Statement

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Chairwoman Kaptur, Ranking Member Simpson and Members of the Subcommittee, it is my pleasure to appear before you today to discuss the President's Fiscal Year (FY) 2021 Congressional Budget Request for the Department of Energy's (DOE) Office of Fossil Energy (FE).

Madam Chairwoman, we are meeting at an exciting time in the history of American energy development, especially with regard to fossil energy development and abundance.

Fossil fuels continue to provide over 60 percent of U.S. electricity. At the same time, it is important to note that we saw U.S. energy-related carbon dioxide (CO_2) emissions decrease by 2.1 percent in 2019, and the U.S. Energy Information Administration (EIA) projects continued decreases through 2021.[1] According to the International Energy Agency (IEA), U.S. energy-related CO_2 emissions have declined by nearly 1 gigaton from their highest levels in 2000 – "the largest absolute decline by any country over that period."[2]

The era of energy abundance and environmental progress that we are witnessing is in large part a result of the shale revolution, which was unleashed, in part, by early DOE-supported research. The shale revolution has opened up a phenomenal expansion of domestic conventional and unconventional oil and gas development and production. And, it is changing the energy landscape in the U.S. and around the world.

The U.S. is now the world's top producer of both oil and gas. We are also now a net exporter of natural gas and we expect to become a net energy exporter this year.

[1] https://www.eia.gov/todayinenergy/detail.php?id=42515
[2] https://www.iea.org/articles/global-co2-emissions-in-2019

In the meantime, our natural gas exports are having a global reach. To date, DOE has authorized exports of nearly 45 billion cubic feet per day (Bcf/d) of natural gas as liquefied natural gas (LNG). So far, U.S. LNG cargos have landed in 38 countries on five continents.

Coal continues to play a critical role in ensuring the reliability and security of the Nation's electric grid. In fact, coal is the Nation's most abundant domestic energy resource, and is an important part of the domestic energy mix, providing about 24 percent of the Nation's electricity and over 38 percent globally.

We all recognize the challenges to coal as a power generation source. The development of advanced technologies is essential to strengthening coal's important place in the Nation's power generation mix.

In addition, our vast coal resources hold great potential as a source of rare earth elements (REE) and critical minerals (CM) that are vital to a broad range of industries and our national security.

Coal and coal by-products can also be developed to provide a rich source of other valuable commercial products, such as carbon-based infrastructure construction materials, nanomaterials, carbon fiber, battery/electrode materials, carbon materials for 3-D printing applications, and carbon additives for manufacturing composites.

Ultimately, by pursuing innovative technology solutions, we can open a new chapter for coal in the 21st century and maximize the benefits of the Nation's fossil energy resources.

FE's mission is to discover and develop advanced fossil energy technologies to ensure U.S. energy dominance, create American jobs, support a resilient infrastructure, maintain environmental stewardship, and enhance the Nation's economy. Our efforts are focused on ensuring the Nation's access to – and use of – safe, secure, reliable, and affordable fossil energy resources and strategic reserves.

To that end, our Office of Clean Coal and Carbon Management plans and executes Federal early-stage research and development (R&D) – led by the National Energy Technology Laboratory (NETL) – focused on advanced power generation; power plant efficiency; water management; and carbon capture, utilization, and storage (CCUS) technologies. Our R&D is also focused on expanding the value chain for coal, including the development of REEs, CMs, and other commercial products from coal and coal by-products.

Additionally, FE is focused on finding technological solutions for the prudent and sustainable development of our unconventional oil and gas domestic resources. FE has regulatory responsibilities under the Natural Gas Act to approve natural gas and LNG imports and exports. FE also manages the Nation's Strategic Petroleum Reserve (SPR), the Northeast Home Heating Oil Reserve (NEHHOR), and the Northeast Gasoline Supply Reserve (NGSR).

Fiscal Year 2021 Congressional Budget Request

The FY 2021 Congressional Budget Request seeks $930.7 million to fund the Office of Fossil Energy. The Budget Request is guided by FE's commitment to addressing the Nation's energy and environmental challenges. It focuses on early-stage R&D and reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies.

The FY 2021 request includes $730.6 million for the Fossil Energy Research and Development (FER&D) Program, covering R&D programs in Advanced Coal Energy Systems and Carbon Capture, Utilization and Storage; Natural Gas Technologies; and Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies, as well as funding for NETL.

The President's request also includes $200.1 million for the Office of Petroleum Reserves. This request comprises SPR and its related SPR Petroleum Account; the Naval Petroleum and Oil Shale Reserves; and the NEHHOR.

Beginning with the FER&D program, I would like to provide an overview of the President's FY 2021 budget request for FE.

FER&D

The FY 2021 Budget Request for FER&D focuses on early-stage R&D that will prepare innovative new technologies for the private sector to further develop, scale up, and deploy. The FER&D program encompasses advanced fossil energy systems, crosscutting fossil energy research, and CCUS technologies. It also includes R&D to ensure the prudent and sustainable development of domestic oil and gas resources, with a focus on natural gas technologies and unconventional resources. Finally, FER&D includes funding for NETL's research, operations, and infrastructure.

Following are highlights of the FY 2021 FER&D budget request by program area.

Office of Clean Coal and Carbon Management

The Office of Clean Coal and Carbon Management R&D program advances transformative science and innovative technologies which enable the reliable, efficient, affordable, and environmentally sound use of fossil fuels.

The program's early-stage research focuses on technology challenges that present a significant degree of scientific or technical uncertainty across a relatively long period, making it unlikely that industry will invest in significant R&D on its own. Industry typically focuses on near-term (2-4 year) investments in marginal improvements to operational performance, while FER&D early-stage R&D focuses on longer-range (5-15 year) transformational technologies, materials, and processes. Thus, this request maintains the most critical core capabilities and infrastructure at DOE National Laboratories related to advanced fossil energy technologies.

Our FY 2021 request of $546.15 million is focused on advancing clean coal technologies through early-stage R&D. Of this, $36 million is for NETL Coal R&D, which is a portion of the total funding in this request that is directed to support NETL. I would like to highlight some of our high-priority areas.

Developing Technologies to Underpin the Coal Plant of the Future. The coal plant of the future will be small (50 to 350 megawatts), highly efficient, flexible, reliable, and environmentally responsible to compete with other sources of power generation.

The Coal FIRST (Flexible, Innovative, Resilient, Small, and Transformative) initiative is our flagship program to develop a coal-fired power plant with zero or near-zero emissions that meets the demands of the 21st century U.S. electricity grid. In FY 2021, the request of $140 million (funded through the request for Power Generation Efficiency, $216.5 million) will focus on Phase II of this initiative.

Phase II includes R&D on critical component design and on advanced combustion and integrated design studies that will be applicable to different coal types and regions in the United States. This R&D will underpin coal-fired power plants that are capable of flexible operations to meet the needs of the grid; use innovative and cutting-edge components that improve efficiency and reduce emissions; provide resilient power to the American people; and are small compared to today's conventional utility-scale coal plants. They will transform how coal technologies are designed and manufactured.

In addition to their domestic benefits, we see an export opportunity for these technologies, especially for developing countries. They can use tomorrow's U.S. coal technology to improve their energy security and – in many cases – to expand energy access to people who live with limited access and even no access to electricity, thus enabling them to use indigenous fuels, including coal. At the same time, exporting these technologies to countries that import coal could expand the markets for U.S. coal and boost the U.S. economy.

Reducing the Cost of Carbon Capture. The FY 2021 request of $123 million for Carbon Capture, Utilization and Storage (CCUS) focuses on R&D for a new generation of clean, fossil fuel energy conversion systems capable of producing competitively priced electric power with a focus on improving efficiency, increasing plant availability, reducing cooling water requirements, and achieving ultra-low emissions.

A key aspect of this research is to enable affordable capture, including conversion techniques, for the utilization of CO_2, as well as safe and secure storage of captured CO_2. As such, the program's investments will develop innovative and cost-effective CCUS and emissions control technologies that make progress towards the program goals of reducing the cost of capture by 30 percent by 2030.

FY 2021 activities represent a focus on new capture technologies to enable novel Coal FIRST concepts and allow for the integration of advanced carbon capture technologies with these

systems, as well as with other CO_2-containing gas streams. Specifically, in FY 2021, the Budget provides $74 million to the Carbon Capture activity for early-stage pre- and post-combustion capture R&D on transformational gas separation technologies (at least 90 percent of the CO_2 at 95 percent purity). That research can significantly reduce the cost of CO_2 capture for coal and natural gas-fired power plants, industrial sources, and Direct Air Capture.

Creating New Market Opportunities for Coal. This request also advances efforts to create additional market opportunities for coal, including developing products from coal and CO_2 in two major areas: Advanced Coal Processing and Critical Minerals.

Domestic coal production in the U.S. has been on the decline, mainly due to coal being displaced by natural gas for electricity generation. R&D in the advanced coal processing subprogram will further efforts to identify and quantify the existing and projected markets for everyday and high value stream carbon products. It will research the potential markets for carbon products if production costs are reduced to make those products more competitive with other materials. This R&D will also estimate the volume of coal required if coal were used as feedstock to produce those carbon products, based on several penetration scenarios; and it will also identify the reasons why carbon products have been prevented from penetrating large markets.

The request of $50 million for Advanced Coal Processing is targeted at developing new technologies to create useable coal pitch for new products, including carbon fiber and nanomaterials, foams, composites, building materials, and 3-D printing materials, by integrating coal into the value chain of industries that typically do not use coal in their manufacturing processes. These new technologies and products can supplement traditional markets for U.S. coals.

The $32 million request for Critical Minerals focuses on the recovery of REEs and other critical minerals from coal, coal by-products and other valuable sources. It has the goal of improving the economics of recovery by evaluating coproduction of other valuable products, both critical and noncritical. The development of a domestic, economically competitive supply can help fuel our nation's economic growth; secure our energy independence by reducing our reliance on foreign REE sources; and increase our national security.

Office of Oil and Natural Gas

Just as DOE played a critical role in unleashing the shale revolution, FE's Office of Oil and Natural Gas is focused today on cutting-edge, early-stage research and technologies to enable the safe and environmentally sustainable development, distribution, and storage of the Nation's abundant domestic oil and natural gas resources.

FE issued five Funding Opportunity Announcements in 2019 and recently completed awards for 40 projects across their upstream and midstream research portfolios. Twenty-four projects

with a combined value of $88 million over four years were awarded in the Unconventional Fossil Energy program, including nine new field laboratories, each in a unique basin, and each with an industry and a non-profit research partner. Sixteen new projects were awarded in our midstream program, with a total value of $25 million over three years.

The Gas Hydrates subprogram continues to advance our knowledge of this potentially vast resource. For example, the drilling of a stratigraphic test well on the Alaska North Slope in early FY 2019 resulted in the gathering of pressurized cores and other samples to confirm the occurrence of gas hydrates within the Prudhoe Bay oil field. We are now using these samples to conduct lab-based research.

In addition to R&D, the Office of Oil and Natural Gas manages the LNG export authorization process. The U.S. is now in its fourth consecutive year as a net natural gas exporter, and LNG exports grew significantly in 2019, as three new large-scale terminals came online. We expect exports to continue to grow throughout 2020; the U.S. is now exporting two cargos of LNG every day, enough to support the daily combined natural gas needs of up to a half dozen European countries. We expect that those exports will increase to three cargos of LNG each day by the end of this year, putting the Nation well on its way to becoming the top global exporter of LNG.

The Department's efficient review of LNG export applications has helped promote this growth in U.S. LNG exports. In 2019, and through this year to date, DOE has granted 15 new long-term LNG export approvals, including two to the first applicants under the new small-scale rule. Current U.S. LNG export capacity is over 8 Bcf/d. By the end of this year, that capacity is expected to grow to over 10 Bcf/d.

The FY 2021 Oil and Natural Gas budget request is aimed at continued support of these important activities. The $32 million request is focused on three key areas: Unconventional Oil and Gas development, Natural Gas Infrastructure, and Gas Hydrates research.

Developing Unconventional Fossil Energy Technologies. The Unconventional Fossil Energy Technologies program focuses on basin-specific field research across 17 field sites. This work is then leveraged with lab-based research and high-computing and data-driven work to understand the subsurface and rock fractures.

The FY 2021 request of $17 million for the program will support field laboratory research across seventeen unique locations, each with an industry as well as a nonprofit or academic research partner. Field research will include shale geology and fracture dynamics, enhanced oil recovery, fluid flow and chemical interactions in rock formations, and improved subsurface characterization, visualization, and diagnostics, including the development of predictive models and simulations using high-performance computing.

Developing Natural Gas Technologies. The Natural Gas Technologies Program conducts early-stage R&D pertaining to the safe and sustainable production and transmission of domestic

natural gas, with a specific focus on materials and sensor technologies that will improve the efficiency and longevity of pipelines.

The program comprises two subprograms: Natural Gas Infrastructure Research and Development and Gas Hydrates. Given the importance of natural gas in our energy system, it is critical to ensure the safety and reliability of related infrastructure to protect energy access.

To that end, the new $13 million Natural Gas Infrastructure Research and Development subprogram will support early-stage R&D focused on innovative sensors, materials and systems that enable industry to detect and mitigate resource loss and improve the reliability and operational efficiency of natural gas transmission, distribution, and storage facilities.

Additionally, the subprogram will develop alternative technologies to reduce flaring and venting of natural gas during production and transportation through conversion of the natural gas to high-value, readily transportable products.

Advancing Our Understanding of Gas Hydrates. The Gas Hydrates subprogram conducts lab-based research on samples from the Alaska North Slope to further understand this vast potential resource. The subprogram aims to build on successful previous field work in Alaska by conducting experiments and analysis on the samples taken from the stratigraphic well test. This effort includes our continued collaboration with partners on a possible future long-term flow test on the Alaska North Slope to assess whether commercial production of hydrates would be viable.

National Energy Technology Laboratory

FE could not achieve its mission without the capabilities and expertise of the scientists and researchers at NETL who lead our FER&D projects. NETL is a premier applied energy laboratory; and it is the only one of DOE's 17 national laboratories focused primarily on fossil energy research. NETL's mission is to discover, integrate, and develop technology solutions to enhance the Nation's energy security and protect the environment for future generations.

To carry out this mission, NETL is focused on effective resource development, efficient energy conversion, and environmental sustainability. As the laboratory's primary customer, FE is committed to strengthening NETL's technical capabilities through investments in talent and infrastructure that advance safe, affordable, and environmentally sound technology innovations to increase efficiency, reduce emissions, and drive down energy costs.

For more than a century, NETL has leveraged its unique core competencies to deliver innovative technology solutions to America's energy challenges. Those core competencies are:

- Computational Science and Engineering: multi-scale computational approaches to develop and deliver energy technologies at a faster pace, lower cost, and with reduced risk;

- Energy Conversion Engineering: innovative energy systems for clean power, fuels and chemicals;
- Geological and Environmental Systems: information and assessments to improve resource recovery while reducing risks;
- Materials Engineering and Manufacturing: functional and structural materials solutions to enable advanced energy systems and technologies; and
- Systems Engineering and Analysis: a critical analytical asset driving R&D through assessments of technology, processes, and markets.

In addition to the $36 million that I mentioned earlier for NETL Coal R&D, the President's FY 2021 budget request for NETL is $117.5 million across three key areas: NETL Infrastructure, NETL Research & Operations, and NETL Program Direction, for a total of $153.5 million for NETL.

NETL Infrastructure funds the fixed costs of maintaining NETL's lab footprint in three locations: Morgantown, WV; Pittsburgh, PA; and Albany, OR. These sites include approximately 240 acres of land, including 111 buildings with over 1,100,000 square feet of space.

NETL Research and Operations funds NETL's science and technology development and commercialization functions, including technical program management and strategic scientific planning and partnerships. This program also supports the variable operating costs of NETL's research sites. NETL Program Direction funds NETL federal technical staff and contractors that provide acquisition, finance, legal, and communications support.

Strengthening NETL Infrastructure. NETL has a strong base of historically relevant and mission-critical core capabilities at its three research campuses. The FY 2021 request of $43.1 million ensures adequate facilities at each campus location. The request also provides funding for continuing a 3-year lease of Joule, NETL's high performance computer. Joule is a vital component for the majority of NETL's research. It is among the 25 fastest computers in the United States, enabling advanced modeling and simulations that reduce both the cost and time frame of the research cycle. The request also provides funding to maintain safe, reliable research laboratories and site-wide infrastructure at the three campuses, as well as physical and cybersecurity protection.

Supporting NETL Research & Operations. NETL maintains a portfolio of technology research projects that spans the full development spectrum—from concept discovery to commercial readiness. NETL has more than 900 research activities worth $6.6 billion in its extramural research portfolio. The requested $46 million for NETL Research & Operations provides funding for the Federal staff of technical project managers and engineers who oversee this portfolio of research projects, as well as for utilities, equipment, materials, and other variable costs of operating NETL's research sites.

Funding NETL Program Direction. NETL continues to focus on efficient, low-cost operations. The requested $28.4 million funds NETL federal technical staff and contractor staff that provide acquisition, finance, legal and communications support, as well as payments to the DOE Human Resources Shared Service Center.

Office of Petroleum Reserves

The mission of the Office of Petroleum Reserves (OPR) is to protect the United States economy from severe petroleum supply interruptions through the acquisition, storage, distribution, and management of emergency petroleum stocks.

The OPR manages the Strategic Petroleum Reserve (SPR), a stockpile of more than 600 million barrels of crude oil. In addition to protecting the United States from severe petroleum supply disruptions, the SPR enables the United States to carry out its treaty obligations under the International Energy Program (IEP) as implemented by the International Energy Agency.

The OPR also manages the Northeast Home Heating Oil Reserve (NEHHOR), a one million barrel stockpile of ultra-low sulfur distillate (diesel/heating oil), and the Northeast Gasoline Supply Reserve (NGSR), a one million barrel supply of gasoline. The OPR also has oversight for the environmental cleanup and remediation of the former Naval Petroleum Reserves No. 1 (NPR-1) field located near Bakersfield, CA.

The FY 2021 budget request for the OPR is $200.1 million, which funds three of five accounts – the SPR account (which does not include a request for funding for the NGSR this year), the SPR Petroleum Account, and the Naval Petroleum and Oil Shale Reserves (NPOSR) account. No funding is requested for the NEHHOR account or the Energy Security and Infrastructure Modernization (ESIM) account. FY 2020 was the final year in which Congress authorized crude oil sales to support the ESIM account.

Strategic Petroleum Reserve Account. The FY 2021 budget request for the SPR is $187.1 million, which ensures adequate funding to maintain operational storage and drawdown capability through comprehensive major maintenance, preventive maintenance, and security programs. In FY 2021, the SPR will continue funding of management activities related to field site building leases and Program Office policy, planning, and oversight.

The Department proposes to sell 15 million barrels of crude oil from the SPR to fund department priorities, including all known environmental remediation concerns at the NPR-1 site. Of the sale proceeds, $242 million would be combined with the $13 million requested in NPOSR appropriations to complete NPR-1 environmental remediation by FY 2025. The remainder of the sale proceeds would offset funding for other Departmental priorities in the President's Budget Request.

In FY 2021, DOE re-proposes the disestablishment of the NGSR, with expected revenue of approximately $69 million. NGSR is proposed for disestablishment because it is expensive

relative to the benefit, has never been used for its intended purpose, and is less than one day of average Northeast consumption.

SPR Petroleum Account. The SPR will continue its management of the SPR Petroleum Account, which funds all drawdown costs, including those associated with Congressionally-mandated SPR crude oil sales. In FY 2020, the enacted funding level for the SPR Petroleum Account was $10 million, and the SPR successfully completed a Congressionally-mandated crude oil sale providing $567 million in revenue to the United States Treasury. The FY 2021 request does not include funding for the SPR Petroleum Account. However, the program requests authorization to deposit $19 million in proceeds from the liquidation of the NGSR to fund the SPR Petroleum Account for FY 2021 and FY 2022. The remaining revenue of about $50 million from the sale of the NGSR would be deposited in the general fund of the Treasury.

Naval Petroleum and Oil Shale Reserves Account. The FY 2021 budget request is $13 million for environmental assessment, remediation, and management of the NPR-1 site, including a small amount ($2 million) for management and medical support for former employees. The NPOSR program continues to close out environmental restoration and remediation activities for 131 Areas of Concern (AOCs), as required by the 2008 agreement between DOE and California's Department of Toxic Substance Control. In FY 2020, NPOSR plans to remediate 57 sub-AOCs, which are each small parts of one single AOC. The program anticipates obligating $10.5 million to the NPOSR contract in March 2020. At the current average pace of annual appropriations of approximately $12 million per year, we estimate it will take an additional 48 years to complete all NPR-1 environmental remediation obligations.

As noted above, the Administration is submitting a General Provision to sell 15 million barrels of SPR that will raise an estimated $781 million. Of this amount, $242 million will go to the NPOSR account in addition to the $13 million requested in appropriations. Combined, the $255 million will be sufficient to remediate all known AOCs by the end of FY 2025. Besides reducing completion of the remediation from 48 to 5 years, it will also avoid appropriations through 2068 by $400 million, or $117 million in present value.

Northeast Home Heating Oil Reserve Account. This account funds contracts for storage of a 1 million barrel stockpile of ultra-low sulfur diesel for use as heating oil. The FY 2021 request does not include funding for the NEHHOR account as the Administration re-proposes disestablishing and selling this reserve, with an expected revenue of approximately $75 million. This revenue will be deposited in the U.S. Treasury. NEHHOR is proposed for disestablishment because it is expensive relative to the benefit, has never been used for its intended purpose, and is less than 2.5 days of average Northeast consumption.

Energy Security and Infrastructure Modernization (ESIM) Fund. Section 404 of the Bipartisan Budget Act of 2015 authorized creation of the ESIM Fund and the subsequent drawdown and sale of crude oil from the SPR over four fiscal years (FY 2017–FY 2020) to finance the modernization of SPR infrastructure. We anticipate using $1.42 billion in revenues raised

during this four-year period to finance this modernization (the Life Extension 2, or LE2, Project) through its planned completion in FY 2025. In FY 2020, the LE2 project is continuing with project design work and the procurement of long-lead time equipment. FY 2020 is the final year in which the Department is authorized to raise revenue for the ESIM Fund.

To date, revenue deposited ($971 million total) in the ESIM account is as follows:

- FY 2017: $323.2 million
- FY 2018: $347.8 million
- FY 2019: $300.0 million

The FY 2020 appropriation authorized the drawdown and sale of up to $450 million in crude oil from the SPR to fund the LE2 project. Provided that the SPR sells enough crude oil to ensure generation of the full authorized amount, the upcoming SPR Modernization crude oil sale, when added to the revenues received in the previous three SPR Modernization crude oil sales, will total approximately $1.42 billion in the ESIM fund. The FY 2021 budget request does not include a request for the ESIM fund, because there is no authorization to raise funds beyond FY 2020.

Conclusion

The Office of Fossil Energy is committed to ensuring the use of the Nation's abundant fossil energy resources and strategic reserves in a way that promotes U.S. energy security, sustains our robust economy, and maintains environmental stewardship. We believe President Trump's FY 2021 budget request will provide the appropriate resources to achieve these goals and maximize the benefits to American taxpayers.

Madam Chairwoman and members of the Subcommittee, this completes my prepared statement. I am happy to answer any questions you may have at this time.