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U.S. Department of Energy
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Chairman Simpson, Ranking Member Kaptur, and Members of the Subcommittee, thank you for the opportunity to testify on the President's Fiscal Year 2017 Budget Request for the U.S. Department of Energy's (DOE's) science and energy programs. Before I begin I would like to thank you for your support in the FY 2016 Omnibus appropriations bill, which we are now implementing.

Our Nation stands at a critical point in the transition to a low-carbon economy. I believe we'll look back on this period as one of significant acceleration in innovation that will have made a clean energy future possible. In just the last seven years, the deployment of clean energy technologies has increased dramatically, in part due to cutting-edge investments made through partnerships between the government and private sector. In combination with increased global momentum to accelerate clean energy technology development, the Department's FY17 Budget Request aims to further accelerate this transition.

DOE's science and energy programs invest in all stages of innovation across a diverse portfolio of clean energy technologies. This work is fundamentally aimed at enhancing American economic competitiveness and securing America's long-term energy security in an environmentally prudent manner. The National Laboratories are key contributors to this work, providing the Nation with strategic scientific and technological capabilities. The applied energy programs harness these capabilities and this expertise while working with partners across government and industry to research, develop, demonstrate, and deploy innovative clean energy technologies.

The $12.9 billion Science and Energy Budget Request in FY 2017, $2.8 billion above the FY 2016 Enacted level, supports DOE's missions of enabling the transition to a clean energy future with low-cost, all-of-the-above energy technologies; supporting a secure, modern, and resilient energy infrastructure; and providing the backbone for discovery and innovation for America's future prosperity.

The Request takes the first step in fulfilling the U.S. Government's pledge to Mission Innovation, an unprecedented global initiative across 20 nations to double public clean energy research and development (R&D), in conjunction with commitments for private investments led by a coalition of 28 private investors from ten countries. The Request also continues to implement the President's Climate Action Plan through the development and deployment of clean energy technologies that reduce carbon pollution. Following COP-21, these investments will be a critical next step in enabling the transition to a low carbon energy future through innovation and cost reduction.

The FY 2017 Budget Request builds on the 2015 Quadrennial Technology Review, which provided a systems-based analytical foundation that informed the program proposals in the Request, and it continues to implement the President's Climate Action Plan through the development and deployment of clean energy technologies that reduce carbon pollution.

The FY 2017 Budget Request across the Department of Energy's discretionary applied energy portfolio is $5.1 billion. This funding will support important advances in fossil energy, renewable energy, energy efficiency, sustainable transportation, grid modernization, nuclear energy, Indian energy and technology transitions while increasing funding for new initiatives and priorities. In addition, $1.3 billion ($11.3 billion over ten years) will support game-changing investments in clean transportation infrastructure and technology as part of the Administration's 21st Century Clean Transportation Plan.

Highlights of the Energy FY 2017 Budget Request

ENERGY EFFICIENCY AND RENEWABLE ENERGY

The Office of Energy Efficiency and Renewable Energy (EERE) works with many of America's best innovators and businesses to research, develop, demonstrate, and support the deployment (RDD&D) of cutting-edge technologies and break down market barriers in sustainable transportation, renewable power, and energy efficiency, including advanced manufacturing. EERE implements a range of strategies aimed at reducing U.S. reliance on oil, increasing energy affordability, ensuring environmental responsibility, enhancing energy security, offering Americans a broader range of energy choices, and creating jobs.

The FY 2017 EERE Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development as part of Mission Innovation. The EERE Request of $2.898 billion includes $2.108 billion for the support of Mission Innovation, an increase of $702 million from the Mission Innovation Enacted FY 2016 level of $1.406 billion. These investments will drive innovation essential for economic growth, provide clean, affordable and reliable energy, and advance energy security. In addition, as part of the Administration's 21st Century Clean Transportation Plan, the FY 2017 Budget Request of $1.335 billion of mandatory funds, including $500 million for clean energy R&D, will support scale-up of clean transportation R&D through initiatives to accelerate cutting the cost of battery technology; advance the next generation of low carbon biofuels, particularly for intermodal freight and fleets; and establish a mobility systems integration facility to investigate systems level energy implications of vehicle connectivity and automation.

Sustainable Transportation

Vehicle Technologies

FY 2017 funding supports a number of aggressive vehicle technology goals: battery energy storage, electric drive research and development, and advanced power electronics initiatives in support of the EV Everywhere Grand Challenge that aims to reduce the combined battery and electric drive system costs of plug-in electric vehicles by up to 50 percent by 2022. Efforts

include improvements in lightweight materials and manufacturing processes through the Advanced Materials Crosscut. Work will continue on the Co-Optimization of Fuels and Engines effort, in coordination with the Bioenergy Technologies, to link R&D across fuels and engines early in the R&D cycle; and on SuperTruck II to achieve improved freight hauling efficiency goals. New in FY 2017, the Transportation as a System initiative will explore opportunities for energy efficiency at a system level, above the program's traditional vehicle-level focus. Major funding changes are the result of enhanced support for these activities, in particular, and for increased investment in next-generation lithium-ion technology and beyond lithium-ion R&D, which show great promise in meeting battery cost and performance goals.

Bioenergy Technologies
FY 2017 funding emphasizes development of innovative processes to convert cellulosic and algal- and other microbial-based feedstocks to bio-based gasoline, jet, and diesel fuels at a cost of $3.00 per gallon gasoline equivalent (gge), focusing on processes to develop "drop-in" hydrocarbon biofuels, from non-food sources. Efforts include a collaboration with the Vehicles Technologies, co-optimization of fuels and engines through the Co-Optimization of Fuels and Engines effort and the leveraging of recently developed synthetic biology tools to improve efficiencies in the conversion of biomass to fuels and related products. Major funding changes are the result of increased investment in algae and other microbes and in R&D to overcome technical barriers to the integrated production of fuels. Funding also fully supports competitively selected pilot or demonstration projects for advanced biofuels technologies through cost-shared partnerships.

Hydrogen and Fuel Cell Technologies
FY 2017 funding supports the goal to reduce the cost and increase the durability of transportation fuel cell systems, with a targeted cost of $40/kW and durability of 5,000 hours, equivalent to 150,000 miles, by 2020. In addition, the program is working to reduce the cost of hydrogen from renewable resources to less than $4.00/gge – dispensed and untaxed – by 2020. In FY 2017, Fuel Cell R&D will emphasize areas such as stack component R&D, systems, and balance of plant components. Hydrogen Fuel R&D will focus on technologies and materials that will reduce the cost to produce, compress, transport, and store hydrogen from renewable sources. Funding also provides resources to advance the development of quality control tools for the manufacturing of fuel cell components and systems.

Renewable Power

Solar Energy
FY 2017 funding supports the SunShot Initiative goal to make solar power cost-competitive without subsidies by 2020, equivalent to a cost of solar power of 6 cents/kWh. A major emphasis will support DOE's Grid Modernization crosscut through advanced power electronics solutions for distributed solar, coordinated demonstration projects targeting multiple grid attributes, improved accuracy and availability of solar forecasting technologies, and partnerships with utilities on future business and operational models to reduce "soft costs" of solar installation. SunShot will also support the Clean Energy Manufacturing Initiative by developing and demonstrating innovative manufacturing technologies to increase U.S. competitiveness. Efforts include developing the next generation of photovoltaic modules, integrating advanced

concentrating solar power components, and researching solar thermal-based desalination technologies in support of DOE's Energy-Water Nexus crosscut.

Wind Energy
FY 2017 funding supports offshore wind advanced demonstration projects, as well as complementary research and development through an offshore wind consortium targeting technology and deployment challenges to achieve a 16.7 cents/kWh cost target for offshore wind by 2020. Funding also supports innovative concepts for taller wind towers, turbines, and systems capable of accessing and using the stronger and more consistent winds at elevation. Additionally, leveraging DOE high-performance computing assets at the National Laboratories, funding will advance the Atmosphere to Electrons Initiative to optimize wind farms and will support world-class testing infrastructure capabilities critical for supporting U.S. wind energy innovation and cost of energy reductions. Funding supports DOE's Grid Modernization Initiative, and ongoing efforts to address the impacts of wind development on wildlife.

Water Power
FY 2017 funding continues the HydroNEXT initiative focusing on innovative, low-cost water diversion technologies to enable new stream reach hydropower, to progress to a cost target of 10.9 cents/kWh by 2020 from small, low-head new stream developments. FY 2017 funding also supports RD&D of marine and hydrokinetic technologies, including the procurement and construction phase of a grid-connected open-water test facility and development of concepts for revolutionary wave-energy converters.

Geothermal Technologies
FY 2017 funding supports full implementation of the Frontier Observatory for Research in Geothermal Energy (FORGE), including on-site research and development in enhanced geothermal technologies; and DOE's Subsurface Science, Technology and Engineering RD&D (Subsurface) crosscut to reduce the cost and risk of geothermal development. FY 2017 funding will expand temperature-gradient well drilling under the program's "Play Fairway Analysis," which assesses exploration risk and the probability of finding new geothermal resources on a regional scale, resulting in maps and studies that will reduce the industry's drilling and development risks, and will identify new prospective areas for geothermal exploration and development.

Energy Efficiency

Advanced Manufacturing
FY 2017 funding enables the RD&D of industrial efficiency and crosscutting clean energy manufacturing technologies; and supports the deployment of one additional Clean Energy Manufacturing Innovation Institute, with continued support of five existing institutes, as part of the larger interagency National Network of Manufacturing Innovation. Funding initiates an Energy Innovation Hub to develop integrated technological system solutions and enable technologies for de-energizing, de-carbonizing, and reducing the cost of desalination, and supports the second and final phase of the Critical Materials Hub. Funding also supports Industrial Assessment Centers and the Presidential Better Building's initiative to help American

commercial and industrial buildings become at least 20 percent more energy efficient over the next 10 years.

Federal Energy Management Program
FY 2017 funding supports major Administration initiatives to assist all Federal agencies in meeting aggressive energy, water, greenhouse gas and other sustainability goals to achieve deep energy savings. Additionally, FY 2017 funding initiates one new voluntary leadership challenge to reduce energy use in energy-intensive federal facilities, and increases focus on energy management at large Federal campuses.

Building Technologies
FY 2017 funding supports an increased emphasis on emerging technologies R&D in areas such as lighting, heating and cooling and building envelope, that are needed to support the long-term reduction of the Nation's building energy use by 50 percent; supports the equipment and appliance standards programs to establish minimum energy efficiency requirements pursuant to Federal statutes; and supports building-to-grid integration activities focused on improving the efficiency and resiliency of the electric grid, including connected buildings and building systems. FY 2017 funding establishes an integrated Low- Global Warming Potential (Low-GWP) Advanced Cooling (HVAC) R&D program to address near-term and long-term needs to reduce climate impacts of HVAC and refrigeration technologies; and initiates a Metropolitan Systems effort to develop tools for cities to become low carbon, affordable, livable, economically viable, and more resilient to extreme events.

Weatherization and Intergovernmental Program
FY 2017 funding supports the Weatherization Assistance Program, which provides access to home weatherization services for low-income households across the country, including approximately 35,700 homes in FY 2017. The State Energy Program will continue to disseminate best practices to help government facilities and operations reduce annual energy use by 2 percent by 2020. In FY 2017 DOE will also support a Cities, Counties and Communities Energy Program that will provide technical assistance and competitively-awarded funds to help catalyze more extensive clean energy solutions in community development and revitalization efforts.

Crosscutting Innovation Initiatives

In order to enable the required acceleration of clean energy innovation and commercialization in the U.S., EERE is establishing a new Crosscutting Innovation Initiatives program in FY 2017. This program will strengthen regional clean energy innovation ecosystems, accelerate next-generation clean energy technology pathways, and encourage clean energy innovation and commercialization collaborations between our National Laboratories and American entrepreneurs. First, the program will support Regional Energy Innovation Partnerships, a new competition to establish regionally-focused clean energy innovation partnerships around the country. These regionally focused and directed partnerships will support regionally relevant technology neutral clean energy RD&D needs and opportunities to support accelerated clean energy technology commercialization, economic development, and manufacturing. Second, through a Next-Generation Innovation funding opportunity, the program will accelerate next-

generation clean energy technology pathways. This funding opportunity will be open to off-roadmap RD&D projects with the greatest potential to change the trajectory of EERE core program technology pathways. Third, a new Small Business Partnerships program will competitively provide technology RD&D resources to small businesses through the DOE's National Labs to support their efforts to commercialize promising new clean energy technologies. Fourth, Energy Technology Innovation Accelerators will leverage the technical assets and facilities of the National Laboratories to enable American entrepreneurs to conduct RD&D that leads to the creation of new clean energy businesses.

ELECTRICITY DELIVERY AND ENERGY RELIABILITY

The Office of Electricity Delivery and Energy Reliability (OE) leads the Department's efforts to strengthen, transform, and improve electricity delivery infrastructure so that consumers have access to reliable, secure, and clean sources of energy. To accomplish this critical mission, OE works with private industry and Federal, state, local, and tribal governments on a variety of initiatives to modernize the electric grid. Grid modernization is critical to achieving public policy objectives, sustaining economic growth, supporting environmental stewardship, and mitigating risks to secure the Nation. The goal for the future grid is to enable U.S. economic prosperity and energy innovation in a global clean energy economy, delivering reliable, affordable, and clean electricity to consumers where, when, and how they want it.

OE programs work in partnership with industry and other stakeholders as well as other DOE offices, to enhance key characteristics of the U.S. electric transmission and distribution systems:

- Reliability—consistent and dependable delivery of high quality power.
- Flexibility—the ability to accommodate changing supply and demand patterns and new technologies.
- Efficiency—low losses in electricity delivery and more optimal use of system assets.
- Resiliency—the ability to withstand and quickly recover from disruptions and maintain critical function.
- Affordability—more optimal deployment of assets to meet system needs and minimize costs.
- Security—the ability to protect system assets and critical functions from all hazards.

Within the appropriation, OE funds:

- Research, Development, and Deployment—pursuing technologies to improve grid reliability, efficiency, flexibility, functionality, and security; and making investments and sponsoring demonstrations aimed at bringing new and innovative technologies to maturity and helping them transition to market.
- Modeling and Analytics—developing core analytic, assessment, and engineering capabilities that can evolve as the technology and policy needs mature to support decision making within the Department and for stakeholders.
- Institutional Support and Technical Assistance—building capacity in the industry and convening stakeholders to coordinate efforts to transform the electric grid; providing technical assistance to states and regions in their efforts to improve policies, utility incentives, state laws, and programs that facilitate the modernization of the electric infrastructure.

- Coordination of Federal Transmission Permits—coordinating permits, special use authorizations, and other approvals required under Federal law to site electric transmission facilities.
- Emergency Preparedness and Response—support preparedness efforts through our partnerships and support for innovation, and working with public and private partners to facilitate an efficient recovery from disruptions to energy infrastructure.

The OE mission is reflected in the Strategic Objective 2, support a more economically competitive, environmentally responsible, secure and resilient U.S. energy infrastructure, in the DOE Strategic Plan. OE also plays a critical role in implementation of the President's Climate Action Plan to mitigate the risks and enhance resilience against climate change.

The Request supports the Administration's energy strategy and emphasizes priorities that increase electric grid resilience, including managing risks, increasing system flexibility and robustness, increasing visualization and situational awareness, and deploying advanced control capabilities. The Request also continues crosscutting programs that coordinate across the Department. OE is part of the Grid Modernization and Cybersecurity crosscuts.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double Federal clean energy research and development investments government-wide over the next 5 years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The OE FY 2017 Budget Request of $262 million includes $177 million that contributes to the Mission Innovation pledge, an increase of $24 million from the FY 2016
Enacted level of $153 million. These investments will drive innovation essential for economic growth, provide clean, affordable and reliable energy, and advance energy security.

Program Highlights

The FY 2017 Budget Request reflects the Administration's priority on modernizing the electric grid and boosting the resilience of infrastructure. The Request accelerates ongoing efforts to support the Administration's energy strategy and emphasizes programs that increase electric grid resilience, including managing risks, increasing system flexibility and robustness, increasing visualization and situational awareness, and deploying advanced control capabilities.

Energy Storage
The Energy Storage program supports energy storage technology cost reductions, performance improvements, and reliability and safety validations, and works toward an equitable regulatory environment and industry acceptance. The FY 2017 Request initiates 3–4 new highly leveraged, cost-shared demonstrations with states encompassing 8MW+ of energy storage assets.

Transformer Resilience and Advanced Components (TRAC)
TRAC increases investments in the development of technologies and assessments to mitigate system vulnerabilities to high risk, low frequency events such as geomagnetic disturbances and electromagnetic pulses. Activities will also focus on developing next-generation large power transformers to fill a critical gap identified through the 2015 Quadrennial Technology Review.

Research efforts will address the unique challenges associated with high power levels (voltage and current), high reliability requirements (25–40 years of field operations), and high costs of critical components.

Grid Institute
The FY 2017 Budget Request supports initial funding for a new competitively selected Grid Clean Energy Manufacturing Innovation Institute that will be a part of the multi-agency National Network for Manufacturing Innovation. This Institute will focus on technologies related to critical metals for grid application, and advances will be broadly applicable in multiple industries and markets.

State Distribution-Level Reform Program
Distribution-Level Reform is new in FY 2017 and will award 5–10 cooperative agreements competitively to states, for a performance period of two years to utilize a grid architecture approach to address their system challenges. Achieving an effective design in any given geographic area will require governmental leadership (Federal and state), technological and analytic expertise, and collaboration among many stakeholders. The states will play important leadership roles and could benefit from the assistance that the proposed program could provide.

Infrastructure Security and Energy Restoration
The FY 2017 Budget Request supports further development of a national energy infrastructure situational awareness visualization program with state, local, tribal and territorial entities; and analysis of threats including those resulting from the supply chains and electromagnetic pulses.

State Energy Assurance
The FY 2017 Budget Request supports regional and state activities to continuously improve energy assurance plans and improve capabilities to characterize energy sector supply disruptions; communicate with local, state, regional, Federal, and industry partners; and identify gaps for in the purpose of updating energy planning and emergency response training programs. This activity will assist OE's state, local, tribal and territorial stakeholders in planning, training, and exercising efforts to become better prepared to respond to energy emergencies.

FOSSIL ENERGY RESEARCH AND DEVELOPMENT

The Fossil Energy Research and Development (FER&D) program advances technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels that are important to our Nation's security and economic prosperity. FER&D leads Federal research, development, and demonstration efforts on advanced Carbon Capture and Storage (CCS) technologies to facilitate achievement of the President's climate goals. FER&D also develops technological solutions for the prudent and sustainable development of our domestic unconventional oil and gas resources. DOE is proposing a restructuring of the FER&D budget to streamline the structure, align subprograms that support related efforts under the same program, and provide a more comprehensive view of the costs associated with NETL. Importantly, one of the key motivations for the structural change is to eliminate the categorization by fuel type which is no longer appropriate for this R&D portfolio. The new budget structure reflects the fact that

the CCS and Advanced Power Systems program supports CCS technologies, storage best practices, and innovative power systems integrated with CCS that are applicable to both coal and natural gas generation. Additional information on the restructuring can be found in Volume 3 in the FER&D chapter of the DOE FY 2017 Congressional Budget Request.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double Federal clean energy research and development investments government-wide over the next 5 years as part of Mission Innovation. The Fossil Energy R&D FY 2017 Budget Request of $600 million includes $564 million for the support of Mission Innovation, an increase of $31 million from the Enacted FY 2016 of $533 million. These investments will drive innovation essential for economic growth, provide clean, affordable and reliable energy, and advance energy security.

CCS and Advanced Power Systems (formerly Coal/CCS and Power Systems)

The CCS and Advanced Power Systems program conducts research to reduce carbon emissions by advancing the environmental performance and efficiency of fossil energy systems integrated with CCS technologies. In addition, FER&D continues to manage previously funded major CCS demonstration projects.
It is important to demonstrate that electric generation technology with CCS can be deployed at commercial scale while maintaining reliable, predictable and safe operations. Therefore, the FER&D portfolio includes several major integrated CCS demonstration projects encompassing different technological approaches and applications of CCS. A number of those projects have not yet reached financial close after six years. DOE intends to deobligate $240 million from CCPI projects that have not yet reached financial close and repurpose these funds to support the FY 2017 R&D portfolio.

Carbon Capture
Carbon Capture is focused on the development of post-combustion and pre-combustion CO2 capture and compression technologies for new and existing fossil fuel-fired power plants and industrial sources. The Request will enable selection of one additional large-scale post-combustion capture pilot and will fund a total of three large-scale post-combustion pilots. FY 2017 funding will also enable continued transformational research and development (R&D) technology development for pre- and post-combustion capture. The program will also support a Front End Engineering Design (FEED) study and initial construction of a large pilot facility to capture CO2 from a natural gas power system. The increase in FY 2017 funding will support two additional (four total) FEED studies for advanced combustion systems. The Advanced Combustion activity is moving under the Carbon Capture program in the proposed 2017 restructuring.

Carbon Storage
The overall goal of Carbon Storage is to develop and validate technologies to ensure safe and permanent geologic storage of captured CO2 from both coal and natural gas power systems. The FY 2017 Request supports: 1) storage field management projects, including the Regional Carbon Sequestration Partnerships, and other field characterization and injection projects; 2) risk and integration tool development; and 3) advanced storage R&D efforts, as part of the Department's

cross-functional SubTER technical team, to develop laboratory and bench-scale technologies for identifying and obtaining new subsurface signals, ensuring wellbore integrity, and increasing understanding of the stress state and induced seismicity.

Advanced Energy Systems (AES)

The AES mission is to increase the availability and efficiency of fossil energy systems integrated with CO2 capture, while maintaining the highest environmental standards at the lowest cost. The program elements focus on gasification, advanced turbines, supercritical CO2 (sCO2), and solid oxide fuel cells. The decrease in the FY 2017 Budget Request will refocus the program in order to support the Supercritical Transformational Electric Power (STEP) Generation initiative, which is proposed as an activity under AES as part of the FY 2017 restructuring.

STEP supports the Department's sCO2 crosscut which is focused on technology development for supercritical carbon dioxide-based power conversion cycles. These cycles can be applied to most heat sources, including fossil, nuclear, solar and geothermal applications, while offering significant improvements in efficiency, cost, footprint, and water use. Recognizing that the near-term deployment and potential market applications for commercial sCO2 power cycles are primarily in the fossil energy area, the STEP pilot project is being managed by the Office of Fossil Energy R&D. FY 2017 funding will support initiation of the design and construction of the STEP facility.

Crosscutting Research and Analysis (formerly Crosscutting Research)

Crosscutting Research and Analysis fosters the development of innovative systems for improving availability, efficiency, and environmental performance of advanced energy systems with CCS. Crosscutting Research and Analysis leads efforts that support university-based fossil energy research including science and engineering education at minority colleges and universities. Under the proposed restructuring, this subprogram will also support the Mickey Leland Energy Fellowship (MLEF) Program, which aims to increase in the number of women and under-represented minorities entering the scientific and engineering career fields within the U.S. workforce.

The increase in the FY 2017 Budget Request will focus on the development of new materials, catalysts, water efficient systems and technologies for power plants, and desalinization technologies for water produced through CCS. FY 2017 funding will also support immersive, interactive visualization technology and data communication optimization methods to improve the design and operation of advanced power systems with CCS.

Fuel Supply Impact Mitigation (formerly Natural Gas Technologies)

The Fuel Supply Impact Mitigation program is the new proposed name for the Natural Gas Technologies program. The program is comprised of three subprograms. The Environmentally Prudent Development subprogram will continue to conduct research in water quality, water availability, air quality, induced seismicity, and mitigating the impact of development of domestic unconventional oil and gas in collaboration with the Environmental Protection Agency and the Department of the Interior. The Emissions Mitigation and Quantification subprogram, which combines the former Emissions Mitigation from Midstream Infrastructure and the Emissions Quantification from Natural Gas Infrastructure subprograms, will conduct research on reducing methane emissions from natural gas infrastructure in the areas of advanced composite

materials, non-reactive coatings with embedded sensors, and internal and external pipeline inspection and repair without the need to evacuate natural gas from the pipeline. Additionally, the subprogram will support emissions quantification research focused on updating and improving component-level emission factors across the natural gas value chain for EPA's Greenhouse Gas Reporting Program and the Greenhouse Gas Inventory. The Gas Hydrates subprogram will conduct investigations to confirm the nature and regional context of gas hydrate deposits in the Gulf of Mexico in coordination with the U.S. Geological Survey.

NETL Research and Operations

The NETL Research and Operations program is new for FY 2017. This restructuring of NETL operational lines is proposed to better describe NETL's funding requirements, increase consistency with other national laboratories, and increase transparency in how funds are utilized, promoting enhanced visibility into cost drivers and more efficient resource allocation decisions. This program includes certain funds that were part of the former NETL Coal Research and Development program as well as certain funds that were formerly in the NETL portion of Program Direction.

The new NETL Research and Operations program supports NETL research activities. The program is comprised of the following subprograms: (1) Research and Development, (2) Site Operations, (3) Program Oversight and (4) Feasibility of Recovering Rare Earth Elements. The Research and Development funding supports salaries/benefits and travel for NETL staff directly associated with conducting both intramural and extramural research activities for FER&D programs, including scientists, engineers, and technical project managers. The Site Operations subprogram includes funding for Federal employees and contractors who perform site operations at the laboratories including operational costs such as grounds maintenance and utilities. The Program Oversight subprogram includes funding for Federal employees and contractors performing legal, finance, procurement, information technology, and human resources functions that are necessary for the performance of NETL research-enabling activities.

NETL Infrastructure

The NETL Infrastructure program is new for FY 2017. This budget line includes the former Supercomputer and Plant and Capital Equipment programs as well as portions of the Environmental Restoration, NETL Coal Research and Development, and Program Direction budget lines.

The new NETL Infrastructure program supports the upkeep of a lab footprint valued at $600 million in three geographic locations -- Morgantown, WV; Pittsburgh, PA; and Albany, OR. The funding will provide infrastructure repairs and improvements for both laboratory/research facilities and site-wide/general purpose facilities. This budget line also includes fixed occupancy costs for operating and maintaining research facilities and other site-wide facilities, such as support services and other related costs for building maintenance and information technology infrastructure.

The NETL high performance computer, Joule was commissioned in FY 2012. Given the rapid advances in computing technology, high-performance computers typically have an expected life cycle of approximately three years after which standard warranties run out, replacement parts are

not readily available, and maintenance costs rapidly escalate. Increased funding is requested to cover the cost of replacing all of the out-of-warranty high-speed processors. Thanks to advances in technology, the computational power of the next generation equipment will be much greater. It is anticipated that the refresh will upgrade the processing speed from 0.5 pFLOPS to 5 pFLOPS, a 10-fold increase. While the increase in funding is significant, it allows NETL to obtain and maintain a world-class supercomputer capable of using the most advanced software to enable key energy research.

Program Direction

Program Direction provides the funding for all headquarters personnel and operational expenses for FER&D. Also included is the Import/Export Authorization program, which will continue regulatory reviews and oversight of the transmission of natural gas across the U.S. borders. Program Direction funding no longer includes support for Federal employees performing research enabling functions. Program Direction at NETL continues to include functions such as legal, finance, procurement, information technology and human resources that are necessary for the performance of NETL activities.

FOSSIL ENERGY PETROLEUM ACCOUNTS

Fossil Energy Petroleum Accounts consist of two energy security programs authorized under the Energy Policy and Conservation Act: (1) the Strategic Petroleum Reserve including 695 million barrels of crude oil stockpiled at government-owned Gulf Coast storage sites and 1 million barrels of gasoline stored in commercial facilities in the Northeast (the Northeast Gasoline Supply Reserve) as well as the (2) Northeast Home Heating Oil Reserve 1 million barrels of ultra low sulfur diesel oil – also stored in Northeast commercial terminals. DOE is also responsible for legacy environmental cleanup/ remediation at the previously-sold Naval Petroleum Reserve No. 1 (NPR-1 at Elk Hills, California), and will continue post-sale activities in support of Naval Petroleum Reserve No. 3 (NPR-3 at Casper, Wyoming) landfill remediation and closure.

Program Highlights

Strategic Petroleum Reserve

The Strategic Petroleum Reserve (SPR) provides strategic and economic security against foreign and domestic disruptions in oil supplies via an emergency stockpile of crude oil. The program fulfills U.S. obligations under the International Energy Program, which avails the U.S. of International Energy Agency assistance through its coordinated energy emergency response plans, and provides a deterrent against energy supply disruptions. In 2015, the SPR acquired 4,194,296 barrels of crude oil using proceeds from the operational Test Sale performed in 2014. The acquisition operations were conducted without any safety or environmental incidents. The Northeast Gasoline Supply Reserve 1 million barrel inventory of gasoline continues to be maintained at leased commercial storage terminals along the East Coast to help mitigate the impacts of sudden and unexpected supply disruptions.

The FY 2017 Budget Request will provide the program with SPR operational readiness and drawdown capability of 4.25MB/d. The program will continue the degasification of crude oil inventory to ensure its availability and conduct wellbore testing and cavern remediation. Major

changes from FY 2016 include: full funding for Protective Force positions at all sites; additional preventive/corrective maintenance related to corrosion; and, the addition of a custody transfer flow metering skid.

The Bipartisan Budget Act of 2015 requires the Department to submit to Congress a Strategic Review of the SPR by May, 2016.
The Act also authorized DOE, subject to appropriation, to sell up to $2 billion in SPR oil to fund SPR infrastructure modernization. The results of the SPR Strategic Review will inform SPR infrastructure modernization and shall result in an FY 2017 budget amendment related to SPR modernization

Naval Petroleum and Oil Shale Reserves
Following the 1998 sale of the government's interests in NPR-1 (Elk Hills, CA), environmental cleanup/remediation activities under the Corrective Action Consent Agreement with the State of California Department of Toxic Substances Control (DTSC) began. Of 131 areas of concern (AOCs) for which DOE is responsible for the environmental cleanup, 22 Areas of Concern (AOCs) have received a DTSC certification of "No Further Action"; 66 AOCs are under DTSC review; 20 AOCs require additional testing; and, 23 AOCs are awaiting field investigation or remediation activities. In FY 2017, NPR-1 will continue these assessments and remediation activities.

The account also funds activities at the Naval Petroleum Reserve 3 (NPR-3) in Wyoming (the Teapot Dome field located 35 miles north of Casper, Wyoming), a stripper well oil field. On January 30, 2015, the Department finalized the sale of the Teapot Dome Oilfield for the price of $45.2 million. In FY 2016, NPR-3/RMOTC will complete Phase III of the disposition plan with activities including closure of contracts, preparation of field IT and equipment for disposal, records management processing, and disposal of personal property. FY 2017 activities include the closure and monitoring activities for the landfill. In nearly 40 years of operation under the Department's management, this stripper oilfield produced over 22 million barrels of oil resulting in over $569 million deposited into the U.S. Treasury.

Northeast Home Heating Oil Reserve
The Northeast Home Heating Oil Reserve (NEHHOR) FY 2017 Budget continues to maintain a 1 million barrel inventory of ultra-low sulfur distillate (ULSD), in Northeast commercial storage terminals, as a short-term supplement to the Northeast systems' commercial supply of heating oil for deployment in the event of an emergency supply disruption. New commercial storage contracts have been awarded and are expected to go in effect on April 1, 2016. The Program will continue to focus its oversight and management on quality analysis of the Reserve as well as information technology support for the sales system.

NUCLEAR ENERGY

Nuclear Energy (NE) supports the diverse civilian nuclear energy programs of the U.S.

Government, leading Federal efforts to research and develop nuclear energy technologies, including generation, safety, waste storage and management, and security technologies, to help meet energy security, proliferation resistance, and climate goals.

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STEP R&D
FY 2017 activities to support the Office of Fossil Energy lead STEP pilot scale project and other NE sCO2 R&D activities are consolidated within Reactor Concepts Research, Development and Demonstration.

Small Modular Reactor Licensing Technical Support
The Request is consistent with the requirements outlined in the cooperative agreement with NuScale Power, and includes funding for site permitting and related licensing activities to support the final year of development for small modular reactor technologies previously selected under this program.

Reactor Concepts Research, Development and Demonstration
FY 2017 activities will include cost-shared efforts to extend the life of the existing commercial nuclear reactor fleet through research in the areas of materials aging and degradation, safety margin characterization, and safety technologies; and research into advanced reactor technologies, such as fast reactor technologies and high temperature reactor technologies for the production of electricity and high temperature process heat to improve the economic competitiveness and safety of nuclear energy as a resource capable of meeting the Nation's energy, environmental and energy security goals. In FY 2017 NE's sCO2 R&D activities, including support for the Office of Fossil Energy lead STEP pilot scale project, are consolidated within RCRD&D.

Fuel Cycle Research and Development
The FY 2017 Budget Request will expand efforts that support the Administration's waste management strategy including continued implementation of the activities to lay the groundwork for consent based interim storage and transportation of nuclear waste, and activities associated with exploring potential alternative disposal options for some DOE-managed spent nuclear fuel and high-level radioactive waste. In addition, FCR&D efforts include research and development (R&D) on deep borehole disposal and extended storage of high burnup used nuclear fuel. The Request also supports continued progress toward the development of one or more light water reactor fuels with enhanced accident tolerance.

Nuclear Energy Enabling Technologies

The FY 2017 Budget Request supports R&D and strategic infrastructure investments to develop innovative and crosscutting nuclear energy technologies. This program includes a strong investment in modeling and simulation tools, provides access to unique nuclear energy research capabilities through its Nuclear Science User Facilities (NSUF), and addresses workforce needs in critical, focused nuclear energy related fields. Collectively, Nuclear Energy Enabling Technologies supports the goals, objectives and activities of the Gateway for Accelerated Innovation in Nuclear (GAIN) initiative to make NE research capabilities accessible to industry engineers and scientists in a public-private partnership.

Radiological Facilities Management

FY 2017 activities will include the procurement of 40 and delivery of between 33 and 36 plate fuel elements required annually by university research reactors as determined by need and fuel availability.

Idaho Facilities Management and Idaho Sitewide Safeguards and Security

Idaho Facilities Management program will continue investments to improve the reliability and availability of the Advanced Test Reactor (ATR), complete the refurbishment of the Transient Reactor Test Facility (TREAT), initiate the resurfacing, reconstruction, and sealing of major primary roads at INL as part of a Departmental effort through the National Laboratory Operations Board (LOB) to focus critical funds on revitalizing general purpose infrastructure at DOE national laboratories and plants, and initiate the disposition of excess contaminated facilities at INL identified through Departmental efforts associated with the Excess Contaminated Facilities Working Group. The Idaho Sitewide Safeguards and Security program will continue to sustain program functionality at the level necessary to assure high confidence in the protection of INL assets and a high degree of customer service by maintaining effective staffing levels, proactive preventative and corrective maintenance programs, and a robust cyber security program. The FY 2017 Request will focus on implementing infrastructure investments, capital improvements, emerging technology investments and enhanced cyber security program capabilities to adequately secure site assets.

International Nuclear Energy Cooperation

FY 2017 activities include developing new bilateral collaboration with a variety of countries through R&D Agreements, implementing arrangements and Action Plan updates, as well as maintaining existing multilateral cooperation commitments in the International Framework for Nuclear Energy Cooperation and the International Atomic Energy Agency. In FY 2017, INEC will initiate efforts to develop a program for international nuclear energy education outreach, modeled after the Department of State's International Military Education and Training program, with the goal of supporting diplomatic, nonproliferation, climate, and international economic objectives for the safe and secure use of peaceful uses of nuclear technology in emerging countries developing nuclear energy programs.

INDIAN ENERGY POLICY AND PROGRAMS

The Indian Energy Policy and Programs (IE) FY 2017 Budget Request supports ongoing technical assistance, education, capacity building and financial assistance to Indian Tribes,

Alaska Native Tribes and corporations, and Tribal energy resource development organizations. The increased funding over the FY 2016 Enacted level supports expanded technical assistance and competitive grant programs through intertribal networks to support clean energy development and deployment for Tribes.

While Indian Lands comprise just 2 percent of all U.S. lands, Indian Lands contain 5 percent of the total renewable energy generation potential of the entire Nation. The National Renewable Energy Laboratory (NREL)[1] has estimated that the annual renewable energy generation potential on Indian Lands (27,661 million MWh) is nearly seven times the annual U.S. electricity generation from all sources, which was 4,117 million MWh in 2011.

The Energy Policy Act of 2005 established the Office of Indian Energy Policy and Programs (IE) to promote Indian tribal energy development, efficiency and use; reduce or stabilize energy costs; enhance and strengthen Indian tribal energy and economic infrastructure relating to natural resourced development and electrification; and to bring electrical power and service to Indian land and homes, where 14.2 percent of tribal households lack access to basic electricity.

To meet the statutory mandate, IE coordinates programmatic activities across DOE related to the development of energy resources on Indian lands and works with other state and federal Government agencies, Indian Tribes, Alaska Native Village and Regional Corporations and organizations to promote Indian innovative energy policies and initiatives.

Program Highlights

In FY 2017, IE will double its FY2016 budget for Technical Assistance ($6 million) to Indian Tribes, Alaska Native Village and Regional corporations, and Tribal Energy Resource Development Organizations to meet the increased demand that has resulted from its outreach activities. The Office will continue to provide financial assistance ($12 million) in the form of grants for deployment of innovative energy systems and technologies and for efficient delivery of technical assistance through the intertribal technical assistance networks. The funding request provides an additional 6 FTEs within Program Direction that are necessary to carry out the programs, especially in the remote communities in Alaska and the Arctic.

In FY 2017, the Department requests a separate appropriation account for Indian Energy to better align the Budget with the program's mission scope and Departmental organization structure as a direct report to the Under Secretary for Science and Energy.

OFFICE OF TECHNOLOGY TRANSITIONS

The mission of the Office of Technology Transitions (OTT) is to expand the commercial impact of the Department of Energy's (DOE) portfolio of Research, Development, Demonstration and Deployment (RDD&D) activities over the short, medium and long term. The OTT's work includes implementing the key responsibilities and duties assigned to the statutorily-created Technology Transfer Coordinator, program management of the Technology Commercialization Fund (TCF), development of the statutory Technology Transfer Execution Plan and Annual

[1] Doris, E., *Geospatial Analysis of Renewable Energy Technical Potential on Tribal Lands*. DOE/IE-0013 (Feb, 2013).

Technology Transfer Report, and the implementation of the Clean Energy Investment Center (CEIC). The OTT provides institutional support of technology transition activities throughout the Department including administrative, budgetary, planning and execution responsibilities.

OTT is led by the Department's Technology Transfer Coordinator, the principal advisor to the Secretary of Energy on all matters related to technology transfer, commercialization, and lab-to-market initiatives. The Coordinator serves a corporate role to develop and implement a strategic plan to ensure the Department's transition of technologies to the market. This includes coordinating early-stage technology transition activities within Departmental programs, later-stage applied technology research and development, and eventual deployment and commercialization of energy technologies by the private sector. These activities span the work of the National Laboratories and external stakeholders conducting research funded by the Department.

Technology transfer is a national priority as evidenced by enacted legislation and policy initiatives. OTT activities accomplish priorities set out in policy documents such as: (1) Climate Action Plan: Deploying Clean Energy, Unlocking Long-Term Investment in Clean Energy Innovation; (2) Cross-Agency Priority Goal on Lab-to-Market: Accelerating and improving the transfer of new technologies from the laboratory to the commercial marketplace; and (3) Presidential Memorandum 2011: Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Businesses. The OTT activities align with the Department's Strategic Goal #1, Objective #3: "Deliver the scientific discoveries and major scientific tools that transform our understanding of nature and strengthen the connection between advances in fundamental science and technology innovation."

Program Highlights

The Department requests $8,400,000 for the OTT Program Direction in FY 2017. For FY 2015 and FY 2016, the technology transition activities are funded through funds executed within DOE's applied energy and science programs. For FY 2017, the Department is seeking funding consistent with the OTT's operational requirements, to fully establish the OTT as an integral and critical function within DOE. The resources requested for FY 2017 are required to maintain adequate staffing to fulfill Congressional and Administration direction to increase Departmental engagement for the transition of new and evolving energy technology to the U.S. markets, a principal component of Mission Innovation.

Beginning in FY 2017, 0.9% of funding for the applied energy programs' research and development activities will be transferred into a TCF, managed by the OTT. The estimated FY 2017 transfer is approximately $20 million based on the Department's FY 2017 request; however this funding level will be calculated from the FY 2017 enacted budget.

The TCF will be used to provide catalytic seed-stage funding for high-potential national laboratory-based energy technology not yet transferred to the private sector. The TCF funding will focus on early commercialization activities such as market analysis, customer development, prototype development, testing and validation. To further facilitate transition to the private

sector, laboratories will conduct all these activities in cost-shared collaboration with a private sector partner or partners.

The OTT also manages the Clean Energy Investment Center (CEIC). The CEIC's primary mission is to catalyze private, mission-oriented investment in energy technologies to address the significant gap in U.S. clean energy technology investment. The CEIC will be a single point of access to identify DOE and laboratory experts, projects and informational reports and whitepapers covering DOE's portfolio of energy research, initiatives and projects. The CEIC will lead efforts to develop a Lab "Partnering" Service to enable connections between the private sector and the National Laboratories.

Crosscutting Activities

One of the ways the Department is increasing the productive links between the science and energy programs is through the budget crosscuts the Department introduced in the FY2015 budget cycle.

Building on the success of these initiatives, my office is continuing to bring together subject matter experts across our programs to overcome overarching challenges. The crosscuts embody the improved agency-wide coordination the Secretary envisioned when he created the Office of the Under Secretary for Science and Energy as part of the Department's FY 2013 reorganization.

Taking an enterprise-wide approach to research efforts will continue to improve outcomes and avoid redundancy between program offices. The FY 2017 Request includes just over $1.4 billion in crosscutting research and development across seven initiatives: energy-water nexus, exascale computing; grid modernization; subsurface technology and engineering; supercritical carbon dioxide technology; advanced materials for energy innovation, and cybersecurity.

Energy-Water Nexus: Supports the Nation's transition to more resilient energy-water systems

Water and energy systems are interdependent. Water is used in all phases of electricity generation and energy production, accounting for over 40% of total water withdrawals and over 5% of total water consumption. Conversely, energy is required to extract, convey, and deliver water of appropriate quality for diverse human uses, and then again to treat wastewaters before return to the environment; this accounts for 3% of total electricity consumption. Current trends are increasing the urgency to address the energy-water nexus in an integrated way. Precipitation and temperature patterns, U.S. population growth and regional migration trends, and the introduction of new technologies could shift water and energy demands.

The Energy-Water Nexus crosscutting initiative, which draws on ideas presented in DOE's report, *The Water-Energy Nexus: Challenges and Opportunities* (June 2014), is an integrated set of cross-program initiatives that 1) builds and deploys a DOE mission-critical data, modeling and analysis platform to improve understanding and inform decision-making for a broad range of users; 2) strategically targets crosscutting technology RDD&D opportunities within the system

of water and energy flows; and 3) is informed and supported by focused policy analysis and outreach and stakeholder engagement. Taken as an integrated whole, these investments position DOE to contribute strongly to the Nation's transition to more resilient energy-water systems. The FY 2017 Request continues to strategically expand activities in the four focus areas listed below. Features of the Request include an investment in a low-carbon, low-energy, low-cost desalination innovation hub; regional-scale data, modeling, and analysis test beds; and research into the beneficial use of non-traditional water.

Exascale Computing: Enables U.S. leadership in the next generation of high performance computing

Since the beginning of the digital era, the U.S. Federal government has made pivotal investments in the computer industry at critical times when market progress was stagnating. We are once again at a critical turning point in high performance computing (HPC) technology, with industry innovations in hardware and software architectures driving advances in computing performance, but where the performance of application codes is suffering because the technology advances are not optimized for memory intensive, floating point HPC use. Yet the importance of HPC simulations is increasing as the U.S. faces serious and urgent economic, environmental, and national security challenges based on dynamic changes in the energy and climate systems, as well as growing security threats. Providing tools for solving these and future problems requires exascale capabilities.

Committed U.S. leadership toward exascale computing is a critical contributor to our competitiveness in science, national defense, and energy innovation as well as the commercial computing market. Equally important, a robust domestic industry contributes to our nation's security by helping avoid unacceptable cybersecurity and computer supply chain risks.

Addressing this national challenge requires a significant investment by the Federal government. For this reason, in July 2015, the President set forth the National Strategic Computing Initiative, a whole-of-government effort designed to create a cohesive, multi-agency strategic vision and Federal investment strategy, executed in collaboration with industry and academia, to maximize the benefits of HPC for the United States. A key goal of this initiative is to accelerate the development of exascale computing capabilities with a thousand-fold improvement in performance over current high-performance computers. DOE's Exascale Computing crosscutting initiative focuses resources across the Department to work toward this goal. The initiative is organized around four pillars: application development, software technology, hardware technology, and exascale systems. In FY 2017, DOE proposes to expand its efforts in the first three technical focus areas, and begin efforts in the fourth focus area in FY 2018.

Grid Modernization: Provides tools to set the Nation on a cost-effective path to the grid of the future

The reliability and functioning of the Nation's electricity grid is often taken for granted. Whereas rolling blackouts are the norm in many developing countries, U.S. customers have historically benefitted from highly reliable and affordable power transported through long-lived transmission and distribution infrastructure. Our extensive and resilient power grid has fueled the Nation's growth engine and long been an exemplar for other countries. Access to electricity is such a

fundamental enabler for the economy that the National Academy of Engineering named Electrification the greatest engineering achievement of the 20th century.

The Grid Modernization crosscutting initiative supports strategic investments by DOE in foundational technology development, enhanced security and resilience capabilities, and greater institutional support and stakeholder engagement, which will provide tools necessary for the evolution to the grid of the future. Investment is critical now as industry is considering approaches to address aging infrastructure. The FY 2017 Budget Request includes a new emphasis on cooptimization demonstration projects in the areas of (1) clean, resilient distribution feeders; (2) balance in areas with lean reserve margin grid operations; and (3) improved planning tools.

Subsurface Science, Technology and Engineering RD&D (Subsurface): Advances a new era of capabilities across a range of energy applications

Over 80 percent of our total energy supply comes from the subsurface, and this importance is magnified by the ability to also use the subsurface to store and sequester fluids and waste products. The Subsurface crosscut will address identified challenges in the subsurface through highly focused and coordinated research in wellbore integrity, subsurface stress state and induced seismicity, permeability manipulation, and new subsurface signals to enhance renewable energy supply, ensure material impact on climate change via CO_2 storage, and significantly mitigate environmental impacts from energy-related subsurface activities and operations.

Subsurface resources constitute the Nation's primary source of energy, which provides safe storage capacity for CO_2 and presents an opportunity for environmentally responsible management and disposal of hazardous materials and other energy waste streams. In addition to these four core pillars, the FY 2017 Request funds R&D on an identified grand challenge on advanced imaging of geophysical and geochemical signals in the subsurface.

Supercritical CO_2 Technology: Synchronizes R&D activities around a collective technology demonstration opportunity

The supercritical carbon dioxide (sCO_2) based power generation initiative is a technology-focused crosscut that will facilitate industry's transition to realize power cycles based on sCO_2 as the working fluid. Demonstrating and developing this power cycle has the potential to revolutionize electric power generation for fossil, concentrating solar, geothermal, nuclear and waste heat recovery applications in a way that is cleaner and more efficient, and which reduces cost. The FY 2017 Request builds on industry outreach and focused R&D efforts in FY 2015, and the development of more detailed conceptual plans, technical approach, and cost and schedule estimates relevant to a 10 MWe pilot test facility in FY 2016. These inputs will inform the development of the Supercritical Transformational Electric Power Generation (STEP) solicitation, to be issued and awarded in FY 2016, for the design, construction and operation of a 10 MWe pilot test facility. Initiation of design and construction of the STEP facility would begin in early FY 2017. Recognizing that the near-term deployment and potential market applications for commercial sCO_2 power cycles are primarily in the fossil energy area, the STEP project is being managed by the Office of Fossil Energy.

Advanced Materials: Accelerating advanced materials development from discovery through deployment

Affordable, reliable, high-performance materials are key enablers to most transformational changes in technology, including critical clean energy applications. New materials discoveries have the potential to revolutionize whole industries, but only a small fraction of these materials make it to widespread market deployment. As a result, many new materials concepts that are hailed as scientific breakthroughs in the laboratory either never realize commercial application, or spend decades in the development cycle at significant cost. The reality is that no matter how well a material performs in the laboratory, the uncertainties and risks associated with scale-up and production, as well as the real or perceived liabilities associated with material failures in service, significantly slow the development and deployment cycles. To relieve this uncertainty and reduce risk, most sectors require a new material be "qualified" before commercialization, requiring arduous and resource-intensive testing loops that can take years or even decades to complete. Accelerating advanced materials development from discovery through deployment is critical for U.S. manufacturing competitiveness in the 21st century.

The Advanced Materials Crosscut serves as the principal forum for coordinating advanced materials related activities across the Department. This newly-formed crosscut focuses on a subset of materials R&D that will involve close coordination among the participating offices to form a cohesive network with the following capabilities: (1) predictive tools, (2) functional (applied) design validation, (3) process scale-up, (4) qualification, and (5) digital data and informatics. This crosscut is anchored by a shared vision of the optimal approach to designing, scaling, and qualifying materials that harnesses a suite of innovative capabilities, tools, and methodologies that represent a radical improvement over resource and time-intensive testing loops necessary under current conditions.

Cybersecurity: Protecting the DOE enterprise and improving cybersecurity in the energy sector

The Department of Energy (DOE) is engaged in two categories of cyber-related activities: protecting the DOE enterprise from a range of cyber threats that can adversely impact mission capabilities and improving cybersecurity in the electric power subsector and the oil and natural gas subsector. The cybersecurity crosscut supports central coordination of the strategic and operational aspects of cybersecurity and facilitates cooperative efforts such as the Joint Cybersecurity Coordination Center (JC3) for incident response and the implementation of Department-wide Identity, Credentials, and Access Management (ICAM).

Under the Presidential Policy Directive on Critical Infrastructure Security and Resilience (PPD-21), DOE is the Sector Specific Agency for the energy sector and has a number of responsibilities, including the following: 1) collaborating with infrastructure owners and operators to strengthen the security and resilience of critical infrastructure; 2) serving as the day-to-day Federal interface for the prioritization and coordination of sector-specific activities; 3) carrying out incident management responsibilities consistent with statutory authority and other appropriate policies; and 4) providing technical assistance to the energy sector to identify vulnerabilities and help mitigate incidents, as appropriate.

Conclusion

I appreciate the opportunity to discuss how the Budget Request advances the Department's mission in delivering fundamental scientific research and accelerating the development of clean energy technologies. The Department of Energy is focused on investing in a portfolio clean energy technologies to secure America's energy future and enhance American competitiveness. The Fiscal Year 2017 Budget Request aims to continue and advance this pursuit.