovative new technologies that ultimately benefit the DOE mission or national priorities. The opportunity to pursue new, independent research ideas is especially important at the laboratories conducting national security programs for the Department, where recruiting talent is a greater challenge due to the restrictions to one's scientific professional activities that come along with performing classified work, for example publishing research in the peer reviewed literature. Conducting research under LDRD-supported projects gives these scientists an avenue to perform unclassified work and publish their results. At the national security laboratories over 50% of the post-doctoral hires into the LDRD program are converted to permanent staff.

- Q6. I note your budget request includes \$158 million for an Advanced Energy Storage Initiative within the Offices of Electricity and Renewable Energy. This funding is in addition to the JCESR Energy-Innovation Hub in the Office of Science. Energy storage is the key to increased energy security, reliability and resilience. What specifically are you proposing to accomplish in FY20 within this storage initiative?
- A6. The proposed Advanced Energy Storage Initiative (AESI) will provide an integrated research and development (R&D) strategy across DOE's Offices of Electricity, Energy Efficiency and Renewable Energy, Fossil Energy, and Nuclear Energy to drive improvements in bi-directional energy storage and other technologies that can increase the reliability and resilience of the U.S. electrical grid. AESI will provide a platform to coordinate R&D activities across these program offices and with energy storage efforts in the DOE Office of Science and Advanced Research Projects Agency – Energy to establish aggressive, achievable, and measurable goals for the development of cost-

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competitive energy storage technologies, services, and applications. The application-specific cost and performance metrics developed under ASEI will be utilized across DOE to target research objectives and enable accelerated development of new energy storage and technologies providing greater grid flexibility.

- Q6a. Will long-term energy storage of perhaps 100 hours be an emphasis of AESI?
- A6a. Energy storage technologies that can provide very long duration storage capacities (such as 100 hours or more) will be an important application class within the AESI portfolio.
- Q7. I was pleased last year to see ARPA-E initiate funding for R&D on long-term energy storage up to 100 hours. However, I believe your decision to eliminate funding again for ARPA-E in FY20 is incredibly myopic. Can you please explain to me your logic for eliminating ARPA-E in light of your supposed premise to fund only "early-stage" R&D in partnership with the private sector? Isn't that exactly what ARPA-E does?
- A7. The President's FY 2020 Proposed Budget focuses resources on early-stage R&D, where the federal role is strongest, for energy technologies best positioned to enable American energy independence and domestic job-growth in the near to mid-term. Through careful prioritization and ensuring that funding goes to the most promising research, the DOE will continue to be a world-leading science and technology enterprise that generates the innovations that fulfill our mission of ensuring the nation's security and prosperity. While the program may be eliminated in the budget, we are implementing its principles across the department.
- Q8. Your budget request for FY20 includes \$119 million for artificial intelligence, including \$71 million for the Office of Science and \$48 million for NNSA. Where do you see the near-term opportunities to apply AI and machine learning to Big Data in the nation's energy and national security sectors?
- A8. Artificial Intelligence/Machine learning (AI/ML) requires large data sets of known results for validation, benchmarking, and testing of the trained models. Much of the open, foundational AI/ML research, such as that funded by the Advanced Scientific Computing Research program in the Department's Office of Science, can be leveraged across the Department's missions.

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Given the large amount of data that exists in the Energy sector, there are several opportunities for using AI/ML techniques to build intelligent sensors and more realistic and predictive models.

- Machine learning models are currently used to predict flow, optimize hydraulic fracturing (“fracking”), and detect seepage from carbon sequestration and nuclear non-proliferation sites. Data mining coupled with AI/ML is used to predict reservoir behavior in key features such as pressure and saturation levels.
- Distributed sensing can be used for real-time feedback and improvement of operational capabilities in energy infrastructures (e.g., power grid).
- Big data and ML can be used to refine fundamental understanding of materials, equipment, and systems performance to yield more efficient R&D on extreme environment materials and novel system design, including design of small-scale modular reactors; for identifying materials and component fatigue; understanding and predicting fluid flows in power plant systems and the subsurface; and optimizing dynamic responses to market dynamics.
- AI/ML techniques can be used to automate the design process for complex designs like combustion engines or coal burners that can decrease the time to solution from many months to a few weeks. Data science, and AI/ML can provide insights for predicting performance, designing critical validation experiments, and discovering new catalysts. Chemical reactions important to the Energy sector are often made more performant with the aid of catalysts. Due to the enormous variety of compositions, structures, and experimental techniques, it’s difficult for humans to find relationships between the chemical composition of catalysts and the performance of the overall reaction.

Within the National Security sector, AI/ML can be used for learning material physics models for weapon simulation from experimental data; evaluating patterns and identifying anomalies in nuclear test data using heterogeneous data sets; assessing and predicting computer component failures from runtime data and system logs; addressing

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the dynamic load balancing problem to maximize efficiency on our supercomputers; and rethinking numerical algorithms to leverage machine learning hardware evolution.

- Q9. I am pleased to see the FY20 budget's new focus on Quantum Information Science. QIS is a field that both Sandia and Los Alamos National Laboratories have a great deal of expertise and experience with, and the DOE's Center for Integrated Nanotechnologies is in New Mexico. Do you see a continuing role for the NNSA labs to contribute to the Office of Science's efforts in quantum technologies?
- A9. Sandia and Los Alamos National Laboratories do have a great deal of quantum information science (QIS) expertise and experience that can benefit the Office of Science's (SC) QIS program. The Advanced Scientific Computing Research program in SC recognized that expertise when it selected Sandia to develop one of two quantum testbeds (QTS) to give researchers access to their unique set of capabilities. Sandia's testbed will function as small collaborative research facility that will host experimental quantum computing resources on site, provide external researchers with access to and support in using these resources, and sponsor community engagement activities. Research performed at the QTS laboratories will inform the design of next-generation devices, ensuring that tomorrow's quantum computers will be capable of running quantum algorithms in support of DOE's science and energy mission. Sandia's QTS will reside in the Center for Integrated Nanotechnologies (CINT), where CINT will play a critical role in the QTS by providing new materials and qubits for next generation devices. In addition, SC's Office of Basic Energy Sciences, through its support for CINT, awarded two research projects in FY 2018 to develop tools and capabilities to enable the next generation of quantum systems. At Sandia, researchers will develop a first-of-its-kind Quantum Sensed Nuclear Magnetic Resonance Discovery Platform™ which will be used for spectroscopy and measuring magnetic properties of quantum materials at a scale and resolution unavailable by other means. At Los Alamos, researchers are establishing ion and chemical defect implantation capabilities for precisely creating atomic defects in quantum materials to enable tailored properties.

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QUESTION FROM SENATOR ANGUS S. KING, JR.

- Q1. In your budget proposal for Fiscal Year 2020, you have highlighted a new Advanced Energy Storage Initiative. Could you supply greater details about this new effort, including what the goals are for the initiatives and how it will interact with the Department's existing efforts on energy storage?
- A1. The proposed Advanced Energy Storage Initiative (AESI) will provide an integrated research and development (R&D) strategy across the DOE Offices of Electricity, Energy Efficiency and Renewable Energy, Fossil Energy, and Nuclear Energy to drive improvements in bi-directional energy storage and other technologies that can increase the reliability and resilience of the U.S. electrical grid. AESI will provide a platform to coordinate R&D activities across these program offices and with energy storage efforts in the DOE Office of Science and Advanced Research Projects Agency – Energy to establish aggressive, achievable, and measurable goals for the development of cost-competitive energy storage technologies, services, and applications. The application-specific cost and performance metrics developed under AESI will be utilized across DOE to target research objectives and enable accelerated development of new energy storage and technologies providing greater grid flexibility.

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QUESTION FROM SENATOR CATHERINE CORTEZ MASTO

Q1. On March 21, 2019, the Defense Nuclear Facilities Safety Board sent you a report saying they are “concerned that the Department of Energy has not adequately addressed the seismic hazards for the Device Assembly Facility at the Nevada National Security Site,” and that “a seismically induced high explosive violent reaction could result in unmitigated dose consequences to the offsite public.” Predominately, the report states “DOE has not evaluated the impact of the increased seismic hazard on safety-related structures credited to protect public health and safety during a seismic event.” Have you taken these seismic hazard reports into consideration as you continue to push to open Yucca Mountain?

A1. Regarding the Device Assembly Facility (DAF), seismic hazard reports were considered in relation to Yucca Mountain. In 2007, seismic analyses were developed for the DAF and prepared by Geomatrix Consultants, Inc., the same consultants who earlier prepared the seismic hazard analyses specific to Yucca Mountain. The 2007 DAF assessment used data and interpretations from the Yucca Mountain probabilistic seismic hazard analysis (PSHA) as the starting point for its analysis, updating it with additional information specific to seismic sources in proximity to the DAF. Therefore, the seismic analysis used to support the Yucca Mountain licensing activities (LA) considered the seismic analyses that were appropriate for Yucca Mountain. DOE’s seismic analyses were reviewed in 2015 and affirmed by the Nuclear Regulatory Commission technical staff and documented in the Yucca Mountain Safety Evaluation Report.

DOE has studied this matter and remains confident that a repository can be safely constructed and operated at Yucca Mountain.

Q2. What analyses has the DOE recently used to justify your budget request that continues to push for Yucca Mountain to be the repository site and to move forward with the re-licensing process at Yucca?

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- A2. DOE's FY 2020 Budget supports the development and implementation of a robust interim storage program and the Nuclear Regulatory Commission licensing proceeding for the Yucca Mountain repository. The analyses performed support those activities.
- Q3. On March 28, 2019 when you appeared before the Senate Armed Services Committee, you acknowledged there is both a technical and political challenge to storing high-level waste, referring to the situation with Yucca Mountain. You mention that if Yucca is not going to be one the repository site, there is a site in far west Texas that has historically been open and supportive of waste coming into that part of the state. What conversations have you or others at DOE had on exploring other locations?
- A3. The Department has had no conversations about siting a repository in west Texas.
- Q4. On October 20, 2018, President Trump told a Reno news station regarding Yucca Mountain:
- "I think you should do things where people want them to happen. So I would be very inclined to be against it and we will be looking at it very seriously over the next few weeks. And I agree with the people of Nevada."*
- Q4a. Does President Trump no longer agree with the people of Nevada when he expressed his opposition to Yucca Mountain?
- A4a. The FY 2020 Budget supports the Nuclear Regulatory Commission licensing proceeding for the Yucca Mountain repository and the development and implementation of a robust interim storage program.
- Q4b. Did you talk to the President directly on this topic following these comments?
- A4b. The Department looks forward to working with Congress to implement the FY 2020 President's Budget.
- Q4c. What direction did the President give you following his comments expressing opposition to Yucca Mountain?
- A4c. The Department looks forward to working with Congress to implement the FY 2020 President's Budget.

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- Q4d. Knowing the President supports Nevadans when they've said they don't want a nuclear waste dump in their state, why was this request included in the President's budget?
- A4d. The FY 2020 Budget supports the Nuclear Regulatory Commission licensing proceeding for the Yucca Mountain repository and the development and implementation of a robust interim storage program, as have the FY 2019 and FY 2018 Budgets.
- Q5. You've previously stated that you believe national laboratories are "the crown jewels of the nation and I plan to support and advocate for their work." If that is the case, why does the DOE budget again propose cuts too many of the programs that should be sufficiently funded if you value the work that national labs do?
- A5. The Department of Energy's budget continues to focus the Department's energy and science programs on early-stage research and development at our national laboratories to advance scientific and energy research in an efficient and cost-effective manner, including supporting priority areas for the Administration, such as Artificial Intelligence and Quantum Information Science.

This year's Budget Request secures America's path to energy independence and continued historic economic growth by investing in and empowering reliable, affordable energy, advancing transformative scientific innovation, and enhancing U.S. national security. The request reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies by fostering collaboration between the National Laboratories, universities, and companies. Through careful prioritization and ensuring that funding goes to the most promising research, DOE will continue to be a world-leading science and technology enterprise that generates the innovations that fulfill our missions.

- Q6. The budget would again eliminate the *Advanced Research Projects Agency-Energy program*, which is popular in Congress and bridges that research gap where privately-funded research does not have the available capital to invest in extensive R&D, or have the capacity to invest in research that may not always lead to commercial revenue-making ventures. Is it not in the nation's current and future interest to make ground-level investment in this type of research?

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- A6. The President's FY 2020 Proposed Budget focuses resources on early-stage R&D, where the federal role is strongest, for energy technologies best positioned to enable American energy independence and domestic job-growth in the near to mid-term. Through careful prioritization and ensuring that funding goes to the most promising research, the DOE will continue to be a world-leading science and technology enterprise that generates the innovations that fulfill our mission of ensuring the nation's security and prosperity. While the program may be eliminated in the budget, we are implementing its principles across the department.
- Q6a. Given your previously stated support for ARPA-E, when will you be able to convince OMB to stop proposing to eliminate it in the budget?
- A6a. As the Secretary of Energy, I support the President's Budget.
- Q7. The budget again proposes to sell the transmission assets owned and operated by the Power Marketing Administrations, including those of the Western Area Power Administration, and also proposes to repeal WAPA's Transmission Infrastructure Program borrowing authority which is used to construct/fund projects within WAPA's service territory to facilitate deliver of power generated by renewable resources. Will you commit that the Department of Energy will not pursue the proposal to auction off PMA transmission infrastructure, including those operated by WAPA?
- A7. Under current law, DOE is responsible for the supervision of the PMAs. DOE has no authority to sell or otherwise divest of PMA transmission assets. Any such action would require congressional authorization.
- Q8. This budget request and previous requests has proposed to eliminate the Weatherization Assistance Program and the State Energy Program. For over 40 years, the weatherization program has helped make 29,000 Nevada residences more energy efficient and saved the average Nevada homeowner nearly \$300 a year on energy bills. Cuts to this programs hurts Nevadans and communities across the country.
- In addition, state-run energy programs have helped local communities save taxpayer dollars. Can you explain the rationale for why the Administration continues to propose the elimination of programs that specifically helps rural areas?
- Q8a. Coupled with a drastic reduction in funding for energy efficiency and renewable energy programs, how does DOE otherwise plan to take advantage of future technological opportunities in these spaces with a budget that doesn't invest in them?

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A8a. The President's Budget requests no funding for the Weatherization Assistance Program (WAP) and the State Energy Program (SEP) to reduce federal intervention in state-level energy policy and implementation. The Administration's focus for the Office of Energy Efficiency and Renewable Energy (EERE) is on early-stage applied research and development. DOE is focused on higher risk activities that are more appropriately performed by the federal government, versus those that are more appropriately left to the private sector, states, and local governments. DOE also understands congressional interest in these programs, and continues to manage them consistent with statute and execute appropriated funds in an expeditious manner.

Nevada (NV) has been allocated \$1,199,608 for WAP and \$457,790 for SEP in fiscal year 2019 funds to be awarded by the July 1st start date of the NV program year.

EERE invests in research and development (R&D) as part of the DOE broad portfolio approach to addressing our Nation's energy and environmental challenges. The FY 2020 budget request focuses DOE resources toward these early-stage R&D activities and reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies. It emphasizes energy technologies best positioned to support American energy independence and resilience in the near- to mid-term.

Q9. Senator McConnell publically stated last week that he believes climate change is real and is caused by humans. As you know, the vast majority of science tells us that rising global temperatures, driven in large part by the burning of fossil fuels contributes to the rise of global temperatures, fueling further changes to the climate. In April 2017, the National Academy of Sciences concluded unequivocally that climate change is shaping extreme weather all over the world. The U.S. has spent billions to repair communities devastated by extreme weather events. Mitigating the intensity of extreme weather events would save the U.S. billions in disaster relief spending. And we can mitigate such events by investing in renewable energy technologies that don't contribute to global climate change, but a budget that makes cuts in these areas does not contribute to needed mitigation efforts. How does this budget specifically reduce carbon pollution?

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- A9. Several Department of Energy early stage research and development investments support low or zero carbon emissions technologies. For example, nuclear energy provides 20 percent of the U.S. electricity baseload, and 60 percent of U.S. carbon-free generated electricity. The Fiscal Year (FY) 2020 Budget Request provides \$824 million for the Office of Nuclear Energy to continue innovating new and improved nuclear energy technologies. Furthermore, the Energy Efficiency and Renewable Energy budget provides \$696 million, including \$353 million in use of prior year balances, to maintain America's leadership in transformative science and emerging energy technologies in sustainable transportation, renewable power, and energy efficiency.

Additionally, a wealth of knowledge is generated by early-stage research and development programs at the Department. This enables U.S. industries, businesses, and entrepreneurs to develop and deploy innovative energy technologies and gives them the competitive edge needed to excel in the rapidly changing global energy economy.

