

versities, and other Minority Serving Institutions. The Committee understands that each national laboratory develops its own recruitment and retainment strategies and provides those plans to the Department for review. The fiscal year 2020 Act directed the Department to comprehensively evaluate these plans and provide a report to the Committee detailing efforts to recruit and retain diverse talent from the institutions mentioned above. Further, the fiscal year 2020 Act directed the Department to provide to the Committee a report on its internal programs that support research and development opportunities from the institutions mentioned above. The Committee is still awaiting these reports and directs the Department to provide these reports not later than 30 days after enactment of this Act.

RESEARCH AND DEVELOPMENT POLICY

Research and Development Policy.—The budget request again proposes to focus the Department solely on early-stage research and development activities at the expense of medium- and later-stage research and development, including deployment, demonstration, and other approaches to spur innovation. The Committee rejects this short-sighted and limited approach, which will ensure that technology advancements will remain in early-stage form and are unlikely to integrate the results of this early-stage research into the nation's energy system. While early-stage research and development has an appropriate place in a balanced research portfolio, the Committee strongly believes that a focus on only early-stage activities will forego the nation's scientific capabilities in medium- and later-stage research and development and will not fully realize the technological advancements that can and should happen as a result of the Department's applied energy activities. The Committee provides robust funding to support a comprehensive, balanced approach that also includes medium- and later-stage research, development, deployment, and demonstration activities. The Committee directs the Department to follow this comprehensive approach in each applied energy research and development program office and expend funding in an expeditious manner, to include the timely issuance of funding opportunity announcements and awards of funds. To capitalize on the research infrastructure and expertise at universities across the country, the Committee encourages the Department to increase opportunities for universities to compete for funding within the Department's portfolio of research.

CROSSCUTTING INITIATIVES

Grid Modernization.—The Department is directed to continue the ongoing work among the national laboratories, industry, and universities to improve grid reliability and resiliency through the strategic goals of the Grid Modernization Initiative (GMI). The Committee recognizes the accomplishments of over 200 partners from industry, academia, and state governments in these efforts. The Department shall brief the Committee not later than 90 days after enactment of this Act on the funding profiles, portfolio of funding opportunities, programmatic investments for the Initiative, and the roles and responsibilities of each participating program office. The

Committee supports the Grid Modernization Laboratory Consortium and continued implementation of the Grid Multi-Year Program Plan (MYPP) to ensure coordination across all applied program offices, including the additions of the Offices of Cybersecurity, Energy Security, and Emergency Response (CESER); Nuclear Energy (NE); and Fossil Energy (FE) to the MYPP. The Committee directs the Department to emphasize national energy systems resilience modeling and improved grid cyber resilience to address emerging national resilience challenges of the grid and related energy systems, planned investments in energy storage to improve grid flexibility and resilience, and advanced sensors and control paradigms that promise to improve energy system resilience of the grid of the future. The Committee recognizes the growing importance of training and workforce development to support grid modernization research and development, and the Committee directs the Department to develop a plan for a pipeline of students, graduates, and professors to sustain a robust grid modernization research, design, and operations capability over the long-term. The recommendation provides not less than \$392,500,000 for GMI, including not less than \$114,500,000 from the Office of Energy Efficiency and Renewable Energy (EERE); not less than \$172,000,000 from the Office of Electricity (OE); not less than \$90,000,000 from CESER; not less than \$13,000,000 from FE, and not less than \$3,000,000 from NE.

Within available funds for GMI, the recommendation provides not less than \$4,000,000 for university-based R&D of scalable cyber-physical platforms for resilient and secure electric power systems that are flexible, modular, self-healing, and autonomous.

Within available funds for GMI, the recommendation provides up to \$10,000,000 to establish a network of university-based, regional electric power-cybersecurity centers. The centers should address interrelated research and development challenges of cybersecurity and critical energy infrastructure and develop a trained, globally competitive workforce. The centers should be distributed regionally across the country to leverage regional utilities, national laboratories, and regulatory bodies and consider the distinctive characteristics of each region's electricity system, network of infrastructure, and workforce expertise.

Within available funds for GMI, the recommendation provides up to \$9,500,000 for a pilot project to demonstrate cybersecurity best practices and collaborations in deploying and operating cybersecure electric vehicle charging facilities.

Public, open-source decentralized technologies like blockchain, in combination with digital identities, are positioned to enable innovation for advanced digital solutions that solve various market pain points associated with the registration, scheduling, dispatch and activation, measurement and verification, and financial settlement of energy customers and their devices. These digital solutions may help grid operators, electric utilities, energy companies, and customers to capture the full potential of investments in grid modernization. The Committee directs the Department to coordinate research on the opportunity and needs for new digital solutions built with public, open-source decentralized technologies to support elec-

tric grid modernization efforts. These research efforts should include state regulatory and consumer privacy components.

The Committee is concerned about the increasing frequency of severe weather events that have the capability to cause power outages and disable the electric grid. While the ability to forecast and model extreme weather events has drastically improved in recent decades, most power grid operators lack similarly sophisticated tools to combine specific weather forecasts and data on state and regional grid infrastructure to better predict where specifically outages will be most severe. GMI has excelled in recent years at working with public and private partners to develop the concepts, tools, and technologies needed to measure, analyze, predict, protect, and control the grid of the future. The Committee strongly recommends that the GMI include efforts to develop regional predictive models of weather-caused power outages in its next Grid Modernization Lab Call and MYPP to address this pressing need.

The Committee understands the benefits that natural gas demand response could bring to the electric grid, including reducing energy costs and emissions. The recommendation provides up to \$15,000,000, including not less than \$10,000,000 from FE, for natural gas demand response pilot programs to be developed by gas utilities, state public utility commissions, and local distribution companies. The Committee encourages the Department to prioritize funding of pilots that have the potential to advance real-time deployment and testing of new technologies that could be used to monitor the effectiveness of natural gas demand response.

Energy Storage.—The Committee supports the Department’s ongoing efforts to formulate the Energy Storage Grand Challenge initiative to build on and coordinate the Department’s prior research, development, and demonstration efforts in energy storage to accelerate the development, commercialization, and utilization of next-generation energy storage technologies.

The Committee directs the Department to publish not later than 180 days after enactment of this Act a crosscutting R&D roadmap and implementation plan to illustrate the Energy Storage Grand Challenge’s goals through 2030, focusing efforts on a diverse set of energy storage technologies and in coordination among EERE, OE, FE, NE, and the Office of Science. The R&D roadmap shall include a focus on the technical, regulatory, and market issues necessary to achieve technology goals, and the implementation plan shall include a breakdown of the roles and responsibilities of each participating program office. The Department is directed to provide quarterly briefings to the Committee on these efforts, starting not later than 90 days after enactment of this Act.

The recommendation provides not less than \$205,000,000 for energy storage, including not less than \$97,000,000 from EERE, not less than \$75,000,000 from OE, not less than \$5,000,000 from FE, not less than \$4,000,000 from NE, and not less than \$24,000,000 from the Office of Science.

The recommendation provides for not less than one pilot energy storage project that demonstrates business model innovation targeted at cost-effective deployment through aggregation in rural electric cooperatives. The Department is encouraged to focus on reducing the soft costs of novel project design and optimization and

developing legal and power purchase model agreements that can be replicated in cooperatives elsewhere in the nation, reducing future costs for deployment of energy storage projects.

Critical Minerals.—The modern global economy has increasingly come to depend on access to a number of critical materials that were not widely used or considered essential to manufacturing just a few decades ago. Given that growing dependency, the Committee appreciates the Department's elevation and coordination of the existing critical minerals activities across the Department through the newly established Critical Minerals Initiative. The Department shall brief the Committee not later than 90 days after enactment of this Act on the funding profiles, portfolio of funding opportunities, programmatic investments, and roles and responsibilities of each participating program office. The recommendation provides not less than \$107,500,000 for activities related to critical minerals, including not less than \$52,000,000 from EERE, \$29,500,000 from FE, not less than \$1,000,000 from NE, and not less than \$25,000,000 from the Office of Science.

Plastics Innovation Challenge and Revolutionizing Polymer Upcycling.—In fiscal year 2020, the Department launched the Plastics Innovation Challenge with the stated goal of reducing the energy costs associated with the current lifecycle of plastics; developing new polymers that are recyclable-by-design; and developing biological and chemical methods to deconstruct plastic waste, including from rivers and oceans, into useful chemical feedstock streams. While these are important goals, the Committee continues to be concerned about partnerships, relationships with sponsoring institutes, and implementation of the program. The Committee remains concerned with certain partnerships under this initiative and that the focus of this research may result in promoting the use of more plastic, not less.

In the fiscal year 2021 budget request, EERE proposes activities to explore novel feedstocks, technologies, and approaches to economically deconstruct existing plastics; increase opportunities for upcycling; develop infinitely recyclable polymers; and to make better use of renewable chemicals and biodegradable alternatives to traditional plastics. In the fiscal year 2021 budget request, the Office of Science proposes activities to discover the chemical and biological pathways for transforming polymers and synthesizing high-value chemicals or new polymers. The Committee is concerned about the lack of coordination and a cohesive research agenda for these activities and directs the Department to provide to the Committee a report that describes a coordinated research plan for activities within EERE, the Office of Science, and any other relevant program office. The research plan shall include the roles and responsibilities for each program office. The report shall be provided not later than 90 days after enactment of this Act and prior to any funds being obligated for these purposes.

The recommendation provides not more than \$35,000,000 for research activities related to plastics and polymers, including up to \$20,500,000 from EERE and up to \$14,500,000 from the Office of Science.

Integrated Energy Systems.—The Committee supports the integrated energy systems activities of EERE, FE, and NE with the

purposes of maximizing energy production and efficiency; developing energy systems involving the integration of nuclear energy with renewable energy, fossil energy, and energy storage; and expanding the use of emissions-reducing energy technologies into nonelectric sectors to achieve significant reductions in environmental emissions. The recommendation provides not less than \$15,000,000 for activities related to integrated energy systems, including not less than \$5,000,000 from FE and not less than \$10,000,000 from NE. The Department is directed to submit to the Committee not later than 90 days after enactment of this Act a report that details a potential research agenda of integrated energy systems activities, including estimated funding levels for those activities and the roles and responsibilities of each participating program office. The Department is directed to coordinate all integrated energy systems activities across FE, NE, EERE, and any other relevant program office.

Negative Emissions Technologies.—Negative emissions technologies, also referred to as carbon dioxide removal technologies, aim to remove and sequester excess carbon from the atmosphere, and these technologies have been identified as an important part of the portfolio of responses to climate change. The fiscal year 2020 Act directed the Department to develop an implementation plan coordinated across EERE, FE, and the Office of Science. The Committee is still awaiting this plan and directs the Department to provide the plan not later than 30 days after enactment of this Act. The Department is directed to include a breakdown of the roles and responsibilities of each participating program office in the implementation plan. The recommendation provides not less than \$95,000,000 for research and development of negative emissions technologies, including not less than \$20,000,000 from EERE, not less than \$50,000,000 from FE, and not less than \$25,000,000 from the Office of Science. Within available funds for negative emissions technologies, the recommendation provides not less than \$40,000,000 for direct air capture, including not less than \$10,000,000 from EERE, not less than \$20,000,000 from FE, and not less than \$10,000,000 from the Office of Science.

Emissions Reductions.—The Committee directs the Department to take into consideration the projected reductions in greenhouse gas emissions when selecting activities and projects for funding within EERE, OE, NE, and FE. The Department shall not fund projects within EERE, OE, NE, and FE, that do not demonstrate potential for emissions reductions or improved environmental performance.

ENERGY PROGRAMS

ENERGY EFFICIENCY AND RENEWABLE ENERGY

Appropriation, 2020	\$2,790,000,000
Budget estimate, 2021	719,563,000
Recommended, 2021	2,848,000,000
Comparison:	
Appropriation, 2020	+58,000,000
Budget estimate, 2021	+2,128,437,000

The Committee recommends a net appropriation of \$2,848,000,000 for Energy Efficiency and Renewable Energy (EERE). The recommendation also includes a rescission of \$2,240,293 of unused, previously appropriated funds. EERE programs include research, development, demonstration, and deployment activities that advance energy efficiency and renewable energy technologies, as well as federal energy assistance programs. Since the early 1970s and in partnership with business, industry, universities, research labs, and stakeholders, EERE has spurred innovation of affordable, renewable energy and energy efficiency technologies critical to combating climate change. EERE remains at the forefront of clean energy innovation, implementing a range of strategies aimed at reducing U.S. reliance on fossil fuels that is saving American families and businesses money, creating jobs, and reducing pollution.

The EERE program is divided into three portfolios: sustainable transportation, renewable energy, and energy efficiency. The sustainable transportation portfolio, which consists of the vehicles, bio-energy, and hydrogen and fuel cell programs, advances the development of plug-in electric and other alternative fuel vehicles, high-efficiency advanced combustion engines, and the replacement of oil with clean domestic transportation fuels. The renewable energy portfolio, which consists of the solar, wind, water, and geothermal programs, aims to develop innovative technologies to make renewable electricity generation cost competitive with traditional sources of energy. The energy efficiency portfolio, which consists of the advanced manufacturing, buildings, and federal energy assistance programs, seeks cost-effective solutions to reduce energy consumption in plants, buildings, and homes.

Additional Programmatic Direction.—Additional direction related to Department-wide crosscutting initiatives is provided under the heading Crosscutting Initiatives in the front matter of Department of Energy.

Research and Development Policy.—The Department is reminded that the research and development (R&D) policy contained in the front matter of Title III of this report specifically applies to each program within EERE. The Department shall provide the Committee with the specific breakdowns for R&D stages for both funds that are allocated according to this report and any funds that are not allocated by this report for each program.

The Commonwealth of Puerto Rico and the U.S. Virgin Islands.—The Committee directs the Department to offer technical and other programmatic assistance to the Commonwealth of Puerto Rico for the assessment and implementation of innovative technologies with the capability of combining different infrastructure systems in an integrated manner to effectively mitigate power plant emissions, efficiently treat and reuse wastewater, produce biofuels, and generate power from solid waste. In addition, the Committee directs the Department to offer technical and other programmatic assistance to the Commonwealth of Puerto Rico and the U.S. Virgin Islands in assessing the feasibility of a Puerto Rico/U.S. Virgin Islands subsea electric cable interconnection. The Department is directed to brief the Committee not later than 90 days after enact-

ment of this Act on the status of, and future plans for, these efforts.

DOE and USDA Interagency Working Group.—The Committee looks forward to expeditiously receiving the report on research collaborations with the U.S. Department of Agriculture (USDA), including at national laboratories, that was required by the fiscal year 2020 Act. The Committee supports the establishment of the interagency working group to promote energy and develop technologies that will support and advance agricultural communities and domestic manufacturing, as required by the Agriculture Improvement Act of 2018. Both agencies have unique roles in assisting the nation in integrating alternative fuels and energy efficiency savings throughout our economy. The Committee directs the working group to pursue joint activities related to the research and development of affordable, deployable, resilient energy and water efficient technologies for four-season food production platforms that can serve undernourished regions of the country. The Committee further directs the working group to pursue joint activities related to the energy and water efficiency of other agricultural platforms, irrigation systems, wastewater treatment facilities, and greenhouses. To achieve this, the Committee encourages collaboration between USDA's Office of Urban Agriculture and Innovative Production, the Agricultural Research Service, the Natural Resources Conservation Service, and the National Institute of Food and Agriculture and various DOE offices including, but not limited to, EERE, Advanced Research Projects Agency—Energy, the Office of Science, and Fossil Energy.

Clean Energy Workforce.—The Committee believes a skilled workforce is critical to the successful transition to a clean energy economy and long-term sustainability of energy efficient and renewable energy technologies. The Committee encourages the Department to continue to work with two-year, community and technical colleges, labor, and non-governmental and industry consortia to pursue job training programs, including programs related to building retrofits and the construction industry and programs focused on displaced fossil fuel workers that lead to an industry-recognized credential in the energy workforce.

Zero Emissions Energy Credit.—The Committee notes that in the fiscal year 2018, 2019, and 2020 Acts the Department was directed to produce a report to evaluate the effects of a Zero Emissions Energy Credit. The Committee directs the Department to provide this report not later than 15 days after enactment of this Act.

Underserved Communities.—The Department is directed to continue to expand its work to lower barriers for the adoption of renewable energy and other low emissions technologies for low-income households, renters, multi-family homes, and racially diverse communities. The Department shall provide to the Committee not later than 90 days after enactment of this Act a briefing on its current efforts to lower barriers for adoption of renewable energy in low-income, racially-diverse, and historically underserved communities to include an update on its electric vehicle community partner projects that support charging infrastructure deployment in urban areas, particularly in underserved and disadvantaged communities.

Energy Star.—The Committee supports the Department's ongoing role in the Energy Star program in its current structure.

SUSTAINABLE TRANSPORTATION

The Vehicle, Bioenergy, and Hydrogen and Fuel Cell Technologies programs fund activities that can reduce American dependence on oil. Annually, vehicles transport 11 billion tons of freight or about \$35,000,000,000 worth of goods each day and move more than three trillion vehicle miles. Research into cutting-edge technologies that will increase the fuel economy of gasoline and diesel fuel vehicles—the vast majority of today's fleet—will allow Americans to spend less on fuel while traveling the same distance. Research into next-generation automotive and fuel cell technologies that power vehicles with domestic energy sources such as natural gas, electricity, biofuels, and hydrogen can likewise dramatically lower the impact of gas prices on Americans.

Coordination.—The Committee directs the Vehicle, Bioenergy, and Hydrogen and Fuel Cell Technologies offices to continue to work closely to develop common metrics to evaluate and compare the costs and energy consumption of advanced transportation technologies with existing technologies and to support a broad portfolio of vehicle technology innovation with a focus on demonstration, field validation, and market transformation activities.

Vehicle Technologies.—The recommendation provides \$396,000,000 for Vehicle Technologies. Within available funds, the recommendation includes \$175,000,000 for Batteries and Electric Drive Technology and not less than \$40,000,000 for electric drive research and development to include electrification technologies. The recommendation provides \$20,000,000 to launch the SuperTruck III program and \$1,000,000 to complete the EcoCAR Mobility Challenge.

The Committee directs the Department to continue to support the Clean Cities program, including competitive grant solicitations to support alternative fuel, infrastructure, and vehicle deployment activities. Within available funds, the recommendation provides \$43,000,000 for Deployment through the Clean Cities Program. When issuing competitive grants in support of these activities, the Department is encouraged to focus on awards that range from \$500,000 to \$1,000,000 and include at least one Clean Cities coalition partner. The Committee encourages the Department to ensure balance in the award of funds to achieve varied aims in fostering broader adoption of clean vehicles and installation of supporting infrastructure. The Committee encourages the Department to explore ways in which the Clean Cities Program can leverage funding to provide greater support for electrification efforts, recognizing the strong emissions reduction and public health benefits delivered by electrification.

Within available funds for Technology Integration, Data, Modeling, and Analysis, the recommendation provides not less than \$10,000,000 to fund a pilot Clean School Bus Grant Program in cooperation with current Electric Vehicle Community Partner Projects. The pilot program shall focus on replacing old diesel school buses with alternative fuel school buses, to include electric school buses. As part of this pilot, the Department shall consider

deployment of recharging infrastructure, planning and technical assistance to school districts, and workforce development and training.

Within available funds, the Committee includes up to \$10,000,000 for medium- and heavy-duty on-road natural gas engine research and development, including energy efficiency improvements, emission after-treatment technologies, fuel system enhancements, and new engine development. The recommendation also includes \$10,000,000 to continue to support improving the energy efficiency of commercial off-road vehicles, of which up to \$5,000,000 is for fluid power systems.

The Committee encourages continued research and development as appropriate in advanced combustion and vehicle engine technology efficiency in propane engines used for light- and medium-duty applications. The recommendation provides up to \$5,000,000 for research on direct injection, engine technology, and use of dimethyl ether as fuel.

Within available funds, the Committee recommends \$10,000,000 for section 131 of the 2007 Energy Independence and Security Act for transportation electrification.

The Committee supports the Department's continued work on electric air flight through its national laboratories and with the National Aeronautical Space Administration (NASA). The Department is directed to provide to the Committee not later than 180 days after enactment of this Act a report, developed in cooperation with NASA, that discusses battery storage needs, challenges, and opportunities in electric air flight. The Committee encourages efforts to overcome technological barriers in demonstrating the capability of higher energy density batteries, development of new, lower cost materials, and the establishment of testing methods and protocols.

The Department shall provide to the Committee not later than 270 days after enactment of this Act a report with recommendations to enhance domestic manufacturing of battery technologies to include recommendations on reducing the size of vehicle batteries and reducing the use of cobalt.

The Committee encourages continued outreach and deployment activities of renewable natural gas and natural gas-powered vehicles.

The Department is reminded that the fiscal year 2020 Act directed a report on describing research and development activities applicable to two-stroke opposed piston engines within the Vehicle Technologies Office and how this research differs from ongoing work within the Department and other agencies. The Committee looks forward to receiving this report expeditiously.

The Committee supports existing work to develop a lifecycle model that fully evaluates energy and emission impacts of advanced and new transportation fuels, the fuel cycle from well to wheel, and the vehicle cycle through material recovery and vehicle disposal. The Committee encourages further research to develop standardized modeling that establishes a tool that can be used for future lifecycle analysis reporting and accounting.

Bioenergy Technologies.—The recommendation provides \$258,000,000 for Bioenergy Technologies. The recommendation provides not less than \$40,000,000 for feedstock supply and logistics,

of which \$5,000,000 is for upgrades at the Biomass Feedstock National User Facility. The recommendation provides \$40,000,000 for advanced algal systems.

Within available funds for Conversion Technologies, the recommendation provides \$20,000,000 to continue the Agile Biology Foundry.

The Committee is supportive of current Bio-Restore efforts and directs continued research on carbon storage in forest lands and the impacts of different forest management practices that may result in preservation and expansion of forests and grasslands.

The Committee is appreciative of research that the Department has supported regarding wet and gaseous waste streams in waste-to-energy projects. The Committee remains interested in understanding how further research and development activities can support baseload power generation using municipal solid waste-to-energy technologies, including to lower the energy costs of wastewater treatment plants. The Department is reminded that the fiscal year 2018 Act required a report on research and development activities that can improve the economic viability of municipal solid waste-to-energy facilities. The Committee looks forward to receiving this report promptly.

The Committee encourages the Department to focus on defining and meeting technical targets that reduce the costs of sustainable aviation fuels through the conversion of low-cost waste carbon as feedstocks. These efforts should consider relevant global supply chains and should be coordinated with national laboratories, other federal agencies, the aviation industry, and universities.

Hydrogen and Fuel Cell Technologies.—The recommendation provides \$150,000,000 for Hydrogen and Fuel Cell Technologies. Within available funds, the Committee recommends not less than \$51,000,000 for Systems Development and Integration, of which not less than \$10,000,000 is for Safety, Codes, and Standards and up to \$10,000,000 is for industry-led manufacturing, research, development, and deployment, with a focus on fuel cell stack manufacturing cost reduction. Within available funds, \$15,000,000 is provided to cost share the Office of Nuclear Energy hydrogen demonstration project. The recommendation provides \$25,000,000 for Fuel Cell Technologies with a focus on reducing fuel cell system cost and improving overall system efficiency and durability.

The Committee remains supportive of H2@Scale activities that enable wide-scale hydrogen production and use as well as resiliency of power generation and transmission, and the recommendation provides not less than \$80,000,000 for these activities. The Department is encouraged to pursue research on large-scale low carbon intensity hydrogen production, including next-generation liquefaction plants, large-scale hydrogen storage, and development systems and equipment for the delivery of hydrogen, including pipelines. Further, the Department is encouraged to research ways to reduce the cost of hydrogen fuel production, storage, and distribution, including lowering the cost and improving durability of key infrastructure hardware.

The Department is directed to continue to research novel on-board hydrogen tank systems, as well as trailer delivery systems to reduce cost of delivered hydrogen and to work with the Depart-

ment of Transportation on coordinating efforts to deploy hydrogen fueling infrastructure.

RENEWABLE ENERGY

The Solar Energy, Wind Energy, Water Power, and Geothermal Technologies programs fund applied research, development, demonstration, and deployment to reduce the cost of renewable energy to economically competitive levels. Research into innovative technologies, such as photovoltaic and concentrating solar technologies, offshore wind, hydropower, and ground heat, can expand energy production from our domestic resources and reduce our dependence on foreign oil. Research efforts have led to affordability and growth in adoption of renewable energy alternatives. Wind has become the cheapest energy source in many regions of the country and since 2010, the average price of wind energy has dropped by 84 percent. In little more than a decade, solar technology now powers more than nine million homes in the United States.

Solar Energy.—The recommendation provides \$280,000,000 for Solar Energy. Within available funds, the recommendation provides \$55,000,000 for Concentrating Solar Power Technologies, \$77,000,000 for Photovoltaic Technologies, \$60,000,000 for Manufacturing Competitiveness, and \$35,000,000 for Balance of System Soft Cost Reduction. Within funds for Concentrating Solar Power Technologies, \$5,000,000 is provided for a demonstration on advanced thermal desalination technologies.

Within funds for Balance of System Soft Cost Reduction, \$1,000,000 is for the Solar Ready Vets program and \$5,000,000 is for the National Community Solar Partnership program to provide technical assistance to low and moderate income individuals, businesses, non-profit organizations, and state, local, and tribal governments to increase use of community solar installations.

The Committee recognizes the importance of improving the reliability and lifetime of photovoltaic systems and encourages the Department to continue to focus on this priority. The recommendation provides \$20,000,000 to advance U.S. leadership in cadmium telluride based solar cell technologies. The Department is directed to provide to the Committee not later than 120 days after enactment of this Act a briefing on its efforts to work cooperatively with industry, university, and laboratory partners and efforts to develop strategies and technologies to support continued evolution and success. The briefing shall include an outline of a policy roadmap to demonstrate how this domestic industry can remain competitive globally while ensuring that cadmium telluride is produced as part of a robust American supply chain and include how funds provided in the fiscal year 2020 were utilized for cadmium telluride technologies.

The recommendation provides \$20,000,000 for a competitive solicitation on perovskites research focused on manufacturing, durability, sustainability, and reducing market barriers, development costs, and technology risks.

Wind Energy.—The recommendation provides \$104,000,000 for Wind Energy. Within available funds, not less than \$10,000,000 is for the Department's work on distributed wind technologies, with a focus on smaller systems for rural communities.

The recommendation provides \$1,000,000 for the Wind for Schools program.

The Committee is aware of the growing interest in offshore wind technology and the need to address key challenges including offshore wind energy infrastructure, supply chain, and transmission issues. The recommendation provides \$5,000,000 for a competitive solicitation for a Center of Excellence focused on regional and national strategies to accelerate and maximize the effectiveness, reliability, and sustainability of U.S. offshore wind deployment and operation with partners from institutions of higher education, research institutions, national laboratories, the private sector, and state and local governments relevant to emerging commercial scale offshore wind deployments. The mission of the Center of Excellence shall not overlap with the mission of the National Offshore Wind Research and Development Consortium.

Within available funds, not less than \$4,000,000 shall be for work on additive manufacturing of large offshore wind blades.

The Committee encourages continued work on the advanced Next-Generation, High-Efficiency, Lightweight Wind Turbine Generator program as early design work has yielded promising results.

The Committee encourages the Department to continue its efforts to decrease the costs and improve performance of land-based wind technologies, to address barriers to deployment of wind turbines with blade lengths greater than 75 meters, and to explore opportunities to improve recycling of wind energy equipment, including to enhance recovery of critical materials.

Water Power.—The recommendation provides \$145,500,000 for Water Power. Within available funds, the recommendation provides not less than \$98,000,000 for marine and hydrokinetic technologies. The Committee supports the Department's emerging focus on bringing marine energy to meet near-term opportunities in the blue economy, thereby accelerating marine energy grid readiness. The recommendation supports research and development, testing, and partnership activities for the Powering the Blue Economy initiative. The Committee encourages the Department to continue to use existing core capabilities within its national laboratories to execute this work, in partnership with universities and industry.

Within available funds, the Committee provides \$40,000,000 for a balanced portfolio of competitive solicitations to support industry- and university-led research, development, and deployment to validate the performance, reliability, maintainability, environmental impact, and cost of marine energy technology components, devices, and systems at a variety of scales. The Committee is concerned that uncertainty in frequency of and access to competitive awards has a unique effect on university capacity to drive needed foundational research and develop the skilled workforce to accelerate marine energy commercialization efforts. The Department is encouraged to consider the need to create a pipeline of well-trained students when determining competitive solicitations.

Within available funds, up to \$10,000,000 is provided to address infrastructure needs at marine energy technology testing sites. The Department shall continue its coordination with the U.S. Navy on marine energy technology development for national security applications at the Wave Energy Test Site and other locations.

The recommendation provides not less than \$39,000,000 for conventional hydropower, of which \$7,000,000 is for the purposes of section 242 of the Energy Policy Act of 2005.

The Committee supports the Department's scoping activities to investigate establishing a hydropower test facility.

The Committee encourages continued research, development, and demonstration of closed-loop pumped storage technologies, projects to improve watershed and ecosystem health, and foundational research to address engineering and operational challenges to wave and tidal power including system design and validation.

The Department is directed to continue research, development, demonstration, and deployment efforts related to innovative, more efficient fish passage technologies and invasive fish species removal. Further, the Committee encourages close coordination between the Department, Corps, Reclamation, and other relevant agencies and industry to reduce the amount of time to permit and deploy new fish passage and invasive fish species removal technologies in rivers and waterways.

The Committee notes the emergence of Ocean Thermal Energy Conversion (OTEC) and Sea Water Air Conditioning (SWAC) systems in the United States and the potential to produce sustainable electricity, reduce carbon dioxide emissions, and diversify fuel options while creating job opportunities. The Department is directed to submit not later than 180 days after enactment of this Act a report on completed, ongoing, and planned OTEC and SWAC projects in non-contiguous states and U.S. territories. The report should also include recommendations to address barriers to expanding OTEC and SWAC technologies.

Geothermal Technologies.—The recommendation provides \$108,500,000 for Geothermal Technologies. The Department is directed to continue its efforts to identify prospective geothermal resources in areas with no obvious surface expressions. Within available funds, up to \$10,000,000 is provided for at least one demonstration project in an area with no obvious surface expressions. The Department is further directed to fund at least one demonstration of geothermal technologies for innovative distribution of ground source heating and cooling of district heating systems. The Department is encouraged to work with the Department of the Interior on opportunities to improve geothermal permitting.

Within available funds, up to \$20,000,000 is provided for the continuation of activities of the Frontier Observatory for Research in Geothermal Energy (FORGE).

ENERGY EFFICIENCY

The Advanced Manufacturing, Building Technologies, Federal Energy Management, and Weatherization and Intergovernmental programs advance cost-effective solutions to reduce energy consumption through increased efficiency. Research into cutting-edge technologies that enhance manufacturing processes, develop advanced materials, and reduce energy use in buildings, homes, and factories can serve the national interest by greatly reducing our energy needs, while also giving American manufacturers an advantage to compete in the global marketplace.

Advanced Manufacturing.—The recommendation provides \$395,000,000 for Advanced Manufacturing. The Committee provides not less than \$5,000,000 for improvements in the steel industry; \$25,000,000 for the Critical Materials Institute; \$25,000,000 for the Energy-Water Desalination Hub; and \$25,000,000 for the Manufacturing Demonstration Facility (MDF) and the Carbon Fiber Test Facility. Within available funds for the MDF, up to \$5,000,000 is for the development of processes for hybrid materials solutions with prescribed microstructural and mechanical properties to enable born qualified and certified components. The Committee supports the Department's ongoing efforts with the MDF to work on bio-based composites, bio-derived materials, and nano/microcellulose research to further capabilities for large scale additive manufacturing.

The Committee provides \$14,000,000 for the Clean Energy Manufacturing Innovation Institutes. The Department is directed to brief the Committee not later than 60 days after enactment of this Act on the status of the Institute for Cybersecurity in Energy Efficient Manufacturing.

The Committee provides \$20,000,000 for process-informed science, design, and engineering of materials and devices in harsh environments, including nuclear environments, and \$10,000,000 for dynamic catalyst science coupled with data analytics.

Within available funds for the Industrial Technical Assistance program, the Committee recommends \$12,000,000 to provide ongoing support for the Combined Heat and Power (CHP) Technical Assistance Partnerships (TAP) and related CHP Technical Partnership activities, including \$5,000,000 for TAPs and \$7,000,000 for related CHP activities, including research and development opportunities. The Committee recommends \$12,000,000 to expand the technical assistance provided by the Industrial Assessment Centers.

The Committee recognizes the great potential for energy savings in water and wastewater treatment systems, which are among the country's largest industrial electricity users. The Committee appreciates the Department's work on technical assistance in this area, and the recommendation provides \$5,000,000 for technical assistance for water and wastewater treatment. In addition, the Committee provides \$20,000,000 for research and development on technologies to achieve energy efficiency at water and wastewater treatment plants, including the deployment of alternative energy sources and the use of biosolids or algae treatment.

The Committee recognizes the need to retain American competitiveness in building the vehicles of the future and to rebuild the domestic automobile industry. Therefore, the Committee recommends \$10,000,000 for the development of advanced tooling for lightweight automotive components to lead the transition to electric vehicle and mobility solutions to meet the national urgency for market adoption. This funding shall also support activities to carry out industry outreach to identify and report on the breadth of need and potential applicants for such grants.

Within available funds, the Committee provides not less than \$10,000,000 for continued work on battery manufacturing research and development that includes strong end user participation.

The Committee notes that drying processes consume approximately 10 percent of the process energy used in the manufacturing sector. The recommendation provides up to \$10,000,000 for the issuance of a competitive solicitation for university- or industry-led teams to improve the efficiency of industrial drying processes and foster new and innovative drying technologies.

The Committee encourages the Department to support improving steel industry competitiveness by integrating advanced 3D computer simulation and visualization, augmented reality and virtual reality, machine learning, and similar technologies for both research and workforce development, as well as collaboration with academic institutions and the steel industry.

The Committee directs the Department to provide to the Committee not later than 60 days after enactment of this Act a briefing on the status of its decarbonization roadmaps in key technology areas to guide research and development at the Department to achieve significant, economical greenhouse gas emission reductions by 2050, including energy efficiency, process electrification, industrial electrification technologies, and carbon capture.

The Committee encourages research and development on carbon capture, utilization, and storage with an emphasis on reuse utilization within industry processes and materials, low-carbon fuels, transformative technology that will allow deep industrial decarbonization, materials efficiency and circular economy, carbon intensity definitions and labeling across key product groups, and the steel industry.

The Committee recognizes the growing need for the use of more sustainable chemistry in consumer and commercial products, which can create significant value as an economic opportunity for U.S. manufacturing. The Committee provides up to \$5,000,000 for efforts related to sustainable chemistry. The Department is directed to provide to the Committee not later than 90 days after enactment of this Act a report exploring how incorporating sustainable chemistry in consumer and commercial manufacturing processes fits within its research and development portfolio and can benefit these processes.

The Committee supports the Department's continued work on the development of aluminum alloy and provides \$5,000,000 for this effort.

The Committee supports the Department's efforts to develop the next generation of energy and manufacturing entrepreneurs through the Lab-Embedded Partnership Programs. The Department is directed to brief the Committee not later than 90 days after enactment of this Act on the status of existing programs and the potential for establishing additional programs at national laboratories or DOE sites.

The Committee recognizes the important contributions made by the clean energy manufacturing institutes. The Committee notes that the fiscal year 2020 National Defense Authorization Act allows the renewal of such institutes and encourages the Department to consider funding renewals for institutes as appropriate.

The Committee supports continued efforts at the Lithium Research Center to convert lithium chloride to lithium hydroxide.

Building Technologies.—The recommendation provides \$285,000,000 for Building Technologies. The Committee directs the Department to maintain existing transactive control research efforts and provides not less than \$30,000,000 for building-grid integration research and development consistent with a transactive energy system and, in coordination with the Office of Electricity transactive energy systems program, integration of renewable energy assets, such as photovoltaics, associated hardware and software development, and the establishment of a living-learning laboratory that integrates education for training of new and current professionals. The Committee includes not less than \$50,000,000 for Commercial Buildings Integration, not less than \$40,000,000 for Residential Buildings Integration, not less than \$140,000,000 for Building Energy Research and Development, and \$25,000,000 for solid-state lighting. If the Secretary finds solid-state lighting technology eligible for the twenty-first century lamp prize, specified under section 655 of the Energy Independence and Security Act of 2007, \$5,000,000 is provided in addition to funds recommended for lighting research and development.

The Committee includes not less than \$55,000,000 for Equipment and Buildings Standards, of which not less than \$10,000,000 is for Building Energy Codes.

The Committee supports continued innovative housing research that encourages the design, construction, and retrofitting of energy efficient, fire hardened, and resilient residential homes and commercial buildings, and the Committee encourages the Building America Program to prioritize funding for resiliency solutions that also meet the energy code and reach codes. The Committee encourages collaborative efforts between the Building America Program and the national laboratories, industry, community-based organizations, and local communities that are making notable progress in developing construction techniques and identifying building materials to actively mitigate fire risk.

The Committee supports novel research and development technologies to impact commercial buildings by developing, building, and evaluating wood-based construction technologies, including off-site manufactured wood-based wall systems for embodied resiliency, energy content, operating energy efficiency, wall moisture profiles, and structural connector durability.

The Committee notes that natural gas plays an important role in meeting the energy needs of U.S. homes and commercial buildings. The Committee encourages the Department to continue to explore research and development that can advance future natural gas systems and appliances to meet consumer demand for high efficiency and environmentally friendly products. The Department is encouraged to continue research, development, and market transformation programs related to the direct use of natural gas and propane gas in residential applications, including gas heat pumps with power generation and water heating, on-site combined heat and power, and on-site micro-combined heat and power to include integration with renewables.

The Committee supports the Department's continued work on thermal and electric heat pumps but remains concerned that further research is needed to test and evaluate these technologies in

the field. The Department is directed to provide the Committee not later than 90 days after enactment of this Act a briefing regarding the status of these efforts and the potential need for a consortium.

Federal Energy Management Program.—The recommendation provides \$40,000,000 for the Federal Energy Management Program. Within available funds, \$2,000,000 is for the Performance Based Contract National Resource Collaborative Initiative to provide expertise to state and local governments to facilitate the expansion of performance-based contracts nation-wide. The Committee awaits the report directed in the fiscal year 2020 Act that outlines the types of technical and financial expertise the Department is suited to provide and includes an analysis of the available infrastructure work that can be accomplished through performance-based contracts over a 10-year period and the resources necessary to achieve this goal. The Department is directed to provide this report not later than 30 days after enactment of this Act.

The recommendation provides \$11,000,000 for the Department to continue its work through the Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) program.

Weatherization and Intergovernmental Programs.—The Committee rejects the proposed elimination of the Weatherization Assistance Program and provides \$310,000,000. The Committee directs the Department to ensure a timely distribution of Weatherization Assistance Program funds. The Committee also encourages the Department to continue its oversight of grantees to ensure that funds are dispersed to weatherization providers in a timely manner.

The Committee provides \$500,000 for technical assistance to continue the Sustainable Wastewater Infrastructure of the Future Accelerator.

The fiscal year 2020 Act directed the Department to provide a briefing on its collaborative efforts with the U.S. Department of Health and Human Services, the U.S. Department of Housing and Urban Development, and the U.S. Department of Veterans Affairs. The Committee is still awaiting this briefing and directs the Department to provide the briefing not later than 30 days after enactment of this Act.

The Committee believes that community-scale weatherization efforts could focus on individual homes or units as part of a broader, innovative “neighborhood” approach to weatherization. The fiscal year 2020 Act directed the Department to provide a report that analyzes the feasibility of community-scale weatherization efforts and the Committee looks forward to a timely receipt of this report. The recommendation provides \$1,500,000 within funds for technical assistance to create a pilot that supports community and neighborhood scale weatherization, including the feasibility of integrating renewable and alternative energy infrastructure. These funds shall be made available to grantees that present targeted and innovative use of these funds to model methods for weatherization integration with various other programs including but not limited to the HOME Investment Partnership Program, Low-Income Home Energy Assistance Program, and programs at the U.S. Department of Veterans Affairs. The Department shall regularly brief the Com-

mittee on progress to implement this pilot project, beginning not later than 90 days after enactment of this Act.

The Committee recognizes that lead exposure is exacerbated by outdated windows and windowpanes and understands that the Department has made progress in replacing leaded windows. The Committee encourages the Department to include benefits from eliminated lead exposure in the calculation of the savings-to-investment ratio. The Department is also encouraged to allow program funds to be used to replace leaded windows with EnergyStar rated windows.

The Committee rejects the proposed elimination of the State Energy Program and provides \$65,000,000.

CORPORATE SUPPORT

The Program Direction, Strategic Programs, and Facilities and Infrastructure budgets provide necessary resources for program and project management across all of EERE's technology programs, for the adoption of technologies to market, and for the operation and upkeep of the National Renewable Energy Laboratory.

Facilities and Infrastructure.—The recommendation provides \$128,740,000 for Facilities and Infrastructure. The Committee supports the continued planned upgrades to the National Wind Energy Technology Center. The Department is encouraged to demonstrate a commitment to operations and maintenance of facilities that support the Department's critical missions within EERE.

Program Direction.—The recommendation provides \$165,000,000 for Program Direction. The Committee acknowledges that the Department is taking steps to hire staff and encourages an aggressive strategy to ensure that EERE is appropriately staffed to carry out and oversee the funds provided by the Committee. The Committee expects continued, regular updates on its progress, beginning not later than 45 days after enactment of this Act.

CYBERSECURITY, ENERGY SECURITY, AND EMERGENCY RESPONSE

Appropriation, 2020	\$156,000,000
Budget estimate, 2021	184,621,000
Recommended, 2021	160,000,000
Comparison:	
Appropriation, 2020	+4,000,000
Budget estimate, 2021	– 24,621,000

The Cybersecurity, Energy Security, and Emergency Response program leads the Department's efforts to secure the nation's energy infrastructure against all hazards, reduce the risks of and impacts from cyber events, and assist with restoration activities. A reliable and resilient power grid is critical to the nation's economic competitiveness and leadership.

Additional direction related to Department-wide crosscutting initiatives is provided under the heading Crosscutting Initiatives in the front matter of Department of Energy.

The Committee places a high priority on ensuring the protection of the grid against cyberattacks and extreme weather events caused by climate change. The Committee appreciates the Department's enhanced focus on these activities. Many different actors, governmental and private, play a role in preventing and responding

to threats to the nation's energy infrastructure. The Committee expects the Department to continue coordinating its efforts with all stakeholders to ensure the highest priority areas are being addressed effectively in its ongoing efforts to protect the grid.

Grid security and resiliency are issues of paramount importance to national security. The nation continues to face global cybersecurity threats from nations such as Iran, Russia, and North Korea, which have launched documented cyberattacks on the country. U.S. electric grid infrastructure remains a top target, and the Committee encourages the Department to work with electric cooperatives, public utility districts, investor-owned utilities, and municipal utilities to plan and build out needed cybersecurity infrastructure.

The Committee is aware of an advanced cyber analytics tool currently utilized within the Department that maps classified and unclassified networks and encourages consideration of this tool for other applications with the Department, as appropriate.

The Committee directs the Department to collaborate with other federal agencies on cybersecurity efforts to ensure effective contributions to the overall success of the federal critical infrastructure security mission.

Cybersecurity for Energy Delivery Systems.—Within available funds, \$5,000,000 is for consequence-driven cyber-informed engineering and \$5,000,000 is for the DarkNet project.

Infrastructure Security and Energy Restoration.—The fiscal year 2020 Act directed the Department to provide a report explaining the rationale for establishing any new testing capabilities designed to examine the vulnerabilities of the energy sector from threats such as electromagnetic pulse and geomagnetic disturbances and an inventory of existing capabilities that could serve this function. The Committee is still awaiting this report and directs the Department to provide the report not later than 30 days after enactment of this Act and prior to any funds being obligated for the establishment of any new testing capabilities.

ELECTRICITY

Appropriation, 2020	\$190,000,000
Budget estimate, 2021	195,045,000
Recommended, 2021	195,000,000
Comparison:	
Appropriation, 2020	+5,000,000
Budget estimate, 2021	– 45,000

The Office of Electricity advances technologies and provides operational support to increase the efficiency and technological advancement of the nation's electricity delivery system. The power grid employs aging technologies at a time when power demands and the deployment of new energy technologies are imposing new stresses on the system. This program aims to develop a modern power grid by advancing resilient power distribution systems, intelligent and high-efficiency grid components, and energy storage systems.

Additional direction related to Department-wide crosscutting initiatives is provided under the heading Crosscutting Initiatives in the front matter of Department of Energy.

Transmission Reliability and Resilience.—Within available funds, the recommendation provides not less than \$1,000,000 for sensors and analytics technologies.

Within available funds, the recommendation provides not less than \$500,000 for the Department to designate an appropriate section of grid or distinct microgrid to undertake a field test of utility poles constructed of composite materials to determine the benefit, if any, to overall grid infrastructure resilience from environmental factors. The Department shall submit to the Committee not later than 180 days after enactment of this Act a report that assesses the performance of composite poles, taking into account price; durability; resilience to the effects of extreme weather; ongoing maintenance costs; and ease of repair, preplacement, or upgrade, giving special consideration to performance in watersheds and flood-prone environments.

The fiscal year 2020 Act directed the Department to provide a report outlining the barriers and opportunities for technologies that provide increased, more efficient, or more effective delivery over the existing transmission network. The Committee is still awaiting this report and directs the Department to provide the report not later than 30 days after enactment of this Act.

The Committee notes the potential to more effectively manage the bulk electric power system by adjusting ratings of power lines through dynamic line rating equipment. The Department is directed to submit to the Committee not later than 180 days after enacted of this Act a report on ways to maximize utilization of the existing electricity delivery system by enabling dynamic line ratings, dynamically controlling the flow of electricity, and optimizing electricity delivery system topology. The report shall consider utilization of sensors, development of power flow control devices and analytical tools, and novel control mechanisms that would allow maximized transmission of electricity and improvement of grid resilience by adjusting line ratings according to weather conditions, controlling flow of electricity with power flow control devices, and optimizing topology of electricity delivery systems through dynamically switching network configuration.

The Committee is interested in the possible impacts of increased bulk transmission efficiency in general, and of dynamic line rating technology specifically, on retail power rates. The Department is directed to conduct a case study on regional, wide-spread deployment of dynamic line rating technologies to assess the potential benefits and costs. The Department is directed to submit to the Committee not later than 180 days after enactment of this Act a report that summarizes the findings of the case study.

Resilient Distribution Systems.—Within available funds, the Committee directs the Department to continue efforts to support the integration of sensors into the nation's electric distribution systems, fundamental research and field validation of microgrid controllers and systems, and transactive energy concepts, including studies and evaluations of energy usage behavior in response to price signals. The Committee places a high priority on addressing the challenges facing the electric power grid by developing the innovative technologies, tools, and techniques to modernize the distribution portion of the electricity delivery system. Resilient Dis-

tribution Systems pursues strategic investments to improve reliability, resilience, outage, recovery, and operational efficiency, building upon previous and ongoing grid modernization efforts.

In addition to emerging technologies for distributed grids, the Committee recommends that currently available distributed fuels, such as propane fueled microgrids, combined heat and power, and demand response, be evaluated.

Within available funds, the Committee directs the Department to support the demonstration of interconnected systems, including in rural areas, of microgrids that operate independently and are ideal for providing energy assurance. The microgrid demonstrations should feature solar generation, storage, smart controls, and other grid technologies.

NUCLEAR ENERGY

Appropriation, 2020	\$1,493,408,000
Budget estimate, 2021	1,179,931,000
Recommended, 2021	1,435,800,000
Comparison:	
Appropriation, 2020	– 57,608,000
Budget estimate, 2021	+255,869,000

Nuclear power generates approximately one-fifth of the nation's electricity and continues to be an important zero carbon-emissions energy source. The Department of Energy's Nuclear Energy (NE) program invests in research, development, and demonstration activities that develop the next generation of clean and safe reactors, further improve the safety and economic viability of our current reactor fleet and contribute to the nation's long-term leadership in the global nuclear power industry.

Additional direction related to Department-wide crosscutting initiatives is provided under the heading Crosscutting Initiatives in the front matter of Department of Energy.

Given past concerns about the Department's use of flexibility in funds previously provided, the Committee has continued to include additional control points for fiscal year 2021. The Department is directed to submit its fiscal year 2022 budget request using this budget structure.

Nuclear Energy University Program.—Since 2009, the Department has allocated up to 20 percent of funds appropriated to Nuclear Energy Research and Development (NEUP) programs to fund university-led R&D and university infrastructure projects through an open, competitive solicitation process using formally certified peer reviewers. The Department is directed to continue this practice, with not less than \$40,000,000 for R&D activities performed at U.S. colleges and universities. The Department is directed to provide the Committee quarterly briefings on the status of NEUP and the university work being funded, beginning not later than 90 days after enactment of this Act.

Integrated University Program.—The Committee is alarmed by the statistics highlighting the severe shortage of highly trained nuclear specialists and the lack of academic programs to train and prepare individuals for work in the nuclear sector. The recommendation includes \$5,000,000 to continue the Integrated Uni-

versity Program, which is critical to ensuring the nation's nuclear science and engineering workforce in future years.

Uranium Reserve.—The budget request proposes to establish a new Uranium Reserve. The Department has been unable to provide specific information about how it would implement the program, including in congressional justifications, briefings, and in responses to questions from the Committee about how the funds would be spent, including the process for the purchase, conversion, or sale of uranium in a reserve. The Committee is concerned about the lack of justification for a reserve and potential market implications of establishing a reserve for commercial purposes. The Committee also notes that the Department will require a domestic source of uranium for defense purposes in the coming decades. The Department is directed to submit to the Committee not later than 180 days after enactment of this Act a plan for the proposed establishment of a uranium reserve. The plan shall include the legal authorities in place or needed to establish and operate a uranium reserve, including the purchase, conversion, and sale of uranium; a ten-year implementation plan of the activities for establishment and operations of a uranium reserve; and a ten-year cost estimate. No funds are provided for the establishment of a uranium reserve, and no funds may be spent on activities related to the establishment of a uranium reserve other than the development of the required plan.

NUCLEAR ENERGY ENABLING TECHNOLOGIES

Nuclear Science User Facilities.—Within available funds, the recommendation includes not less than \$10,000,000 for nuclear energy computation system and support and not less than \$3,000,000 for Nuclear Materials Discovery and Qualification.

Crosscutting Technology Development.—Within available funds, the recommendation includes \$5,000,000 for research collaborations between research universities and national laboratories utilizing existing capabilities and infrastructure focused on the benefits, as well as vulnerabilities of digital instrumentation for existing and future nuclear reactors, including the use of new approaches, such as predictive analytics, machine learning, and artificial intelligence, to improve reactor safety and performance and address cybersecurity issues. The Department is encouraged to continue activities related to materials development, including through public-private partnerships to develop new materials the nuclear industry will need in the future.

FUEL CYCLE RESEARCH AND DEVELOPMENT

Material Recovery and Waste Form Development.—Within available funds, the recommendation provides not less than \$10,000,000 for EBR-II Processing for High-Assay Low Enriched Uranium (HALEU).

Accident Tolerant Fuels.—The recommendation provides not less than \$55,600,000 to continue the participation of three industry-led teams for the cost-shared research and development program, and the recommendation provides not less than \$20,000,000 to support accident tolerant fuels development at the national laboratories and other facilities, including the Advanced Test Reactor and Tran-

sient Reactor Test Facility. The recommendation provides \$15,000,000 for industry-led efforts for testing, code development, and licensing of higher-enriched and higher burnup fuels. The Department is encouraged to continue development of silicon carbide ceramic matrix composite cladding to be used in light water reactors, especially through public-private partnerships. The Committee encourages the Department to evaluate accident tolerant fuel irradiation testing capability gaps resulting from the closure of the Halden reactor.

Used Nuclear Fuel Disposition R&D.—The Committee is aware of the Department's ongoing research and development efforts regarding the safe transportation of spent nuclear fuel and directs the Department to continue to study the behavior of spent fuel under transportation conditions and opportunities to improve safety of spent fuel rods during transportation.

Integrated Waste Management System.—Within available funds, the Department is directed to continue site preparation activities at stranded sites, to evaluate the re-initiation of regional transport, and undertake transportation coordination efforts. Additionally, the Committee notes that spent nuclear fuel is in many cases located in or near cities and Indian reservations. As the Department continues to plan for an integrated waste management system for our nation's spent nuclear fuel, the Committee encourages the Department to include planning for the removal of spent nuclear fuel from sites located near cities and Indian reservations.

REACTOR CONCEPTS RESEARCH, DEVELOPMENT, AND DEMONSTRATION

Advanced Small Modular Reactor RD&D.—Within available funds, the recommendation provides \$10,000,000 for the Joint Use Modular Program.

Light Water Reactor Sustainability.—Within available funds, the recommendation provides \$10,000,000 to support new or previously awarded hydrogen demonstration projects.

Advanced Reactor Technologies.—Within available funds, the recommendation provides \$20,000,000 for public-private partnerships focused on advancing reactor designs towards demonstration phase and not less than \$15,000,000 for MW-scale reactor research and development.

ADVANCED REACTORS DEMONSTRATION PROGRAM

The Committee is encouraged by the Department's pace of activities to establish the Advanced Reactors Demonstration Program. This program will help facilitate the accelerated development and deployment of advanced reactors. The Department is directed to continue to streamline its procurement process and aggressively act to ensure implementation is not delayed.

Advanced Reactor Demonstrations.—The Department is reminded to focus resources on partners able to provide the required portion of cost share and capable of project delivery in the next five to seven years.

INFRASTRUCTURE

INL Facilities Operations and Maintenance.—Within available funds, the recommendation includes \$280,000,000 for INL Nuclear Facilities Operations and Maintenance to support the reliability and sustainability of the Materials and Fuels Complex (MFC) and the Advanced Test Reactor (ATR).

Idaho Sitewide Safeguard and Security.—The recommendation includes \$137,800,000 for Idaho Sitewide Safeguards and Security, the same as the budget request.

FOSSIL ENERGY RESEARCH AND DEVELOPMENT

Appropriation, 2020	\$750,000,000
Budget estimate, 2021	730,601,000
Recommended, 2021	727,500,000
Comparison:	
Appropriation, 2020	– 22,500,000
Budget estimate, 2021	– 3,101,000

Fossil energy resources, such as coal, oil, and natural gas, generate a significant portion of the nation's electricity and will continue to contribute to those needs for the foreseeable future. The Fossil Energy Research and Development program funds research, development, and demonstration activities to improve existing technologies and to develop next-generation systems in the full spectrum of fossil energy areas. The activities funded within this program advance our nation's position as a leader in energy technologies and ensure the safe, reliable, efficient, and environmentally sound use of fossil energy resources.

Additional direction related to Department-wide crosscutting initiatives is provided under the heading Crosscutting Initiatives in the front matter of Department of Energy.

Consistent with direction provided in previous fiscal years, the Committee does not support the closure of any National Energy Technology Laboratory (NETL) site and provides no funds to plan, develop, implement, or pursue the consolidation or closure of any of the NETL sites.

The Committee encourages the Department to develop educational partnerships focused on carbon capture and storage, methane capture and storage, and emission mitigation technologies. The Committee directs the Department to submit to the Committee not later than 90 days after enactment of this Act a report detailing possible education partnerships in these areas.

The Committee notes that liquefied petroleum gases, including propane, are increasingly being generated from renewable sources. The recommendation provides up to \$4,000,000 for a demonstration project to show the increased viability of renewable liquefied petroleum gases.

CCUS AND POWER SYSTEMS

Carbon capture, utilization, and storage is a process that captures carbon dioxide emissions from sources and either reuses or stores it so it will not enter the atmosphere. The potential for these technologies is considerable, and the use of these technologies will

decrease the costs for mitigating climate change in addition to deploying clean energy and energy efficient technologies.

The Committee encourages the Department to continue to support the Clean Energy Research Consortium: Advanced Coal Technology Consortium program. The Committee encourages the Department to continue support for the National Carbon Capture Center.

Carbon Capture.—The Committee encourages the Department to focus its efforts on improving the efficiency and decreasing the costs of carbon capture technologies, demonstrating carbon capture technologies, and identifying how these technologies can be integrated with business models and operations. This focus includes small- and large-scale pilot testing of technologies moving through the program pipeline and retrofit activities on the existing fleet. The Committee directs the Department to increase public-private partnerships and natural gas-based carbon capture research program opportunities.

Within available funds, the recommendation provides not less than \$8,000,000 for research and optimization of carbon capture technologies at industrial facilities and not less than \$10,000,000 for research and optimization of carbon capture technologies for natural gas power systems.

Within available funds, the recommendation provides not less than \$15,000,000 for a new solicitation for Front-End Engineering and Design (FEED) studies of commercial-scale carbon capture projects that generate carbon dioxide suitable for geologic storage, with at least two of these studies supporting projects at industrial facilities such as a steel or cement facility. A FEED study shall incorporate work from feasibility studies and testing to provide specific project definition; engineering including specifications; scopes of work; schedules for the detailed design, material procurement, and construction; estimate of total installed cost for the project; and environmental and non-environmental permitting requirements.

Carbon Utilization.—The recommendation provides separate funding for carbon utilization activities that were previously funded through Carbon Storage, and the recommendation funds Carbon Use and Reuse activities under Carbon Utilization. The Committee anticipates carbon utilization technologies to mature in the coming years. Therefore, the Committee directs the Department to significantly advance carbon utilization activities over the next five years with specific technology goals and milestones to ensure that the Department is using its resources in the most efficient manner.

The recommendation includes \$30,000,000 for Carbon Utilization for research and development activities to support valuable and innovative uses of captured carbon, including biological utilization by the conversion of carbon dioxide to higher-value products such as chemicals, plastics, building materials, curing for cement, and the integration of carbon utilization technologies with fossil fuel power plants, such as biological conversion systems.

The recommendation provides not less than \$8,000,000 for a competitive solicitation to conduct tests of technologies for carbon dioxide absorption integrated with algae systems for capturing and reusing carbon dioxide to produce useful fuels and chemicals, giving priority for teams with university participants.

Carbon Storage.—The Carbon Storage subprogram shall focus on the development of technologies for the safe and secure storage of captured carbon dioxide. The recommendation funds Carbon Use and Reuse activities previously funded under Carbon Storage under Carbon Utilization.

Advanced Energy Systems.—Within available funds, the recommendation provides \$30,000,000 for Solid Oxide Fuel Cell (SOFC) systems for distributed and central power generation, electrolysis, SOFC combined heat and power, and storage applications.

Within available funds, the recommendation provides \$35,000,000 for Advanced Turbines, and the Committee directs the Department to use these funds for a research and development program to improve the efficiency of gas turbines used in power generation systems, working cooperatively with industry, universities, and other appropriate parties.

Within available funds, the recommendation provides up to \$15,000,000 for the Coal FIRST Initiative.

Cross Cutting Research.—Within available funds, the recommendation includes not less than \$40,000,000 for plant optimization technologies, including materials R&D, water management R&D, and sensors and controls. Within available funds for materials R&D, the recommendation includes \$21,000,000 for the Advanced Ultrasupercritical Program to fabricate, qualify, and develop domestic suppliers capable of producing components from high temperature materials.

Within available funds, the recommendation includes \$29,500,000 to develop economically competitive and sustainable domestic supply of rare earth elements and critical materials to assist in maintaining economic growth and national security.

NETL Coal Research and Development.—The recommendation includes the budget request proposal to move the Critical Materials Initiative to Cross Cutting Research. The recommendation provides funds for the remaining activities previously funded by NETL Coal Research and Development in the funding under NETL Research and Operations and NETL Infrastructure.

Supercritical Transformational Electric Power (STEP) Generation.—Within available funds, the Committee supports efforts, consistent with the original scope of work, to complete the necessary design and construction of the 10-MW pilot and to conduct the necessary testing for the facility. The Committee is concerned about repeated cost overruns for the project, and the Department is directed to brief the Committee not later than 90 days after enactment of this Act and prior to the obligation of any funds on an updated scope and cost profile that incorporates all past, current, and potential future cost increases necessary to complete the project. The recommendation provides additional funds for competitively awarded research and development activities, coordinated with the Offices of Nuclear Energy and Energy Efficiency and Renewable Energy, to advance the use of supercritical power cycles.

NATURAL GAS TECHNOLOGIES

Research.—Within available funds, the recommendation provides up to \$5,200,000 for the Risk Based Data Management System. The Department is directed to submit to the Committee not later

than 180 days after enactment of this Act a plan on how to fully transition the functionality and responsibility of the Risk Based Data Management System to states as called for in the budget request.

Within available funds, the recommendation provides \$15,000,000 for Emissions Mitigation from Midstream Infrastructure and \$7,000,000 for Emissions Quantification from Natural Gas Infrastructure.

The Department is encouraged to explore technologies that curtail methane gas emissions from flaring and venting in shale formations. The fiscal year 2020 Act directed the Department to provide a report on these activities. The Committee is still awaiting this report and directs the Department to provide the report not later than 30 days after enactment of this Act.

The Committee encourages coordination with industry and the Pipeline and Hazardous Materials Safety Administration on methane leak detection technology development. The Committee remains supportive of investment in smart pipeline sensors and controls, internal pipeline inspection and repair, and composite and advanced material science technologies. The Committee encourages the Department to consider expanded use of gas pressure monitoring, both real time and hourly, in distribution systems to improve system integrity and safety.

The Department is directed to submit to the Committee not later than 90 days of enactment of this Act a research plan for natural gas utilization for purposes in addition to power generation and direct use applications. Natural gas utilization can include processes for converting natural gas and carbon-based feedstocks to higher-value products—including chemicals, liquids and hydrogen. The plan shall include research and development activities, including materials research, artificial intelligence and machine learning tools, gas conversion and separation technologies, new process flowsheets such as modular units, and novel uses for light hydrocarbons to produce commercial and industrial products, and demonstration activities that may be needed to test the performance and cost-effectiveness of new gas conversion technologies.

The recommendation includes up to \$5,000,000 for university research and field investigations in the Gulf of Mexico to confirm the nature, regional context, environmental impacts, and hydrocarbon system behavior of gas hydrate deposits and the impacts of produced water.

Within available funds, the Department is encouraged to coordinate with other agencies and states to maximize the benefits of U.S. unconventional natural gas liquids production.

UNCONVENTIONAL FOSSIL ENERGY TECHNOLOGIES

The Committee recognizes the Department's continued investment in research and development on unconventional fossil energy technologies, including support for field laboratories.

The Committee directs the Department to submit to the Committee not later than 180 days after enactment of this Act a report assessing the potential of using solid propellant fuel to generate gas, which will drive hydraulic systems to shut off unwanted flows or blow outs of oil or gas from onshore or offshore wells in the

shortest possible time with the highest possible reliability and efficiency. The report shall include a research plan if additional work in this area is deemed merited after the Department's assessment.

The Committee understands the Department, in partnership with the Department of Transportation, has completed its study of the volatility of crude oils, including oil from the Bakken Shale in North Dakota, to accurately assess and characterize volatility before transporting. The Department is directed to brief the Committee not later than 90 days after enactment of this Act on the findings and recommendations of the Crude Oil Characterization Study.

NAVAL PETROLEUM AND OIL SHALE RESERVES

Appropriation, 2020	\$14,000,000
Budget estimate, 2021	13,006,000
Recommended, 2021	13,006,000
Comparison:	
Appropriation, 2020	- 994,000
Budget estimate, 2021	- - -

The Naval Petroleum and Oil Shale Reserves no longer serve the national defense purpose envisioned in the early 1900's, and consequently the National Defense Authorization Act for fiscal year 1996 required the sale of the government's interest in the Naval Petroleum Reserve 1 (NPR-1). To comply with this requirement, the Elk Hills field in California was sold to Occidental Petroleum Corporation in 1998. Following the sale of Elk Hills, the transfer of the oil shale reserves, and transfer of administrative jurisdiction and environmental remediation of the Naval Petroleum Reserve 2 (NPR-2) to the Department of the Interior, the Department retained one Naval Petroleum Reserve property, the Naval Petroleum Reserve 3 (NPR-3) in Wyoming (Teapot Dome field). The Department issued a disposition plan for NPR-3 in June 2013 and began implementation of the plan in fiscal year 2014. Transfer of NPR-3 to a new owner occurred in fiscal year 2015.

STRATEGIC PETROLEUM RESERVE

Appropriation, 2020	\$195,000,000
Budget estimate, 2021	187,081,000
Recommended, 2021	195,000,000
Comparison:	
Appropriation, 2020	- - -
Budget estimate, 2021	+7,919,000

The mission of the Strategic Petroleum Reserve is to store petroleum to reduce the adverse economic impact of a major petroleum supply interruption to the United States and to carry out obligations under the international energy program.

The recommendation includes funding to address facilities development and operations, including physical security and cavern integrity, and the recommendation provides \$20,000,000 to maintain 1,000,000 barrels of gasoline blendstock in the Northeast Gasoline Supply Reserve.

No funding is requested for the establishment of a new regional petroleum product reserve, and no funding is provided for this purpose. Further, the Department may not establish any new regional petroleum product reserves unless funding for such a proposed re-

ADVANCED RESEARCH PROJECTS AGENCY—ENERGY

Appropriation, 2020	\$425,000,000
Budget estimate, 2021	– 310,744,000
Recommended, 2021	435,000,000
Comparison:	
Appropriation, 2020	+10,000,000
Budget estimate, 2021	+745,744,000

The Advanced Research Projects Agency—Energy (ARPA–E) supports research aimed at rapidly developing energy technologies whose development and commercialization are too risky to attract sufficient private sector investment but are capable of significantly changing the energy sector to address our critical economic, environmental, and energy security challenges. The technology breakthroughs funded by ARPA–E have significant commercial impact and have received billions of dollars in private-sector funding to continue to advance those technologies toward the marketplace. Projects funded by ARPA–E include wide-ranging areas such as production processes for transportation fuel alternatives that can reduce our dependence on imported oil, heating and cooling technologies with exceptionally high energy efficiency, and low-cost electric aviation technologies.

The Committee again strongly rejects the short-sighted proposal to terminate ARPA–E. Instead, the Committee continues investment in this transformational program and directs the Department to continue to spend funds provided on research and development and program direction. The Department shall not use any appropriated funds to plan or execute the termination of ARPA–E. The Department is directed to disburse funds appropriated for ARPA–E within a reasonable time period.

TITLE 17 INNOVATIVE TECHNOLOGY LOAN GUARANTEE PROGRAM

ADMINISTRATIVE EXPENSES

GROSS APPROPRIATION

Appropriation, 2020	\$32,000,000
Budget estimate, 2021	3,000,000
Recommended, 2021	32,000,000
Comparison:	
Appropriation, 2020	— — —
Budget estimate, 2021	+29,000,000

OFFSETTING COLLECTIONS

Appropriation, 2020	– \$3,000,000
Budget estimate, 2021	– 3,000,000
Recommended, 2021	– 3,000,000
Comparison:	
Appropriation, 2020	— — —
Budget estimate, 2021	— — —

RESCISSIONS AND CANCELLATIONS

Appropriation, 2020	\$ — — —
Budget estimate, 2021	– 384,659,000
Recommended, 2021	— — —
Comparison:	
Appropriation, 2020	— — —
Budget estimate, 2021	+384,659,000

DEPARTMENT OF ENERGY
(Amounts in thousands)

	FY 2020 Enacted	FY 2021 Request	Bill	Bill vs. Enacted	Bill vs. Request
ENERGY PROGRAMS					
ENERGY EFFICIENCY AND RENEWABLE ENERGY					
Sustainable Transportation:					
Vehicle Technologies.....	396,000	74,400	396,000	---	+321,600
Bioenergy Technologies.....	259,500	44,500	258,000	-1,500	+213,500
Hydrogen and Fuel Cell Technologies.....	150,000	42,000	150,000	---	+108,000
Subtotal, Sustainable Transportation.....	805,500	160,900	804,000	-1,500	+643,100
Renewable Energy:					
Solar Energy Technologies.....	280,000	67,000	280,000	---	+213,000
Wind Energy Technologies.....	104,000	22,100	104,000	---	+81,900
Water Power Technologies.....	148,000	45,000	145,500	-2,500	+100,500
Geothermal Technologies.....	110,000	26,000	108,500	-1,500	+82,500
Subtotal, Renewable Energy.....	642,000	160,100	638,000	-4,000	+477,900
Energy Efficiency:					
Advanced Manufacturing.....	395,000	94,600	395,000	---	+300,400
Building Technologies.....	285,000	61,000	285,000	---	+224,000
Federal Energy Management Program.....	40,000	8,400	40,000	---	+31,600
Weatherization:					
Weatherization assistance program.....	305,000	---	310,000	+5,000	+310,000
Training and technical assistance.....	3,500	---	5,000	+1,500	+5,000
Subtotal, Weatherization.....	308,500	---	315,000	+6,500	+315,000

DEPARTMENT OF ENERGY
(Amounts in thousands)

	FY 2020 Enacted	FY 2021 Request	Bill	Bill vs. Enacted	Bill vs. Request
State Energy Program Grants.....	62,500	---	65,000	+2,500	+65,000
Subtotal, Weatherization and Intergovernmental Program.....	371,000	---	380,000	+9,000	+380,000
Subtotal, Energy Efficiency.....	1,091,000	164,000	1,100,000	+9,000	+936,000
Corporate Support:					
Facilities and Infrastructure:					
National Renewable Energy Laboratory (NREL).....	130,000	107,000	128,740	-1,260	+21,740
Program Direction	165,000	122,563	165,000	---	+42,437
Strategic Programs.....	14,500	5,000	14,500	---	+9,500
Subtotal, Corporate Support.....	309,500	234,563	308,240	-1,260	+73,677
Subtotal, Energy Efficiency and Renewable Energy..	2,848,000	719,563	2,850,240	+2,240	+2,130,677
Rescission.....	-58,000	---	-2,240	+55,760	-2,240
TOTAL, ENERGY EFFICENCY AND RENEWABLE ENERGY.....	2,790,000	719,563	2,848,000	+58,000	+2,128,437
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DEPARTMENT OF ENERGY
(Amounts in thousands)

	FY 2020 Enacted	FY 2021 Request	Bill	Bill vs. Enacted	Bill vs. Request
CYBERSECURITY, ENERGY SECURITY, AND EMERGENCY RESPONSE					
Cybersecurity for Energy Delivery Systems.....	95,000	103,100	99,000	+4,000	-4,100
Infrastructure Security and Energy Restoration.....	48,000	70,000	48,000	---	-22,000
Program Direction.....	13,000	11,521	13,000	---	+1,479
TOTAL, CYBERSECURITY, ENERGY SECURITY, AND EMERGENCY RESPONSE.....	156,000	184,621	160,000	+4,000	-24,621
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ELECTRICITY					
Transmission Reliability and Resilience.....	57,000	55,950	50,000	-7,000	-5,950
Resilient Distribution Systems.....	45,000	18,300	35,000	-10,000	+16,700
Energy Storage:					
Research.....	55,000	43,500	60,000	+5,000	+16,500
Construction: 20-OE-100 Grid Storage Launchpad.....	1,000	40,000	15,500	+14,500	-24,500
Subtotal, Energy Storage.....	56,000	83,500	75,500	+19,500	-8,000
Transformer Resilience and Advanced Components.....	7,000	9,000	7,000	---	-2,000
DCEI Energy Mission Assurance.....	---	1,650	1,650	+1,650	---
Transmission Permitting and Technical Assistance.....	7,000	7,000	7,000	---	---
Program Direction.....	18,000	19,645	18,850	+850	-795
TOTAL, ELECTRICITY.....	190,000	195,045	195,000	+5,000	-45
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DEPARTMENT OF ENERGY
(Amounts in thousands)

	FY 2020 Enacted	FY 2021 Request	Bill	Bill vs. Enacted	Bill vs. Request

NUCLEAR ENERGY					
Research and Development:					
Integrated University Program.....	5,000	---	5,000	---	+5,000
STEP R&D.....	5,000	---	5,000	---	+5,000

Nuclear Energy Enabling Technologies:					
Crosscutting Technology Development.....	25,000	28,000	28,000	+3,000	---
Joint Modeling and Simulation Program.....	35,000	30,000	30,000	-5,000	---
Nuclear Science User Facilities.....	30,000	28,000	30,000	---	+2,000
Transformational Challenger Reactor.....	23,450	30,000	---	-23,450	-30,000

Subtotal, Nuclear Energy Enabling Technologies..	113,450	116,000	88,000	-25,450	-28,000

Fuel Cycle Research and Development:					
Front End Fuel Cycle:					
Mining, Conversion, and Transportation.....	2,000	2,000	2,000	---	---
Civil Nuclear Enrichment.....	40,000	40,000	40,000	---	---

Subtotal, Front End Fuel Cycle.....	42,000	42,000	42,000	---	---

Material Recovery and Waste Form Development.....	30,000	12,000	24,000	-6,000	+12,000
Advanced Fuels:					
Accident Tolerant Fuels.....	95,600	36,000	99,000	+3,400	+63,000
Triso Fuel and Graphite Qualification.....	30,000	34,000	34,000	+4,000	---

Subtotal, Advanced Fuels.....	125,600	70,000	133,000	+7,400	+63,000

Fuel Cycle Laboratory R&D.....	20,000	3,000	10,000	-10,000	+7,000

DEPARTMENT OF ENERGY
(Amounts in thousands)

	FY 2020 Enacted	FY 2021 Request	Bill	Bill vs. Enacted	Bill vs. Request
Used Nuclear Fuel Disposition R&D.....	62,500	60,000	62,500	---	+2,500
Integrated Waste Management System.....	25,000	---	25,000	---	+25,000
Subtotal, Fuel Cycle Research and Development...	305,100	187,000	296,500	-8,600	+109,500
Reactor Concepts RD&D:					
Advanced Small Modular Reactor RD&D.....	100,000	10,000	105,000	+5,000	+95,000
Light Water Reactor Sustainability.....	47,000	30,500	47,000	---	+16,500
Advanced Reactor Technologies.....	55,000	71,000	50,000	-5,000	-21,000
Versatile Advanced Test Reactor R&D.....	65,000	---	---	-65,000	---
Subtotal, Reactor Concepts RD&D.....	267,000	111,500	202,000	-65,000	+90,500
Versatile Test Reactor Project:					
Other Project Costs.....	---	262,000	65,000	+65,000	-197,000
21-E-200 VTR Project.....	---	33,000	---	---	-33,000
Subtotal, Versatile Test Reactor Project.....	---	295,000	65,000	+65,000	-230,000
Advanced Reactors Demonstration Program:					
National Reactor Innovation Center.....	20,000	10,000	30,000	+10,000	+20,000
Demonstration 1.....	80,000	---	80,000	---	+80,000
Demonstration 2.....	80,000	---	80,000	---	+80,000
Risk Reduction for Future Demonstrations.....	30,000	---	30,000	---	+30,000

DEPARTMENT OF ENERGY
(Amounts in thousands)

	FY 2020 Enacted	FY 2021 Request	Bill	Bill vs. Enacted	Bill vs. Request
Regulatory Development.....	15,000	7,500	15,000	---	+7,500
Advanced Reactors Safeguards.....	5,000	2,500	5,000	---	+2,500
Subtotal, Advanced Reactors Demonstration Program.....	230,000	20,000	240,000	+10,000	+220,000
Subtotal, Research and Development.....	925,550	729,500	901,500	-24,050	+172,000
Infrastructure:					
ORNL Nuclear Facilities O&M.....	20,000	---	---	-20,000	---
INL Facilities Operations and Maintenance.....	280,000	208,000	280,000	---	+72,000
Research Reactor Infrastructure	9,000	11,500	11,500	+2,500	---
Construction:					
16-E-200 Sample Preparation Laboratory, INL.....	25,450	18,000	26,000	+550	+8,000
Subtotal, Construction.....	25,450	18,000	26,000	+550	+8,000
Subtotal, Infrastructure.....	334,450	237,500	317,500	-16,950	+80,000
Idaho Sitewide Safeguards and Security.....	153,408	137,800	137,800	-15,608	---
Program Direction.....	80,000	75,131	79,000	-1,000	+3,869
TOTAL, NUCLEAR ENERGY.....	1,493,408	1,179,931	1,435,800	-57,608	+255,869
URANIUM RESERVE PROGRAM.....	---	150,000	---	---	-150,000

DEPARTMENT OF ENERGY
(Amounts in thousands)

	FY 2020 Enacted	FY 2021 Request	Bill	Bill vs. Enacted	Bill vs. Request
FOSSIL ENERGY RESEARCH AND DEVELOPMENT					
CCUS and Power Systems:					
Carbon Capture.....	117,800	78,000	150,500	+32,700	+72,500
Carbon Utilization.....	---	15,000	30,000	+30,000	+15,000
Carbon Storage.....	100,000	30,000	95,000	-5,000	+65,000
Advanced Energy Systems.....	120,000	285,400	80,000	-40,000	-205,400
Cross Cutting Research.....	56,000	101,750	85,000	+29,000	-16,750
NETL Coal Research and Development	61,000	36,000	---	-61,000	-36,000
STEP (Supercritical CO2).....	16,000	---	20,000	+4,000	+20,000
Transformational Coal Pilots.....	20,000	---	10,000	-10,000	+10,000
Subtotal, CCUS and Power Systems.....	490,800	546,150	470,500	-20,300	-75,650
Natural Gas Technologies:					
Research.....	51,000	15,000	37,000	-14,000	+22,000
Unconventional Fossil Energy Technologies from					
Petroleum - Oil Technologies.....	46,000	17,000	17,000	-29,000	---
Program Direction.....	61,500	62,451	62,115	+615	-336
Special Recruitment Programs.....	700	900	700	---	-200
NETL Research and Operations.....	50,000	46,000	86,000	+36,000	+40,000
NETL Infrastructure.....	50,000	43,100	54,185	+4,185	+11,085
TOTAL, FOSSIL ENERGY RESEARCH AND DEVELOPMENT.....	750,000	730,601	727,500	-22,500	-3,101
NAVAL PETROLEUM AND OIL SHALE RESERVES.....	14,000	13,006	13,006	-994	---

DEPARTMENT OF ENERGY
(Amounts in thousands)

	FY 2020 Enacted	FY 2021 Request	Bill	Bill vs. Enacted	Bill vs. Request
Revitalization, SLAC	500	2,000	2,000	+1,500	---
20-SC-80 Utilities Infrastructure Project, FNAL ..	500	2,000	2,000	+1,500	---
21-SC-71 Princeton Plasma Innovation Center, PPPL.	---	2,000	2,000	+2,000	---
21-SC-72 Critical Infrastructure Recovery & Renewal, PPPL.....	---	2,000	2,000	+2,000	---
21-SC-73 Ames Infrastructure Modernization.....	---	2,000	2,000	+2,000	---
Subtotal, Construction:.....	208,000	151,400	185,500	-22,500	+34,100
Subtotal, Science Laboratories Infrastructure.	301,000	174,110	254,250	-46,750	+80,140
Safeguards and Security.....	112,700	115,623	115,750	+3,050	+127
Program Direction.....	186,300	190,306	188,000	+1,700	-2,306
TOTAL, SCIENCE.....	7,000,000	5,837,806	7,050,000	+50,000	+1,212,194
NUCLEAR WASTE DISPOSAL.....	---	27,500	27,500	+27,500	---
ADVANCED RESEARCH PROJECTS AGENCY-ENERGY					
ARPA-E Projects.....	390,000	---	398,000	+8,000	+398,000
Program Direction.....	35,000	21,256	37,000	+2,000	+15,744
Rescission of Prior Year Balances.....	---	-332,000	---	---	+332,000
TOTAL, ARPA-E.....	425,000	-310,744	435,000	+10,000	+745,744