Science
(dollars in thousands)

FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
$6,585,000	$7,000,000	$5,837,806

Overview

The Office of Science's (SC) mission is to deliver scientific discoveries and major scientific tools to transform our understanding of nature and advance the energy, economic and national security of the United States. SC is the Nation's largest Federal sponsor of basic research in the physical sciences and the lead Federal agency supporting fundamental scientific research for our Nation's energy future.

SC accomplishes its mission and advances national goals by supporting:

- *The frontiers of science*—exploring nature's mysteries from the study of fundamental subatomic particles, atoms, and molecules that are the building blocks of the materials of our universe and everything in it to the DNA, proteins, and cells that are the building blocks of life. Each of the programs in SC supports research probing the most fundamental disciplinary questions.
- *The 21st Century tools of science*—providing the nation's researchers with 28 state-of-the-art national scientific user facilities - the most advanced tools of modern science - propelling the U.S. to the forefront of science, technology development, and deployment through innovation.
- *Science for energy and the environment*—paving the knowledge foundation to spur discoveries and innovations for advancing the Department's mission in energy and environment. SC supports a wide range of funding modalities from single principal investigators to large team-based activities to engage in fundamental research on energy production, conversion, storage, transmission, and use, and on our understanding of the earth systems.

SC is an established leader of the U.S. scientific discovery and innovation enterprise. Over the decades, SC investments and accomplishments in basic research and enabling research capabilities have provided the foundations for new technologies, businesses, and industries, making significant contributions to our nation's economy, national security, and quality of life. Select scientific accomplishments in FY 2018 enabled by the SC programs are described in the program budget narratives. Additional descriptions of recent science discoveries can be found at http://science.energy.gov/news/highlights.

Highlights and Major Changes in the FY 2021 Request

The FY 2021 Request for SC is $5,838 million, a decrease of 16.6 percent below the FY 2020 Enacted level to implement the Administration's objectives in order to advance bold, transformational leaps in U.S. science and technology (S&T), build a diverse workforce of the future, and ensure America remains the global S&T leader for generations to come[a]. The FY 2021 Request supports a balanced research portfolio of basic scientific research probing some of the most fundamental questions in areas such as: high energy, nuclear, and plasma physics; materials and chemistry; biological and environmental systems; applied mathematics; next generation high-performance computing and simulation capabilities; and basic research for advancement in new energy technologies. The Request includes ongoing investments to support the Administration's Industries of the Future (IOTF) initiative through research in quantum information sciences (QIS) and artificial intelligence (AI) and machine learning (ML). The Request also supports research efforts in next-generation microelectronics, genomic sciences to inform biosecurity research, and critical scientific infrastructure needs at DOE laboratories. The Request also initiates new multidisciplinary research initiatives to include data and computational collaboration with NIH, integrated computational and data infrastructure for scientific discovery, next generation biology, rare earth and separation science, revolutionizing polymer upcycling, and strategic accelerator technology. These new initiatives position SC to meet new research demands in a more collaborative effort. The Request supports SC's basic research portfolio, which includes extramural grants and contracts supporting over 23,000 researchers located at over 300

[a] M-19-25, OMB/OSTP Memo: *FY 2021 Administration R&D Budget Priorities* (American Leadership in Industries of the Future, American Security, American Energy and Environmental Leadership, American Health & Bioeconomic Innovation, Building and Leveraging a Diverse, Highly Skilled American Workforce, Creation and Support of Research Environments that Reflect American Values, Support Transformative Research of High Risk and Potentially High Reward, Leverage the Power of Data, and Build, Strengthen, and Expand Strategic Multisector Partnerships.)

institutions and the 17 DOE national laboratories, spanning all fifty states and the District of Columbia. In FY 2021, SC's suite of 28 scientific user facilities will continue to provide unmatched tools and capabilities for over 33,000 users per year from universities, national laboratories, industry, and international partners. The Request will also support the construction of new user facilities and the R&D necessary for future facilities and facility upgrades to continue to provide world class research capabilities to U.S. researchers. SC allocates Working Capital Fund charges for common administrative services to the research programs and the Program Direction account.

Highlights of the FY 2021 Request by Program Office include:

- *Advanced Scientific Computing Research (ASCR)* supports research to discover, develop, and deploy computational and networking capabilities to analyze, model, simulate, and predict complex phenomena important to the DOE and the United States. The ASCR Request of $988.051 million, is an increase of $8.051 million, or 0.8 percent, above the FY 2020 Enacted level. The Request continues support for the Department's Exascale Computing Initiative (ECI), including final application and software preparations through the Exascale Computing Project, and enable delivery exascale-capable systems in calendar year 2021—reasserting U.S. leadership in this critical area. To ensure continued progress during and after the ECI, this Request prioritizes basic research for AI/ML with a focus on foundational research and data intensive science and on future computing technologies, including improving data accessibility and security, leveraging AI and other emerging technologies. Leveraging ASCR's world-class expertise in advanced computing across multiple science programs, disciplines, laboratories, and facilities, the Request includes funding to initiate development of an integrated computational and data infrastructure across the laboratories that will serve all six SC research programs. The Request maintains support for ASCR's Computational Partnerships with a focus on continuing strategic partnerships in quantum computing including the partnerships with other Science programs to support the QIS centers selected in FY 2020, building new data and AI partnerships with NIH, and on supporting multi-disciplinary microelectronics research with BES, FES, and HEP. The Request also provides strong support for ASCR user facilities operations to ensure the availability of high performance computing and networking to the scientific community and upgrades to maintain U.S. leadership in these essential areas. Funding for the Leadership Computing Facilities (LCF's) is increased to finish site preparations prior to the deployment for the of exascale systems at the Argonne Leadership Computing Facility (ALCF) and at the Oak Ridge Leadership Computing Facility (OLCF). The Request also supports the operations of the 200 petaflop (pf) Summit system at OLCF, and the 8.5 pf Theta system at the ALCF for existing users. The National Energy Research Scientific Computing Center (NERSC) will operate the 30 pf Cori supercomputer, and funding will support the final site and early application preparations for NERSC-9. The Request also supports continued operations of the Energy Sciences Network (ESnet) and the ESnet-6 upgrade to address the rapidly growing volume of scientific data transmission. Funds are also requested in FY 2021 to support early stage research associated with the first steps to establish a dedicated Quantum Network.

- *Basic Energy Sciences (BES)* supports fundamental research to understand, predict, and ultimately control matter and energy at the electronic, atomic, and molecular levels to provide foundations for new energy technologies. The BES Request of $1,935.673 million is a decrease of $277.327 million, or 12.5 percent, below the FY 2020 Enacted level. The Request focuses resources toward early-stage fundamental research, the operation and maintenance of a complementary suite of scientific user facilities, and the highest priority facility upgrades. High priority areas in core research include QIS, next-generation microelectronics, AI/ML, exascale computing, critical materials, polymer upcycling, next-generation biology, and strategic accelerator technology. The Request continues BES funding for the multi-disciplinary QIS centers to promote basic research and early stage development to accelerate the advancement of QIS through vertical integration between systems and theory and hardware and software. The Request also continues funding for the Energy Frontier Research Centers. The Request continues support for computational materials and chemical sciences to deliver shared software infrastructure to the research communities as part of the ECI, and supports the Batteries and Energy Storage and Fuels from Sunlight Energy Innovation Hubs. The Fuels from Sunlight Energy Innovation Hub will complete its second five-year term with FY 2019 funding. Funding is requested for continued support of early-stage fundamental research on solar fuels generation that builds on the Hub's unique capabilities and accomplishments to date. The Request also provides funds for the DOE Established Program to Stimulate Competitive Research. BES maintains a balanced suite of complementary tools, including supporting Linac Coherent Light Source (LCLS) operations at 97 percent of optimal. The Request also supports approximately 91 percent of optimal operations at the four other x-ray facilities, both BES-supported neutron sources, and five nanoscale science

research centers (NSRCs). Funding for the Advanced Photon Source Upgrade project continues per the project plan. The Request provides continued support for the Advanced Light Source Upgrade project, the Linac Coherent Light Source-II High Energy project, the Proton Power Upgrade project, and the Second Target Station project. The Request includes one new construction project, a Cryomodule Repair and Maintenance Facility (CRMF). The Request continues two Major Item of Equipment projects: the NSLS-II Experimental Tools-II project for the phased build-out of beamlines at NSLS-II and the NSRC Recapitalization project.

- *Biological and Environmental Research (BER)* supports transformative science and scientific user facilities to achieve a predictive understanding of complex biological, earth, and environmental systems for energy and infrastructure security, independence, and prosperity. The BER Request of $516.934 million is a decrease of $233.066 million, or 31.1 percent, below the FY 2020 Enacted level. The Request implements Administration priorities for early-stage fundamental research focused on biological and earth and environmental systems that will contribute to a future of stable, reliable, and secure sources of American energy and advance transformative science for economic prosperity. The Request for Biological Systems Science supports core research areas of Genomic Sciences and fully supports the fourth year of the recompeted four DOE Bioenergy Research Centers (BRCs). The BRCs continue to perform new fundamental research underpinning the production of fuels and products from sustainable biomass resources and the building blocks of new technological advances for translation of basic research results to industry. Extended secure biosystems design activities will test the fundamental engineering principles that control plant and microbial systems, with a specific goal of enhancing the stability, resilience, and controlled performance of engineered biological systems. New efforts begin in next-generation biology for new tools, capabilities, and computational approaches to probe and understand natural and novel engineered cellular and materials architectures as well as to enable upcycling polymers for new functionalities. Biomolecular Characterization and Imaging Science research will continue to support structural, spatial, and temporal understanding of functional biomolecules and processes occurring within living cells. Efforts in QIS imaging and sensing approaches will expand experimental observation capabilities to advance systems-level predictive understanding of biological processes. In the Earth and Environmental Systems Sciences subprogram, the Request continues to prioritize development of the DOE high-resolution earth system model. Environmental System Science will integrate terrestrial ecosystem and subsurface sciences to provide a robust and scale-aware predictive understanding of ecosystems. The Request supports operations of BER's three scientific user facilities: the DOE Joint Genome Institute (JGI), the Environmental Molecular Sciences Laboratory (EMSL), and the Atmospheric Radiation Measurement Research Facility (ARM). AI/ML tools help validate user facility observations and data from environmental field experiments. The JGI will prioritize improved integration with the Systems Biology Knowledgebase. The ARM user facility will continue testing and evaluation of the aerial capability Major Item of Equipment (MIE) acquired in FY 2019.

- *Fusion Energy Sciences (FES)* supports research to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source. The FES Request of $425.151 million is a decrease of $245.849 million, or 36.6 percent, below the FY 2020 Enacted. The Request prioritizes keeping SC fusion user facilities world-leading, investing in FES-related high-performance computing and preparing for exascale, exploring the potential of QIS and AI/ML, supporting high-impact research in fusion materials, strengthening collaborations that enable access to international facilities with unique capabilities, learning how to predict and control transient events in fusion plasmas, continuing stewardship of discovery plasma science including microelectronics-relevant low-temperature plasma science, and increasing partnership opportunities with the private sector. FES investments in DIII-D facility research and operations focus on utilizing the facility enhancements implemented during the FY 2018 – FY 2019 Long Torus Opening; the Request supports 13 weeks of research operations, which is 65 percent of optimal operations, along with machine improvements needed for new research capabilities. In FY 2021, the NSTX-U facility is down for recovery and repair; the Request for NSTX-U Operations will support high-priority activities to implement repairs and corrective actions required to achieve research operations, as well as to increase machine reliability. In addition, the Request includes funding for enhanced collaborative research at other facilities to support NSTX-U research program priorities. In FY 2021, the FES SciDAC portfolio, in partnership with ASCR, will continue to address challenges in burning plasma science, with emphasis on integration and whole-device modeling capability, as well as strengthening readiness for the Exascale era. In addition, research efforts focusing on emerging technologies with transformational potential, such as AI/ML and computing aspects of QIS, will be enhanced. The FY 2021 Request will continue support for leveraged research opportunities by U.S. scientists on international

superconducting tokamaks, stellarators, and other facilities with unique capabilities, and core discovery plasma science experiments on intermediate-scale collaborative facilities. The Request also supports research conducted on medium-scale laser facilities through the LaserNetUS network, and explores research opportunities of high energy density science for QIS. Funding is requested for the Materials-Plasma Exposure eXperiment MIE project, which is expected to be baselined in FY 2021, and will be a world-leading facility for steady-state, high-heat-flux testing of fusion materials. The Request supports the initiation of a line-item construction project for a significant upgrade to the Matter in Extreme Conditions instrument at the LCLS facility at SLAC National Accelerator Laboratory to support research in high energy density laboratory plasmas. The FY 2021 Request includes funding for continued design and fabrication of the highest priority "in-kind" hardware systems for ITER.

- *High Energy Physics (HEP)* supports research to understand how the universe works at its most fundamental level by discovering the most elementary constituents of matter and energy, probing the interactions among them, and exploring the basic nature of space and time itself. The HEP Request of $818.131 million is a decrease of $226.869 million, or 21.7 percent, below the FY 2020 Enacted level. The Request will focus support on the highest priority elements identified in the 2014 High Energy Physics Advisory Panel (HEPAP) Particle Physics Project Prioritization Panel (P5) Report while minimizing significant impact to national laboratories, mainly to Fermi National Accelerator Laboratory (FNAL), which is funded primarily by HEP. Support for Research will prioritize efforts that address the science drivers of particle physics, Higgs boson, neutrinos, dark matter, dark energy, and exploring the unknown, and enable early and visible science results from HEP project investments. R&D that requires long-term investments, including Advanced Technology R&D, Accelerator Stewardship, and cross-cutting efforts in QIS and AI/ML to accelerate discovery in particle physics, will also be given higher priority in order to sustain world-leading efforts and support SC priorities. HEP, in coordination with SC, will support multi-disciplinary QIS centers to promote basic research and early stage development and to accelerate the advancement of QIS through vertical integration between systems and theory, and hardware and software. HEP Research will support multi-disciplinary microelectronics research with ASCR, BES and FES. The Traineeship Program for Accelerator Science and Technology will expand to research areas in Advanced Technology R&D. The P5 report identified the High-Luminosity Large Hadron Collider (HL-LHC) accelerator and A Toroidal LHC Apparatus (ATLAS) and Compact Muon Solenoid (CMS) Detector Upgrade Projects as the highest priority in the near-term, and Long-Baseline Neutrino Facility and Deep Underground Neutrino Experiment (LBNF/DUNE) as the highest-priority large project in its timeframe. To continue SC's strong international partnership with CERN, the FY 2021 Request will support these high-priority projects, and the Proton Improvement Plan II (PIP-II) construction project. The Request will support a new MIE start for the next generation Cosmic Microwave Background (CMB-S4) experiment, and design studies for a new Fermilab Accelerator Control System. The Request will support the operation of the Fermi National Accelerator Laboratory Accelerator Complex at 80 percent of optimal, the Brookhaven National Laboratory Accelerator Test Facility at 86 percent of optimal, the SLAC Facility for Advanced Accelerator Experimental Tests II (FACET-II) operations at 83 percent of optimal, and investments to enhance the Sanford Underground Research Facility (SURF) to meet DOE expectations for reliable, efficient, and safe operations.

- *Nuclear Physics (NP)* supports experimental and theoretical research to discover, explore, and understand all forms of nuclear matter. The NP Request of $653.327 million is a decrease of $59.673 million, or 8.4 percent, below the FY 2020 Enacted level. The Request will support the highest priority research and scientific user facilities to maintain U.S. leadership in nuclear science. The Request supports operations of the Relativistic Heavy Ion Collider (RHIC) to confirm the origin of intriguing new phenomena observed in quark gluon plasma formation, and continues support for the Strongly Pioneering High Energy Nuclear Interaction eXperiment (sPHENIX) MIE, which will further explore the properties of the quark gluon plasma. Operations support for the recently updated 12 gigaelectonvolt Continuous Electron Beam Accelerator Facility (CEBAF) will enable the highly anticipated science program to make progress towards unraveling the mechanism of quark confinement. At Argonne National Labratory, the Request also supports the operations of the Argonne Tandem Linac Accelerator System (ATLAS) to provide opportunities for research in nuclear structure and nuclear astrophysics. The Request will support the final year of construction of the Facility for Rare Isotope Beams (FRIB) according to the performance baseline profile, and continues support for the Gamma-Ray Energy Tracking Array (GRETA) and High Rigidity Spectrometer detector for FRIB. The Request will continue support for the Measurement of a Lepton-Lepton Electroweak Reaction (MOLLER) MIE, which will search for physics beyond our present understanding by measuring parity-violation in electron-electron scattering with the 12 GeV CEBAF machine is continued, and the Ton-Scale Neutrino-less Double Beta Decay (NLDBD) Experiment MIE, which will determine whether

the neutrino is its own antiparticle. The Request continues to support R&D, conceptual design, and project engineering for the Electron Ion Collider at Brookhaven National Laboratory. The Request also increases support for the DOE Isotope Program to produce, and develop cutting-edge approaches for producing, critical isotopes in short supply. The Request also continues an Accelerator Improvement Project for the harvesting of isotopes at FRIB. The Request continues a construction project for the U.S. Stable Isotope Production and Research Center to produce critical enriched stable isotopes in short supply and mitigate U.S. dependence on foreign supply. The Request will continue activities in support of the National Isotope Strategy to promote U.S. core competencies in isotope enrichment technology. The Request for NP Research supports university and laboratory researchers to nurture critical core competencies and enable the highest priority theoretical and experimental activities to target compelling scientific opportunities at the frontier of nuclear science, including investments in QIS efforts in collaboration with other SC programs, the development of quantum sensors based on atomic-nuclear interactions and quantum control techniques, and the production of stable isotopes for next generation quantum information systems. The Request for NP Research also commences two efforts which align with SC priorities: Artifical Intelligence and Machine Learning, which will seek breakthroughs in AI/ML of relevance to nuclear science research, accelerator facility operations, and automated machine operations, and Strategic Accelerator R&D, which will pursue transformative accelerator R&D initiatives including next generation electron ion source developments and advanced approaches in superconducting radio frequency (SRF) technologies.

Reorganization and Restructure Initiative

SC continues to review its functions and the organizational structure to maximize efficiencies across all programs in an attempt to reduce and streamline the Federal footprint. Through workforce analysis and restructuring, we will continue to review, analyze, and prioritize mission requirements and identify those organizations and functions most in line with the Administration and Department program objectives and SC strategic goals. SC completed the implementation of a restructuring of the Field and mission support components following approval by the Secretary of Energy in November 2018. This restructuring merges two geographically separate service centers (Chicago and Oak Ridge) into a functionally consolidated center and consolidates corporate functions to improve consistency in operations, and pilots the merging of two SC federal site offices at national laboratories in the same geographic area (Lawrence Berkeley National Laboratory Site Office and the SLAC Site Office, both located in the San Francisco Bay area). This reorganization maximizes efficiencies across all SC field components programs and will reduce and streamline the Federal footprint. With the field reorganization complete, SC is focused on a reorganization of SC Headquarters. The changes for this reorganization are intended to address the needed evolution and re-alignment necessitated by current mission imperatives as well as to position SC for continued success in its strategic priorities. The reorganization will establish a new Principal Deputy Director position with transferred staff and functions from the existing Deputy Director positions along with new organizational elements. The vacant Deputy Director for Resource Management position will be eliminated and the reporting offices and staff reassigned to other SC HQ elements. Through workforce analysis and restructuring, SC reviewed, analyzed and prioritized mission requirements and identified those organizations and functions most in line with the Administration and Department program objectives and SC strategic goals.

Basic and Applied R&D Coordination

Coordination between the Department's basic research and applied technology programs is a high priority within DOE and is facilitated through joint planning meetings, technical community workshops, annual contractor/awardee meetings, joint research solicitations, focused DOE program office working groups in targeted research areas, and collaborative program management of DOE's Small Business Innovation Research and Small Business Technology Transfer programs. Co-funding of research activities and facilities at the DOE National Laboratories and partnership/collaboration-encouraging funding mechanisms facilitate research integration within the basic and applied research communities. SC's R&D coordination also occurs at the interagency level. Specific collaborative activities are highlighted in the "Basic and Applied R&D Coordination" sections of each individual SC program budget justification narrative.

High-Risk, High-Reward Research[a]

SC incorporates high-risk, high-reward, basic research elements in all of its research portfolios; each SC research program considers a significant proportion of its supported research as high-risk, high-reward. Because advancing the frontiers of

[a] In compliance with the reporting requirements in the America COMPETES Act of 2007 (P.L. 110-69, section 1008)

science also depends on the continued availability of state-of-the-art scientific facilities, SC constructs and operates national scientific facilities and instruments that comprise the world's most sophisticated suite of research capabilities. SC's basic research is integrated within program portfolios, projects, and individual awards; as such, it is not possible to quantitatively separate the funding contributions of particular experiments or theoretical studies that are high-risk, high-reward from other mission-driven research in a manner that is credible and auditable. SC incorporates high-risk, high-reward basic research elements in its research portfolios to drive innovation and challenge current thinking, using a variety of mechanisms to develop topics: Federal advisory committees, triennial Committees of Visitors, program and topical workshops, interagency working groups, National Academies' studies, and special SC program solicitations. Many of these topics are captured in formal reports, e.g., *Basic Energy Sciences Roundtable: Chemical Upcycling of Polymers,* Basic Energy Sciences report (2019)[a]; *Basic Research Needs for Microelectronics*, joint BES, ASCR, and HEP workshop (2018) [b]; *Basic Research Needs for Scientific Machine Learning; Core Technologies for Artificial Intelligence*, ASCR workshop (2018)[c]; *Building for Discovery: Strategic Plan for U.S. Particle Physics in the Global* Context, by the High Energy Physics Advisory Panel (2014)[d]; *Quantum Computing Testbed for Science,* ASCR workshop report (2017)[e]; *Basic Energy Sciences Roundtable: Opportunities for Basic Research for Quantum Computing in Chemical and Materials Sciences*, Basic Energy Sciences report (2017); *Basic Energy Science Roundtable: Opportunities for Basic Research for Next-Generation Quantum Systems*, Basic Energy Sciences report (2017) [f]; *Challenges at the Frontiers of Matter and Energy: Transformative Opportunities for Discovery Science*, BES Advisory Committee (2015)[g]; *Basic Research Needs Workshop on Quantum Materials for Energy Relevant Technology,* BES workshop report (2016)[h]; *Grand Challenges for Biological and Environmental Research: Progress and Future* Vision, by the BER Advisory Committee (2017)[i]; *Technologies for Characterizing Molecular and Cellular Systems*, BER workshop report (2016)[j]; *Plasma: at the Frontier of Scientific Discovery*, FES workshop report (2017)[k]; *Transformative Enabling Capabilities for Efficient Advance Toward Fusion Energy*, FES Advisory Committee (2018)[l]; *FES Roundtable on QIS* (2018)[m]; *Advancing Fusion with Machine Learning,* joint FES-ASCR workshop report (2019)[n]; *Isotope Research and Production Opportunities and Priorities*, by the Nuclear Science Advisory Committee (NSAC) (2015)[o]; and *Nuclear Physics Long Range Plan*, by the NSAC (2015)[p] and *Quantum Computing and Quantum Information Sciences (QIS),* by the Nuclear Science Advisory Committee (NSAC)[l] (2019).

[a] https://science.osti.gov/-/media/bes/pdf/BESat40/Polymer_Upcycling_Brochure.pdf
[b] https://science.osti.gov/-/media/bes/pdf/reports/2019/BRN_Microelectronics_rpt.pdf
[c] https://science.energy.gov/ascr/community-resources/program-documents/
[d] http://science.osti.gov/~/media/hep/hepap/pdf/May%202014/FINAL_P5_Report_Interactive_060214.pdf
[e] https://science.osti.gov/~/media/ascr/pdf/programdocuments/docs/2017/QTSWReport.pdf
[f] https://science.osti.gov/~/media/bes/pdf/reports/2018/Quantum_computing.pdf
[g] http://science.osti.gov/~/media/bes/besac/pdf/Reports/CFME_rpt_print.pdf
[h] https://science.osti.gov/~/media/bes/pdf/reports/2016/BRNQM_rpt_Final_12-09-2016.pdf
[i] https://science.osti.gov/~/media/ber/berac/pdf/Reports/BERAC-2017-Grand-Challenges-Report.pdf
[j] http://science.osti.gov/~/media/ber/pdf/workshop%20reports/VirtualEcosystems.pdf
[k] https://science.osti.gov/~/media/fes/pdf/program-news/Frontiers_of_Plasma_Science_Final_Report.pdf
[l] https://science.osti.gov/-/media/fes/fesac/pdf/2018/TEC_Report_1Feb20181.pdf
[m] https://science.osti.gov/-/media/fes/pdf/workshop-reports/FES-QIS_report_final-2018-Sept14.pdf
[n] https://science.osti.gov/-/media/fes/pdf/workshop-reports/FES_ASCR_Machine_Learning_Report.pdf
[o] https://science.osti.gov/~/media/ber/pdf/community-resources/Technologies_for_Characterizing_Molecular_and_Cellular_Systems.pdf
[p] https://science.osti.gov/np/nsac/reports/

Scientific Workforce

For more than 60 years SC and its predecessors have fostered the training of a highly skilled scientific workforce. In addition to the undergraduate and graduate research opportunities provided through SC's Office of Workforce Development for Teachers and Scientists, the six SC research program offices train undergraduates, graduate students, and postdoctoral researchers through sponsored research awards at universities and the DOE National Laboratories. The research program offices also support targeted undergraduate and graduate-level experimental training in areas associated with scientific user facilities and not readily available in university academic departments, such as particle accelerator and detector physics, neutron and x-ray scattering, nuclear chemistry, and computational sciences at the leadership computing level. To help attract critical talent, SC supports the Early Career Research Program, which funds individual research programs by outstanding Ph.D. scientists early in their careers in the disciplines supported by SC[a]. To retain highly skilled researchers by rewarding scientific excellence and leadership, SC initiated the Distinguished Scientist Fellows opportunity to recognize innovative and accomplished DOE laboratory staff and sponsoring their efforts to develop, sustain, and promote scientific and academic excellence in SC research through collaborations between institutions of higher education and national laboratories. SC coordinates with other DOE offices and other agencies on best practices for training programs and program evaluation through internal DOE working groups and active participation in the National Science and Technology Council's Committee on Science, Technology, Engineering, and Mathematics Education. SC also participates in the American Association for the Advancement of Science's Science & Technology Policy Fellowships program and the Presidential Management Fellows Program to bring highly qualified scientists and professionals to DOE headquarters for a maximum term of two years.

Cybersecurity

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

[a] https://science. osti.gov/early-career/