

Testimony for the Record

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FOR A HEARING ON

Fiscal Year 2021 Budget Request

**BEFORE THE
UNITED STATES HOUSE
APPROPRIATIONS COMMITTEE
SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT**

**Tuesday, March 3, 2020
Washington, D.C.**

Introduction

The President's FY 2021 Budget Request provides \$719.6 million for the Office of Energy Efficiency and Renewable Energy (EERE) to maintain America's energy dominance through technologies that will make our energy more affordable, reliable, and secure. EERE is part of the Department of Energy's (DOE) broad portfolio approach to addressing our Nation's energy and environmental challenges, investing in research and development in three sectors: renewable power, transportation, and energy efficiency.

The FY 2021 budget request focuses EERE 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. It emphasizes energy technologies best positioned to enable American energy independence and domestic job-growth in the near-to-middle term.

Knowledge generated by EERE early-stage R&D enables American 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. Industry deployment of these technologies creates jobs, increases energy affordability, improves energy security, reduces environmental impact of energy-related activities, and offers Americans a broader range of energy choices.

The FY 2021 budget request prioritizes collaboration with federal and state agency partners, and better coordination across the Department of Energy and the National Labs and EERE offices and programs. Nearly half of EERE's requested budget in FY 2021 supports inter-programmatic, or "crosscutting," initiatives designed to drive efficiencies, maximize resources, and ensure the highest return on investment of tax payer dollars.

EERE Crosscuts

The majority of EERE's R&D budget is in crosscutting initiatives demonstrating the Department's commitment to increased collaboration and coordination of high-priority, integrated activities. Below are brief descriptions of these efforts.

- **Grid Modernization Initiative:** The Budget requests \$114.5 million across EERE in FY 2021 to develop new architectural concepts, tools, and technologies that will better measure, analyze, predict, protect, and control the grid of the future. Areas of focus include beyond LCOE (levelized cost of energy), electricity affordability, generation and hybrid systems, resilience modeling, cyber-physical security, advanced sensing, energy storage, and system flexibility.
- **Energy Storage Grand Challenge:** The Budget requests \$97 million across EERE in FY 2021 to support the Energy Storage Grand Challenge (ESGC), an integrated, comprehensive, DOE-wide strategy to accelerate the development, commercialization, and utilization of next-generation energy storage technologies. The ESGC will coordinate the Department's extensive resources and expertise to address technology development, commercialization, manufacturing, valuation, and workforce challenges. The vision for the ESGC is to create and sustain global leadership in energy storage utilization and exports, with a secure domestic manufacturing supply chain that is independent of foreign sources of critical materials, by 2030.
- **Critical Minerals Initiative:** The Budget requests \$52.6 million across EERE in FY 2021 for critical minerals-related activities. The request will elevate critical minerals activities across DOE

to an intradepartmental initiative. The FY 2021 Budget dissolves the current Critical Materials Institute previously funded by EERE, and replaces it with a broader, National Laboratory-led consortium modeled after the Grid Modernization Laboratory Consortium. This new consortium will develop and implement a multi-year plan encompassing all efforts across the Applied Energy Offices and the Office of Science to diversify supply of, develop substitutes for, and drive recycling, reuse, and more efficient use of critical minerals. EERE will increase activity at all levels of the supply chain through this initiative, including research on mining, concentration, separation, alloying, recycling, and reprocessing critical minerals as called for in EO 13817.

- **Plastics Innovation Challenge:** The Budget requests \$20.5 million across EERE in FY 2021 to accelerate innovations in energy-efficient plastics recycling technologies. EERE, led by the Bioenergy Technologies Office and the Advanced Manufacturing Office, will explore novel technologies and approaches to economically deconstruct existing plastics, increase opportunities for upcycling, and develop infinitely recyclable polymers. The purpose of the Plastics Innovation Challenge is to reduce the energy costs associated with the current lifecycle of plastics; develop new polymers that are recyclable-by-design; and develop biological and chemical methods to deconstruct plastic waste, including from rivers and oceans, into useful chemical feedstock streams. This includes emphasis on designing and manufacturing new technologies for both recyclability and reliability.
- **Water Security Grand Challenge:** The Budget requests \$20 million across EERE in FY 2021 to support the White House-initiated, DOE-led challenge to advance transformational technology and innovation to meet the global need for safe, secure, and affordable water. EERE will focus on desalination technologies, resource recovery from municipal wastewater, and small, modular energy-water systems in coordination with DOE's Offices of Fossil Energy and Nuclear Energy.
- **Energy Sector Cybersecurity:** The Budget requests \$13.6 million in FY 2021 to support early-stage R&D efforts, provide technical assistance, and develop best practices to identify and mitigate cyber risks to energy systems. This work complements the Department's Multiyear Plan for Energy Sector Cybersecurity.
- **Harsh Environment Materials Initiative:** The Budget requests \$6.5 million in FY 2021 for a coordinated effort with the Offices of Fossil Energy and Nuclear Energy to exploit synergies in materials and component manufacturing R&D for advanced thermoelectric power plants.

Sustainable Transportation

In FY 2021, \$160.9 million in funding supports early-stage research that can help industry develop and deploy a broad range of affordable, energy efficient, and clean forms of transportation.

With FY 2021 funding in the **Vehicle Technologies Office (VTO)**, EERE will advance combustion and fuels research to increase engine efficiency and improve passenger vehicle fuel economy. EERE will also explore new battery materials; improve high-power, fast-charging methods; develop innovative chemistries beyond current lithium-ion technology; and advance new cell technologies, with a focus on reducing or eliminating the need for critical materials such as cobalt. Additional funds will support modeling and simulations that help us understand how mobility technologies can improve mobility energy productivity, as well as new artificial-intelligence capabilities developed by the National Laboratories to increase transportation-system efficiency for passengers and freight. Research will

improve our ability to build lightweight, multi-material structures and creating new materials that can withstand extreme temperatures and pressures.

FY 2021 funding for the **Bioenergy Technologies Office (BETO)** supports R&D for transformative technologies that can support a growing bioeconomy. The program's early-stage R&D emphasizes advanced technologies that produce renewable gasoline, diesel, jet, and marine fuels, as well as co-produced bioproducts from biomass and waste streams. These can provide affordable, domestically sourced and produced fuels across the full range of transportation modes. In collaboration with VTO, BETO will explore the co-optimization of fuels and engines, evaluating the biofuels most likely to meet fuel-economy, emissions-reduction, and efficiency targets for advanced compression ignition engines.

Lastly, the **Hydrogen and Fuel Cell Technologies Office (FCTO)**, FY 2021 funding will continue to focus on the H2@Scale concept, which will enable affordable and reliable hydrogen generation, transport, storage, and utilization across sectors and expand fuel-cell applications beyond light-duty vehicles. FY 2021 funding will focus on reducing the cost and improving the durability of fuel cells for heavy-duty applications, as well as developing affordable and efficient technologies that support new hydrogen uses including as a storage medium to support the grid.

Renewable Power

The FY 2021 request of \$160 million supports R&D for technologies that improve the capacity of renewable resources to support an evolving grid through operations, controls, and storage capabilities. EERE will also work to develop technologies and tools needed for variable energy resources that contribute to a reliable and resilient electric grid.

Through the **Solar Energy Technologies Office (SETO)**, the FY 2021 request prioritizes the affordability, reliability, performance, and integration of solar technologies on the grid. In 2017, utility-scale photovoltaic (PV) solar achieved the DOE's 2020 goal of 6 cents/kWh three years ahead of schedule, which accounts for the recent growth in PV deployment. In response to this and projected future growth, SETO will continue to emphasize the integration of high penetrations of solar technologies onto the electric grid. The program will also continue its efforts to reduce the cost of solar electricity, including working to reduce the cost of domestic solar manufacturing. These objectives will strengthen American technological leadership in solar energy, diversify our electricity supply, enhance grid resilience and reliability, and catalyze domestic economic growth.

The **Wind Energy Technologies Office (WETO)** will utilize funds provided in the FY 2021 budget request to support early-stage R&D that improves the performance and reliability of next-generation wind plants for offshore, land-based, and distributed wind applications. Since 2008, WETO-led innovation has contributed to the 55% decline in the cost of land-based wind. Continuing R&D in FY 2021 will focus on controls, sensors, algorithms, materials, and manufacturing that decrease wind-energy costs and improve operational performance. For offshore wind, R&D will target U.S.-specific technology barriers, including advanced substructure technology, installation cost and risks, on-site operations and maintenance costs, and design-standards for the extreme marine conditions unique to U.S. waters. WETO will invest in R&D to enable modernization of the grid to ensure cost-effective, reliable, cyber-secure, and resilient operation of the power grid with increasing levels of wind energy from all wind technology applications. WETO will also address wind and radar challenges, develop technical solutions to reduce environmental compliance costs, and support the development of a robust domestic wind-energy workforce.

The FY 2021 request provides funding for the **Water Power Technologies Office (WPTO)** to continue to strengthen the body of scientific and engineering knowledge that enables industry to develop new technologies that increase the energy generation of American hydropower and marine hydrokinetic technologies (MHK). WPTO will focus on pumped-storage hydropower's contribution to grid reliability and resiliency and will competitively select industry-led projects to test and validate performance of at least one wave device at PacWave, the Nation's first accredited grid-connected MHK test facility in a high-energy site. The program will further the efforts of industry and our National Laboratories to develop standard, modular, hydropower components, as well as site designs for new opportunities at existing non-powered dams and hydropower plant upgrades and modernization. WPTO will continue to develop turbine design and evaluation tools that improve fish passage and turbine efficiency in order to reduce the time, cost, and uncertainty in hydropower licensing.

The FY 2021 request provides **Geothermal Technologies Office (GTO)** the ability to support early-stage R&D technologies, including two new, subsurface-enhancement and sustainability efforts. The request also continues implementation of the Frontier Observatory for Research in Geothermal Energy (FORGE) in Milford, Utah. FORGE is a field laboratory dedicated to the testing of enhanced geothermal systems (EGS) technologies and techniques, which represent the largest opportunity for geothermal power production in the U.S. The 2019 DOE *GeoVision* report estimates that a potential 60 gigawatts, or 8.5% of national electricity generation, can be online by 2050, mainly as a function of commercial EGS. GTO will also build on prior-year work on drilling technologies and endeavor to attract innovative technologies that can effectively separate critical materials from geothermal brines.

Energy Efficiency

The FY 2021 request of \$164 million will support early-stage R&D in energy efficiency. These efforts will focus on the use of energy in manufacturing, building-energy technologies, and technologies pertaining to critical materials.

Through FY 2021 funding, the **Advanced Manufacturing Office (AMO)** will develop technologies that expand the domestic supply of critical materials used in energy applications, substitutes for critical materials, and technologies that enable the reuse and recycling of critical materials. In FY 2021, AMO will work on manufacturing processes, information, and materials technologies essential to efficient and competitive domestic manufacturing. Funding is also requested for the development of innovative manufacturing processes for energy-storage systems. AMO will invest in manufacturing processes, advanced materials and the application of high performance computing to reduce the energy intensity of manufacturing and life cycle energy of manufactured goods. FY 2021 funding will also support early stage R&D at Oak Ridge National Laboratory (ORNL) with industrial partners related to additive manufacturing and carbon fiber materials.

The FY 2021 request will also strengthen the **Federal Energy Management Program's (FEMP)** ability to manage its critical missions and provide strategic energy-management assistance to federal agencies. FEMP supplies agencies with the information, tools, and technical assistance needed to meet and track energy-related requirements and goals. The FY 2021 request will provide a management framework to guide agencies through risk and consequence-informed resilience planning to address mission critical energy and water infrastructure and develop resilient, efficient, and secure solutions. Tools provide resilience and cybersecurity assessment as well as best practices. FEMP will foster interagency collaboration and accountability, and providing training and resources for workforce development.

Recognizing efforts through the annual Federal Energy and Water Management Awards to foster replicable methods.

Finally, FY 2021 funding will support the **Building Technologies Office (BTO)** in its efforts to develop smart, efficient, resilient, grid-interactive, affordable, and secure building systems. In support of the Energy Storage Grand Challenge, particular emphasis will be placed on building-system interaction. Additionally, BTO's early-stage R&D on cyber-secure advanced sensors and controls will enable the industry to develop and deploy "smart" buildings capable of interacting with the power grid securely, improving the efficiency, resilience, and affordability of their electric systems. Through the Better Buildings Initiative, BTO will accelerate the adoption of energy-efficient technologies and practices by establishing close relationships with key market leaders and encouraging private-sector investment in energy-efficient technologies.

Activities in FY 2021 for the **Weatherization and Intergovernmental Program (WIP)** will include completing work activities associated with existing financial and technical assistance awards and initiatives with states and local governments and stakeholder organizations, closing out awards and agreements as they come to the end of their periods of performance, and providing resources and institutional knowledge to state and local entities as practicable.

Conclusion

Today the U.S. is producing more affordable and cleaner energy from a wider range of resources than ever before. EERE's investments in FY 2021 will advance America's leadership in transformative science and emerging technologies in sustainable transportation, renewable power, and energy efficiency.

I look forward to working with you to provide American families and businesses with a wider range of energy and mobility options, and ensure that our Nation's energy continues to be affordable, reliable, and secure. Thank you for the opportunity to appear before the Subcommittee today to discuss the Office of Energy Efficiency and Renewable Energy. I look forward to your questions.