

### TITLE III

#### DEPARTMENT OF ENERGY

##### OVERVIEW OF RECOMMENDATION

The Committee recommendation sets priorities by supporting the Office of Science and the Advanced Research Projects Agency-Energy [ARPA-E], leading the world in scientific computing, addressing the Federal Government's responsibility for environmental cleanup and disposal of used nuclear fuel, keeping large construction projects on time and on budget, effectively maintaining our nuclear weapons stockpile, and supporting our nuclear Navy.

##### INTRODUCTION

The mission of the Department of Energy [Department] is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. To accomplish this mission, the Secretary of Energy [Secretary] relies on a world-class network of national laboratories, private industry, universities, States, and Federal agencies, which allows our brightest minds to solve our Nation's most important challenges.

The Committee's recommendation for the Department includes funding in both defense and non-defense budget categories. Defense funding is recommended for atomic energy defense activities, including the National Nuclear Security Administration [NNSA], which manages our Nation's stockpile of nuclear weapons, prevents proliferation of dangerous nuclear materials, and supports the Navy's nuclear fleet; defense environmental cleanup to remediate the former nuclear weapons complex; and safeguards and security for Idaho National Laboratory. Non-defense funding is recommended for the Department's energy research and development programs (including nuclear, fossil, renewable energy, energy efficiency, grid modernization and resiliency, and the Office of Science), power marketing administrations, the Federal Energy Regulatory Commission, and administrative expenses.

##### REPROGRAMMING GUIDELINES

The Committee's recommendation includes control points to ensure the Secretary spends taxpayer funds in accordance with congressional direction. The Committee's recommendation also includes reprogramming guidelines to allow the Secretary to request permission from the Committee for certain expenditures, as defined below, which would not otherwise be permissible. The Secretary's execution of appropriated funds shall be fully consistent with the direction provided under this heading and in section 301 of the bill,

unless the Committee includes separate guidelines for specific actions in the bill or report.

Prior to obligating any funds for an action defined below as a reprogramming, the Secretary shall notify and obtain approval of the Committees on Appropriations of both Houses of Congress. The Secretary shall submit a detailed reprogramming request in accordance with section 301 of the bill, which shall, at a minimum, justify the deviation from prior congressional direction and describe the proposed funding adjustments with specificity. The Secretary shall not, pending approval from the Committee, obligate any funds for the action described in the reprogramming proposal.

The Secretary is also directed to inform the Committees on Appropriations of both Houses of Congress promptly and fully when a change in program execution and funding is required during the fiscal year.

*Definition.*—A reprogramming includes:

- the reallocation of funds from one activity to another within an appropriation;
- any significant departure from a program, project, activity, or organization described in the agency’s budget justification as presented to and approved by Congress;
- for construction projects, the reallocation of funds from one construction project identified in the agency’s budget justification to another project or a significant change in the scope of an approved project;
- adoption of any reorganization proposal which includes moving prior appropriations between appropriations accounts; and
- any reallocation of new or prior year budget authority, or prior year deobligations.

#### SEXUAL HARRASSMENT

The Government Accountability Office [GAO] recently released a report on sexual harassment in NNSA’s nuclear security forces. The Committee is encouraged that the Department and NNSA stated they welcome opportunities for continuous improvement, and that they agreed with the five recommendations in the report. The Committee also commends NNSA for broadening its focus to implementing the recommendations beyond the nuclear security forces to include all Federal employees and contractors across the NNSA enterprise. To better understand and document the Department and NNSA progress in implementing these recommendations, the Committee requests that the Department and NNSA brief the Armed Services and Appropriations Committees of both the House and Senate on the steps taken, progress made, and relevant findings in their efforts to implement the recommendations in the report. These briefings shall take place within 6 months of enactment of the act and every 6 months thereafter until GAO’s recommendations are implemented.

#### COVID–19 RESEARCH DELAYS

The Committee recognizes the potential impacts and delays in research caused by the effects of the COVID–19 pandemic. The Committee notes that the Department has taken some steps to engage

scientific professional societies, universities and colleges, and other Federal agencies to obtain up to-date information on the impacts to institutions and research communities to help inform an open, transparent, and equitable response. However, the Committee is concerned that this response has been uneven across the Department. The Department is encouraged to consider these impacts within the resources available. The Department is directed to provide to the Committee not later than 60 days after enactment of this act a report that details the impacts of the COVID-19 pandemic on institutions and research communities. The report shall outline funding and costs associated with the impacts. Further, the Department is encouraged to include funding to address the impacts in future budget requests.

#### 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 revised GMI strategy, plans to reflect new decarbonization targets in strategy enhancements, 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 [GMLC] 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 and Carbon Management [FECM] to the MYPP. The Committee directs the Department to continue its emphasis on national energy systems resilience within the context of administration goals in decarbonization of the power system and related infrastructures, such as transportation. This shall build on GMI/GMLC progress in advanced grid 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.

*Carbon Dioxide Removal.*—The fiscal year 2020 Act directed the Department to develop an implementation plan coordinated across FECM, Energy Efficiency and Renewable Energy [EERE], and the Office of Science. The Committee is still awaiting this plan and directs the Department to provide the plan immediately after enactment of this act. The Department is directed to include a break-

down of the roles and responsibilities of each participating program office in the implementation plan. The Department is directed, pursuant to section 5001 and 5002 of the Energy Act of 2020, to establish the Carbon Dioxide Removal Program and Carbon Dioxide Removal Task Force to advance the development and commercialization of carbon dioxide removal, direct air capture, sequestration, and any other relevant technologies on a significant scale. The Department is directed to coordinate these activities among FECM, EERE, and the Office of Science. The Committee supports direct air capture prize competitions. The Department is directed to provide to the Committee not later than 30 days after enactment of this act the report required by section 5002 of the Energy Act of 2020.

The recommendation provides not less than \$120,000,000 for research, development, and demonstration of carbon dioxide removal technologies, including not less than \$20,000,000 from EERE, not less than \$50,000,000 from FECM, and not less than \$35,000,000 from the Office of Science. Within available funds for carbon dioxide removal, the recommendation provides not less than \$75,000,000 for direct air capture.

*Equity and Justice.*—The Committee supports the Department’s continuing efforts and progress in implementing the Justice40 Initiative, Executive Order 13985, and Executive Order 14008. The Committee supports the Department’s reforms toward addressing equity and justice issues within the U.S. energy system. In order to accelerate these reforms at the Department, the Committee directs the Department to survey its current programs, grant-making, policies, procedures, and rules to ensure that it is adequately meeting the clean energy, energy conservation, and energy efficiency needs of low-income, minority, and other marginalized communities. Further, the Department is encouraged to engage with communities impacted by climate change, air and water pollution, systemic racism and underinvestment, high energy costs, and economic inequality when conducting this survey. The Department is directed to provide to the Committee not later than 180 days after enactment of this act a report summarizing its efforts, including key findings, and a strategy to carry out the direction contained herein.

*Critical Minerals.*—The Committee supports the Department’s coordination of critical minerals activities across the Department through the Critical Minerals Initiative. The recommendation provides not less than \$146,000,000 for research, development, demonstration, and commercialization activities on the development of alternatives to, recycling of, and efficient production and use of critical minerals, including not less than \$100,000,000 from EERE, not less than \$25,000,000 from FECM, and not less than \$17,000,000 from the Office of Science. The Department is encouraged to carry out these activities pursuant to sections 7001 and 7002 of the Energy Act of 2020.

*Industrial Decarbonization.*—Nearly 30 percent of greenhouse gas emissions come from hard-to-reduce industrial sources, including heavy road and rail transport, shipping, aviation, chemical production, steel and cement production, and heat production. To make progress on climate change, it is necessary to reduce emis-

sions in this sector. The Committee supports the Department's efforts, aligned with Title VI of the Energy Act of 2020, to foster innovations and enable scale up of cost-competitive, low-emissions technologies. Further, the Committee encourages the Department to establish an Office of Industrial Emissions Reduction Technology Development Program as required by the Energy Act of 2020 to support coordinating research, developing and demonstrating technologies, and providing commercial applications of technologies that achieve significant emissions reductions in the industrial sectors.

The recommendation provides not less than \$520,000,000 for industrial decarbonization activities, including not less than \$250,000,000 from EERE, not less than \$250,000,000 from FECM, and not less than \$20,000,000 from the Office of Science. The funds provided are for research, development, and demonstration of technologies to strengthen the competitiveness of America's industrial sector, including low-carbon feedstocks, clean heat alternatives, industrial carbon capture and removal, and electrification. Not less than \$25,000,000 is provided for low-carbon feedstocks in the steel, cement, concrete, and other heavy industrial sectors. In addition, not less than \$25,000,000 is provided for clean heat alternatives for industrial processes.

Further, the Committee supports the continuation of the Department's existing Cooperative Agreements to develop cost sharing partnerships to conduct basic, fundamental, and applied research that assist industry in developing, deploying, and commercializing efficient, low-carbon, nonpolluting energy technologies that could compete effectively in meeting requirements for clean fuels, chemical feedstocks, electricity, and water resources.

*Energy Storage.*—The Committee supports the Department's ongoing efforts for the Energy Storage Grand Challenge [ESGC] initiative, as well as cost-shared demonstrations of energy storage technologies. The ESGC builds on the Department's prior research and development efforts in storage and will align Energy Storage research and development efforts to focus on technical, regulatory, and market issues necessary to achieve the technology goals. The Department is directed to continue to provide the Committee periodic updates on the ESGC and make publically available a cross-cutting research and development road-map through 2030 to illustrate the ESGC's goals. This road-map shall be focused on reducing costs and improving the performance of a diverse set of grid-scale storage technologies to meet industry needs, improve reliability and environmental performance of the electricity grid, and reduce greenhouse gas emissions.

The Committee recognizes that energy storage will play a vital role in integrating new energy sources while strengthening grid reliability and resilience. Energy storage systems are fuel neutral and help generation connected to the grid become more efficient, productive, and competitive. The Department is directed to carry out these activities in accordance with sections 3201 and 3202 of the Energy Act of 2020. The Department is directed to support long-duration joint demonstration projects with the Department of Defense and grants for rural utilities to build microgrids for resiliency. The Department is directed to support competitive pilot dem-

onstration grants, as authorized in section 3201 of the Energy Act of 2020, for energy storage projects that are wholly U.S.-made, sourced, and supplied.

The recommendation provides not less than \$460,000,000 for energy storage, including not less than \$347,000,000 from EERE, not less than \$80,000,000 from OE, not less than \$5,000,000 from FECM, not less than \$4,000,000 from NE, and not less than \$24,000,000 from the Office of Science.

*Arctic Energy Office.*—The Committee supports the promotion of research, development, and deployment of electric power technology that is cost-effective and well-suited to meet the needs of rural and remote regions of the United States, especially where permafrost is present or located nearby. The Committee encourages the Arctic Energy Office [AEO] to continue to bring together assets from across the Department to work together in collaborative and innovative ways to meet the energy, science, and national security needs of the United States and its allies in the Arctic. Further, the AEO is encouraged to lead cross-cutting operations in the Arctic with a mission to tackle the energy, science, and national security challenges of the 21st Century. Alaska is home to some of the highest energy costs in the nation, making diverse research, development, and deployment opportunities more cost-effective to meet the needs of rural and remote regions of the United States. There are also a wide variety of energy resources and technologies, both traditional and innovative, available in Alaska, including more than 200 microgrids.

*Hydrogen Energy and Fuel Cell Coordination.*—The Committee directs that the Department coordinates its efforts in hydrogen energy and fuel cell technologies across its various departments and offices in order to maximize the effectiveness of investments in hydrogen-related activities. This coordination shall include EERE, FECM, NE, OE, the Office of Science, and ARPA-E.

*Unmanned Aircraft.*—The Committee encourages the Department to test the effectiveness of Counter-Unmanned Aircraft Systems technologies to protect critical Departmental assets.

## ENERGY PROGRAMS

### ENERGY EFFICIENCY AND RENEWABLE ENERGY

Appropriations, 2021 .....	\$2,861,760,000
Budget estimate, 2022 .....	4,732,000,000
Committee recommendation .....	3,896,971,000

The Committee recommends \$3,896,971,000 for Energy Efficiency and Renewable Energy. Within available funds, the Committee recommends \$220,000,000 for program direction.

The Department is directed throughout all of its programs to maintain a balanced portfolio of early-, mid-, and late-stage research, development, demonstration, deployment and other market transformation activities that will deliver innovative energy technologies, practices, and information to American consumers and industry. While Federal investment plays a greater role in early stage research, the portfolio must be balanced by being inclusive of Federal investment in mid-to-late research activities, including field evaluation of early-stage technology to provide testing and

the cylinders have been treated and encourages the Department to prioritize getting the processing lines running at both sites.

*Small Sites.*—The Committee recommends \$124,340,000 for Small Sites. Within available funds, the Committee recommends \$21,340,000 for the Energy Technology Engineering Center, \$11,000,000 for Idaho National Laboratory, \$67,000,000 for Moab, \$5,000,000 to continue work at Lawrence Berkeley National Laboratory, and \$20,000,000 for excess Office of Science facilities.

URANIUM ENRICHMENT DECONTAMINATION AND DECOMMISSIONING  
FUND

Appropriations, 2021 .....	\$841,000,000
Budget estimate, 2022 .....	831,340,000
Committee recommendation .....	860,000,000

The Committee recommends \$860,000,000 for activities funded from the Uranium Enrichment Decontamination and Decommissioning Fund. The Committee understands that cleanup at the Oak Ridge East Tennessee Technology Park is estimated to be completed by 2027. However, cleanup at Portsmouth is estimated to be done between 2039 and 2045. Further, Paducah cleanup is estimated to be completed between 2065 and 2070. These date estimates are based upon the recent funding profiles for the two sites. Significant life-cycle cost-savings would occur with greater funding up front. In future budget requests, the Department is encouraged to seek funding that will bring forward the completion dates for Portsmouth and Paducah.

The Department shall not barter, transfer, or sell uranium during fiscal year 2022 to generate additional funding for Portsmouth cleanup that is in excess of the amount of funding recommended.

SCIENCE

Appropriations, 2021 .....	<sup>1</sup> \$7,026,000,000
Budget estimate, 2022 .....	7,440,000,000
Committee recommendation .....	7,490,000,000

<sup>1</sup>\$2,300,000,000 of this total was designated as emergency funding in fiscal year 2021.

The Committee recommends \$7,490,000,000 for Science. The recommendation includes \$202,000,000 for program direction.

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

*Quantum Information Science.*—The Committee supports the Office of Science’s coordinated and focused research program in quantum information science to support the Department’s science, energy, and national security missions, as authorized in sections 401 and 402 of Public Law 115–368, the National Quantum Initiative. This industry promises to yield revolutionary new approaches to computing, sensing, communication, data security, and metrology, as well as our understanding of the universe, and accordingly, the Committee recommends not less than \$245,000,000 for quantum information science, including not less than \$120,000,000 toward activities authorized under Section 401 of the National Quantum Initiative and \$125,000,000 towards activities authorized the National Quantum Information Science Research Centers in Section

402 of the National Quantum Initiative. Within available funding, the Committee encourages the Department to support a quantum internet and communications research program consistent with the Department's "America's Blueprint for the Quantum Internet" strategy. The Department is directed to continue its coordination efforts with the National Science Foundation, other Federal agencies, private sector stakeholders, and the user community to promote researcher access to quantum systems, enhance the U.S. quantum research enterprise, develop the U.S. quantum computing industry, and educate the future quantum computing workforce.

*Artificial Intelligence and Machine Learning.*—The Committee recommends not less than \$120,000,000 for Artificial Intelligence and Machine Learning across the Office of Science Programs. As the stewards of the leadership computing facilities, the Committee expects Advanced Scientific Computing Research to take a lead role in the Department's artificial intelligence and machine learning activities. The Committee appreciates the Department's focus on the development of foundational artificial intelligence and machine learning capabilities, and directs the Office of Science to apply those capabilities to the Office of Science's mission with a focus on accelerating scientific discovery in its Scientific User Facilities and large experiments.

*Reaching a New Energy Sciences Workforce.*—The Committee supports the new Reaching a New Energy Sciences Workforce initiative for targeted efforts to increase participation and retention of underrepresented groups in the Office of Science's research activities. The Committee encourages the Department to continue funding to support research and development needs of graduate and post-graduate science programs at HBCUs and minority serving institutions. The Department is directed to provide to the Committee not later than 90 days after enactment of this act and yearly thereafter briefings on implementation of this program.

*Lawrence Awards.*—Within available funding, the Department is directed to award up to 10 Lawrence Awards with an honorarium of no less than \$20,000 per awardee.

#### ADVANCED SCIENTIFIC COMPUTING RESEARCH

The Committee recommends \$1,040,000,000 for Advanced Scientific Computing Research [ASCR].

The Committee strongly supports ASCR's leadership in emerging areas relevant to the Department's mission, including artificial intelligence and quantum information science. The Committee commends ASCR's pursuit of machine learning tools for scientific applications and its support for the development of algorithms for future deployable quantum computers. The Committee recognizes that a robust research program in applied and computational mathematics and computer science will be critical to continued progress in these areas and is supportive of the Department's efforts to prioritize these programs.

The Committee recommends \$129,000,000 for the Exascale Computing Project. In addition, the Committee recommends \$250,000,000 for the Oak Ridge Leadership Computing Facility, \$160,000,000 for the Argonne Leadership Computing Facility,



\$130,000,000 for the National Energy Research Scientific Computing Center, and \$93,926,000 for ESnet.

Maintaining international leadership in high performance computing requires a long term and sustained commitment to basic research in computing and computational sciences, including applied math, software development, networking science, and computing competency among scientific fields. The Committee recommends not less than \$270,000,000 for Mathematical, Computational, and Computer Sciences Research. Further, the Committee supports the computational sciences workforce programs and recommends not less than \$20,000,000 for the Computational Science Graduate Fellowship.

#### BASIC ENERGY SCIENCES

The Committee recommends \$2,323,000,000 for Basic Energy Sciences [BES].

The Committee continues to support the EPSCoR program and its goals of broadening participation in sustainable and competitive basic energy research in eligible jurisdictions. The Committee recommends \$25,000,000 for EPSCoR and directs the Department to continue annual or at minimum, biennial implementation grant solicitations.

The Committee recommends \$538,000,000 to provide for operations at the five BES light sources and \$293,000,000 for the high-flux neutron sources. The Committee recommends not less than \$130,000,000 for the Energy Frontier Research Centers to continue multi-disciplinary, fundamental research needed to address scientific grand challenges. The Committee recommends not less than \$142,000,000 for operations at the five BES Nanoscale Science Research Centers and to adequately invest in the recapitalization of key instruments and infrastructure, and in staff and other resources necessary to deliver critical scientific capabilities to users. The Committee recognizes that leveraging advances in artificial intelligence for chemistry and materials science presents a unique opportunity to accelerate discovery and innovation. The Department is encouraged to explore opportunities to develop an autonomous chemistry and materials synthesis platform as part of the Nanoscale Science Research Centers. The capabilities will leverage advances in artificial intelligence to enable greater efficiencies and scientific throughput, leading to significant reduction of the total time and cost in novel materials discovery and innovation.

The Committee recommends \$25,000,000 for the Batteries and Energy Storage Innovation Hub, and \$20,000,000 for the Fuels from Sunlight Innovation Hub.

Within available funds, the Committee is encouraged to use funds to support national lab-academic-industry teams for research to identify and develop entirely solar-driven processes for hydrogen production, adsorbents for sequestering carbon dioxide, and catalysts needed to convert carbon dioxide and hydrogen into fuels. To test these processes at scale, funds may be used for laboratory scale prototypes that integrate such systems. Further, the Committee encourages the Office of Science to work with EERE to address the need to quickly scale up efforts to develop cleaner production of hydrogen at lower costs to attract industrial investment.

The recommendation provides not less than \$14,300,000 for other project costs, including \$4,300,000 for Linac Coherent Light Source-II, \$5,000,000 for Advanced Photon Source Upgrade, \$3,000,000 for Linac Coherent Light Source-II-HE, and \$2,000,000 for Cryomodule Repair & Maintenance Facility. The recommendation includes \$15,000,000 for NSRC Recapitalization. Further, the Second Target Station is supported for other project costs and total estimated costs.

The Committee recommends not less than \$15,000,000 for the NSLS II Experimental Tools II. The Department is directed to continue supporting the construction of additional beamlines in future budget requests so the nation's scientists can more fully leverage the investment that has been made in the NSLS II while it is the most powerful X-Ray light source in the Nation.

#### BIOLOGICAL AND ENVIRONMENTAL RESEARCH

The Committee recommends \$828,000,000 for Biological and Environmental Research. The recommendation includes not less than \$406,450,000 for Biological Systems Science and not less than \$421,500,000 for Earth and Environmental Systems Sciences.

The Department is directed to give priority to optimizing the operation of Biological and Environmental Research User Facilities. The Committee supports the budget request for Earth and Environmental Systems Sciences Facilities and Infrastructure, and supports the proposal for the Environmental Molecular Sciences Laboratory to initiate planning for a high throughput multiomics pipeline.

The Committee directs the Department to enhance investments in machine learning to advance the use of diverse and increasingly autonomous datasets to understand environmental and climate dynamics; rapidly incorporate datasets into predictive watershed, ecosystem and climate models; and project the onset of and track extreme events, such as atmospheric rivers and hurricanes.

The Committee recommends not less than \$100,000,000 for the four Bioenergy Research Centers. The Committee directs the Department to maintain Genomic Science as a top priority and recommends not less than \$109,000,000 for Foundational Genomics Research. Further, the Committee recommends not less than \$45,000,000 for Biomolecular Characterization and Imaging Science, including \$15,000,000 to continue the development of a multi-scale genes-to ecosystems approach that supports a predictive understanding of gene functions and how they scale with complex biological and environmental systems. The Committee recommends \$85,000,000 for the Joint Genome Institute, an essential component for genomic research. The Committee supports the Department's establishment of a national microbiome database collaborative.

The Committee continues to support the prototyping and establishment of fabricated ecosystems, automation, sensors, and computational tools to enable a predictive understanding of soil-plant-microbe interactions across molecular to ecosystem scales. The novel tools and capabilities will accelerate discovery and speed the delivery of solutions to climate change, environmental sustainability, and clean energy. The recommendation provides not less than \$6,000,000 for fabricated ecosystems and sensors. Within

available funds, the recommendation includes up to \$4,000,000 for second generation SmartSoils fabricated ecosystem testbeds, new sensors, and computational tools to enable real-time connectivity between lab-controlled, instrumented SmartSoil testbeds and naturally varying field experiments. Within available funds, the recommendation includes up to \$8,000,000 to develop and test novel sensor technologies, procure second generation EcoPOD units, and create the computational and experimental infrastructures necessary to dissect field observations at atomic and molecular levels in fabricated ecosystems.

The Committee recommends the Department provide \$2,000,000 in funding for academia to perform independent evaluations of climate models using existing data sets and peer-reviewed publications of climate-scale processes to determine various models' ability to reproduce the actual climate.

The Committee recommends not less than \$109,500,000 for Environmental System Science.

The Committee directs the Department to continue to support NGEA Arctic, NGEA Tropics, the SPURCE field site, the Watershed Function and Mercury Science Focus Areas, and the AmeriFLUX project.

The Committee supports the Department's efforts to advance understanding of coastal ecosystems, as initiated with the terrestrial-aquatic interfaces pilot in fiscal year 2019, and recommends \$30,000,000 to build upon the current modeling-focused effort and to develop observational assets and associated research to study the Nation's major land-water interfaces, including the Great Lakes and Puget Sound, by leveraging national laboratories' assets as well as local infrastructure and expertise at universities and other research institutions. The Committee encourages the Department to continue to support the River Corridor Science Focus Area.

Within available funds, the Department is encouraged to develop integrated mountainous hydroclimate modeling and observational capabilities. The new effort shall leverage activities supported by other Federal agencies active in investigating how snow-dominated Upper Colorado mountainous systems are responding to extreme events and gradual warming, and the implications for water resilience in the western U.S.

The Committee continues to support the Department's investment in observational studies, modeling, and computing to reduce the uncertainty in understanding cloud aerosol effects and recommends \$30,000,000 to build upon this research. Of the increase provided, \$15,000,000 is made available for the modernization and acceleration of the Energy, Exascale, and Earth System Model program to improve earth system prediction and climate risk management in the service of U.S. public safety, security, and economic interests. This work shall coordinate with DHS on the modernization and adaptation capabilities from the National Infrastructure Simulation and Analysis Center to support climate impacts on infrastructure and communities.

#### FUSION ENERGY SCIENCES

The Committee recommends \$660,000,000 for Fusion Energy Sciences.

*U.S. Contribution to the International Thermonuclear Experimental Reactor [ITER] Project.*—The Committee recommends \$211,000,000 for the U.S. contribution to the ITER Project, of which not less than \$40,000,000 is for in-cash contributions.

*Operations, Research, and Development.*—The Department is encouraged to support optimal facility operations levels for DIII-D. The Committee recommends not less than \$25,000,000 for the Material Plasma Exposure eXperiment.

The Committee recommends not less than \$50,000,000 for NSTX-U Operations, and not less than \$27,000,000 for NSTX-U Research. The Committee recommends not less than \$20,000,000 for the High-Energy-Density Laboratory Plasmas program to support initiatives in quantum information science, advance cutting-edge research in extreme states of matter, expand the capabilities of the LaserNetUS facilities, and provide initial investments in new intense, ultrafast laser technologies needed to retain U.S. leadership in these fields.

Given the recent FESAC Long-Range Plan, the Committee recognizes the need for the initiation of design studies of various future fusion experimental facilities in the program. The Committee encourages that the stellarator concept be considered as part of that program and that there be broad community participation in these studies.

To maintain U.S. leadership in intense, ultrafast lasers, the Committee directs the Department, within 180 days of enactment of this act, to submit a report to the Committees on Appropriations of Houses of Congress describing the Department's plans to respond to the recommendations of the Brightest Light Initiative Workshop Report, including facility investments and improvements needed to advance laser science technology and applications.

#### HIGH ENERGY PHYSICS

The Committee recommends \$1,079,000,000 for High Energy Physics.

*Research.*—The Committee recommends \$30,000,000 for the Sanford Underground Research Facility and not less than \$40,000,000 for the HL-LHC Upgrade projects.

The Committee recommends \$20,000,000 for the Cosmic Microwave Background-Stage 4.

The Committee encourages the Department to fund facility operations at levels for optimal operations. Further, the Committee encourages the Department to fund facility operations and MIEs at optimal levels.

#### NUCLEAR PHYSICS

The Committee recommends \$744,000,000 for Nuclear Physics.

*Research.*—The Department is directed to give priority to optimizing operations for all Nuclear Physics user facilities.

The Committee recommends up to \$15,800,000 for the Gamma-Ray Energy Tracking Array; completion for sPHENIX; up to \$16,200,000 for MOLLER; up to \$1,400,000 for Ton-Scale Neutrinoless Double Beta Decay; and up to \$13,000,000 for the High Rigidity Spectrometer;

## ISOTOPE R&amp;D AND PRODUCTION

Isotope R&D and Production ensures robust supply chains of critical radioactive and stable isotopes for the Nation that no domestic entity has the infrastructure or core competency to produce. The Committee supports the FRIB Isotope Harvesting projects.

## ACCELERATOR R&amp;D AND PRODUCTION

Accelerator R&D and Production supports cross-cutting research and development in accelerator science and technology, access to unique Office of Science accelerator research and development infrastructure, workforce development, and public-private partnerships to advance new technologies for use in the Office of Science's scientific facilities and in commercial products.

## WORKFORCE DEVELOPMENT FOR TEACHERS AND SCIENTISTS

The Committee recommends \$35,000,000 for Workforce Development for Teachers and Scientists.

Within available funds, the Committee recommends \$14,000,000 for Science Undergraduate Laboratory Internships; \$2,000,000 for Community College Internships; \$5,000,000 for the Graduate Student Research Program; \$2,100,000 for the Visiting Faculty Program; \$5,000,000 for Workforce Training for Underrepresented Minorities; \$1,200,000 for the Albert Einstein Distinguished Educator Fellowship; \$2,900,000 for the National Science Bowl; \$700,000 for Technology Development and Online Application; \$600,000 for Evaluation Studies; and \$1,500,000 for Outreach.

Within Outreach, the Committee directs the Department to establish a working group comprised of the Office of Science and national laboratories and a consortium of universities to assist universities in the development of a curriculum to promote the next generation of scientists utilizing artificial intelligence, quantum information science, and machine learning.

The Department is encouraged to allocate funding to training and workforce development programs that assist and support workers in trades and activities required for the continued growth of the U.S. energy efficiency and clean energy sectors, with an emphasis on training programs focused on building retrofit and the construction industry. The Department is encouraged 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 focused on displaced fossil fuel workers, that lead to an industry-recognized credential in the energy workforce.

Further, the Department is directed to submit to the Committee not later than 120 days after enactment of this act a plan describing a five-year educational and workforce development program for expanding engagement with and support for high school, undergraduate, and graduate students, as well as recent graduates, teachers, and faculty in STEM fields. This plan may include paid internships, fellowships, temporary employment, training programs, visiting student and faculty programs, sabbaticals, and research support. The plan shall also include an outreach strategy to more effectively advertise, recruit, and promote educational and

workforce programs to community colleges, Minority Serving Institutions, and non-research universities.

SCIENCE LABORATORIES INFRASTRUCTURE

The Committee recommends \$295,000,000 for Science Laboratories Infrastructure.

The fiscal year 2021 Act directed the Department to submit to the Committee a report on the funding levels required for operations and maintenance of Oak Ridge National Laboratory nuclear facilities. The Committee is still awaiting this report and directs the Department to provide the report not later than 15 days after enactment of this act.

NUCLEAR WASTE DISPOSAL

Appropriations, 2021 .....	\$27,500,000
Budget estimate, 2022 .....	7,500,000
Committee recommendation .....	27,500,000

The Committee recommends \$27,500,000 for Nuclear Waste Disposal, of which \$20,000,000 is for interim storage and \$7,500,000 is for Nuclear Waste Fund oversight activities. Funds for the Nuclear Waste Fund oversight activities are to be derived from the Nuclear Waste Fund.

TECHNOLOGY TRANSITIONS

Appropriations, 2021 .....	
Budget estimate, 2022 .....	\$19,470,000
Committee recommendation .....	19,470,000

The Committee supports funding the Office of Technology Transition [OTT] through a new, separate appropriation to increase transparency and reflect the need for multi-year funding for programmatic activities.

CLEAN ENERGY DEMONSTRATIONS

Appropriations, 2021 .....	
Budget estimate, 2022 .....	\$400,000,000
Committee recommendation .....	100,000,000

The Committee supports the establishment of an Office of Clean Energy Demonstrations. The Department is directed to conduct these activities on a competitive basis and include cost-share requirements pursuant to section 988 of the Energy Policy Act of 2005. The Department is encouraged to conduct these activities through technology neutral solicitations.

ADVANCED RESEARCH PROJECTS AGENCY—ENERGY

Appropriations, 2021 .....	\$427,000,000
Budget estimate, 2022 .....	500,000,000
Committee recommendation .....	500,000,000

The Committee recommends \$500,000,000 for the Advanced Research Projects Agency-Energy, equal to the budget request. Within available funds, the Committee recommends \$37,000,000 for program direction.

The budget request proposes the establishment of an Advanced Research Projects Agency-Climate [ARPA-C]. The Committee sup-

NON-DEFENSE ENVIRONMENTAL CLEANUP					
Fast Flux Test Reactor Facility (WA) .....	2,500	3,100	3,100	+ 600	.....
Gaseous Diffusion Plants .....	115,554	116,203	121,203	+ 5,649	+ 5,000
Small Sites .....	110,933	129,337	124,340	+ 13,407	- 4,997
West Valley Demonstration Project .....	88,113	88,120	88,120	+ 7	.....
Management and Storage of Elemental Mercury .....	2,100	2,100	2,100	.....	.....
US Enrichment Corporation Fund Receipts .....	.....	- 116,203	.....	.....	+ 116,203
Use of USEC Fund Receipts .....	.....	116,203	.....	.....	- 116,203
Mercury Receipts .....	3,000	.....	.....	- 3,000	.....
Use of Mercury Receipts .....	- 3,000	.....	.....	+ 3,000	.....
<b>TOTAL, NON-DEFENSE ENVIRONMENTAL CLEANUP .....</b>	<b>319,200</b>	<b>338,860</b>	<b>338,863</b>	<b>+ 19,663</b>	<b>+ 3</b>
URANIUM ENRICHMENT DECONTAMINATION AND DECOMMISSIONING FUND					
Oak Ridge .....	134,701	105,000	105,000	- 29,701	.....
Nuclear Facility D&D, Paducah .....	240,000	198,995	240,000	.....	+ 41,005
Portsmouth:					
Nuclear Facility D&D, Portsmouth .....	367,193	397,311	397,311	+ 30,118	.....
Construction:					
15-U-408 On-site Waste Disposal Facility, Portsmouth .....	46,639	5,000	5,000	- 41,639	.....
20-U-401 On-site Waste Disposal Facility (Cell Line 2&3) .....	16,500	65,235	65,235	+ 48,735	.....
Subtotal, Portsmouth .....	430,332	467,546	467,546	+ 37,214	.....
Pension and Community and Regulatory Support .....	30,967	26,299	31,299	+ 332	+ 5,000
Title X Uranium/Thorium Reimbursement Program .....	5,000	33,500	16,155	+ 11,155	- 17,345
<b>TOTAL, UED&amp;D FUND .....</b>	<b>841,000</b>	<b>831,340</b>	<b>860,000</b>	<b>+ 19,000</b>	<b>+ 28,660</b>
SCIENCE					
Advanced Scientific Computing Research:					
Research .....	846,055	911,000	911,000	+ 64,945	.....
Construction:					
17-SC-20 Office of Science Exascale Computing Project (SC-ECP) .....	168,945	129,000	129,000	- 39,945	.....
Subtotal, Advanced Scientific Computing Research .....	1,015,000	1,040,000	1,040,000	+ 25,000	.....

DEPARTMENT OF ENERGY—Continued

[In thousands of dollars]

	2021 appropriations	Budget estimate	Committee recommendation	Committee recommendation compared to—	
				2021 appropriations	Budget estimate
Basic Energy Sciences:					
Research .....	1,856,000	1,995,800	2,018,800	+ 162,800	+ 23,000
Construction:					
13-SC-10 LINAC coherent light source II (LCLS-II), SLAC .....	33,000	28,100	28,100	- 4,900	.....
18-SC-10 Advanced Photon Source Upgrade (APS-U), ANL .....	160,000	101,000	101,000	- 59,000	.....
18-SC-11 Spallation Neutron Source Proton Power Upgrade (PPU), ORNL .....	52,000	17,000	17,000	- 35,000	.....
18-SC-12 Advanced Light Source Upgrade (ALS-U), LBNL .....	62,000	75,100	75,100	+ 13,100	.....
18-SC-13 Linac Coherent Light Source-II-High Energy (LCLS-II-HE), SLAC .....	52,000	50,000	50,000	- 2,000	.....
19-SC-14 Second Target Station (STS), ORNL .....	29,000	32,000	32,000	+ 3,000	.....
21-SC-10 Cryomodule Repair and Maintenance Facility .....	1,000	1,000	1,000	.....	.....
Subtotal, Construction .....	389,000	304,200	304,200	- 84,800	.....
Subtotal, Basic Energy Sciences .....	2,245,000	2,300,000	2,323,000	+ 78,000	+ 23,000
Biological and Environmental Research .....	753,000	828,000	828,000	+ 75,000	.....
Fusion Energy Sciences:					
Research .....	415,000	449,000	434,000	+ 19,000	- 15,000
Construction:					
14-SC-60 US Contributions to ITER (US ITER) .....	242,000	221,000	211,000	- 31,000	- 10,000
20-SC-61 Matter in Extreme Conditions (MEC) Petawatt Upgrade, SLAC .....	15,000	5,000	15,000	.....	+ 10,000
Subtotal, Construction .....	257,000	226,000	226,000	- 31,000	.....
Subtotal, Fusion Energy Sciences .....	672,000	675,000	660,000	- 12,000	- 15,000
High Energy Physics					
Research .....	777,065	782,000	800,000	+ 22,935	+ 18,000
Construction:					
11-SC-40 Long Baseline Neutrino Facility / Deep Underground Neutrino Experiment (LBNF/DUNE), FNAL ...	171,000	176,000	176,000	+ 5,000	.....
11-SC-41 Muon to electron conversion experiment, FNAL .....	2,000	13,000	13,000	+ 11,000	.....



18-SC-42 Proton Improvement Plan II (PIP-II), FNAL .....	79,000	90,000	90,000	+ 11,000	.....
Subtotal, Construction .....	252,000	279,000	279,000	+ 27,000	.....
Subtotal, High Energy Physics .....	1,029,065	1,061,000	1,079,000	+ 49,935	+ 18,000
Nuclear Physics:					
Research .....	624,700	700,000	724,000	+ 99,300	+ 24,000
Construction:					
14-SC-50 Facility for Rare Isotope Beams, MSU .....	5,300	.....	.....	- 5,300	.....
20-SC-52 Electron Ion Collider, BNL .....	5,000	20,000	20,000	+ 15,000	.....
Subtotal, Construction .....	10,300	20,000	20,000	+ 9,700	.....
Subtotal, Nuclear Physics .....	635,000	720,000	744,000	+ 109,000	+ 24,000
Isotope R&D and Production:					
Research .....	66,000	78,000	78,000	+ 12,000	.....
Construction:					
20-SC-51 US Stable Isotope Production and Research Center, ORNL .....	12,000	12,000	12,000	.....	.....
Subtotal, Construction .....	12,000	12,000	12,000	.....	.....
Subtotal, Isotope R&D and Production .....	78,000	90,000	90,000	+ 12,000	.....
Accelerator R&D and Production .....	16,935	24,000	24,000	+ 7,065	.....
Workforce Development for Teachers and Scientists .....	29,000	35,000	35,000	+ 6,000	.....
Science Laboratories Infrastructure:					
Infrastructure Support:					
Payment in Lieu of Taxes .....	4,650	4,820	4,820	+ 170	.....
Oak Ridge Landlord .....	5,860	6,430	6,430	+ 570	.....
Facilities and Infrastructure .....	29,790	17,200	17,200	- 12,590	.....
Oak Ridge Nuclear Operations .....	26,000	20,000	20,000	- 6,000	.....
Subtotal, Infrastructure Support .....	66,300	48,450	48,450	- 17,850	.....
Construction:					
17-SC-71 Integrated Engineering Research Center, FNAL .....	10,250	10,250	10,250	.....	.....
18-SC-71 Energy Sciences Capability, PNNL .....	23,000	.....	.....	- 23,000	.....
19-SC-71 Science User Support Center, BNL .....	20,000	38,000	38,000	+ 18,000	.....
19-SC-73 Translational Research Capability, ORNL .....	22,000	21,500	21,500	- 500	.....
19-SC-74 BioEPIC, LBNL .....	20,000	35,000	35,000	+ 15,000	.....

DEPARTMENT OF ENERGY—Continued

[In thousands of dollars]

	2021 appropriations	Budget estimate	Committee recommendation	Committee recommendation compared to—	
				2021 appropriations	Budget estimate
20–SC–71 Critical Utilities Rehabilitation Project, BNL .....	20,000	26,000	26,000	+ 6,000	.....
20–SC–72 Seismic and Safety Modernization, LBNL .....	5,000	27,500	27,500	+ 22,500	.....
20–SC–73 CEBAF Renovation and Expansion, TJNAF .....	2,000	10,000	10,000	+ 8,000	.....
20–SC–74 Craft Resources Support Facility, ORNL .....	25,000	.....	.....	– 25,000	.....
20–SC–75 Large Scale Collaboration Center, SLAC .....	11,000	12,000	21,000	+ 10,000	+ 9,000
20–SC–76 Tritium System Demolition and Disposal, PPPL .....	13,000	6,400	6,400	– 6,600	.....
20–SC–77 Argonne Utilities Upgrade, ANL .....	500	10,000	8,500	+ 8,000	– 1,500
20–SC–78 Linear Assets Modernization Project, LBNL .....	500	12,850	10,400	+ 9,900	– 2,450
20–SC–79 Critical Utilities Infrastructure Revitalization, SLAC .....	500	10,000	8,500	+ 8,000	– 1,500
20–SC–80 Utilities Infrastructure Project, FNAL .....	500	13,300	10,500	+ 10,000	– 2,800
21–SC–71 Princeton Plasma Innovation Center, PPPL .....	150	7,750	7,000	+ 6,850	– 750
21–SC–72 Critical Infrastructure Recovery & Renewal, PPPL .....	150	2,000	2,000	+ 1,850	.....
21–SC–73 Ames Infrastructure Modernization .....	150	2,000	2,000	+ 1,850	.....
22–SC–71, Critical Infrastructure Modernization Project (CIMP), ORNL .....	.....	1,000	1,000	+ 1,000	.....
22–SC–72, Thomas Jefferson Infrastructure Improvements (TJII), TJNAF .....	.....	1,000	1,000	+ 1,000	.....
Subtotal, Construction: .....	173,700	246,550	246,550	+ 72,850	.....
Subtotal, Science Laboratories Infrastructure .....	240,000	295,000	295,000	+ 55,000	.....
Safeguards and Security .....	121,000	170,000	170,000	+ 49,000	.....
Program Direction .....	192,000	202,000	202,000	+ 10,000	.....
TOTAL, SCIENCE .....	7,026,000	7,440,000	7,490,000	+ 464,000	+ 50,000
NUCLEAR WASTE DISPOSAL .....	27,500	7,500	27,500	.....	+ 20,000
TECHNOLOGY TRANSITIONS					
Technology Transitions Programs .....	.....	11,095	11,095	+ 11,095	.....
Program Direction .....	.....	8,375	8,375	+ 8,375	.....