



## ENERGY SCIENCES COALITION

March 2024

The Energy Sciences Coalition (ESC) thanks Congress for continuing its strong, bipartisan support of the U.S. Department of Energy (DOE) Office of Science. To build on this support, **ESC urges Congress to appropriate \$9.5 billion in FY 2025 for DOE Office of Science.** This level of funding is necessary to maintain U.S. competitiveness. Specifically, increased funding is needed to accelerate construction of world-class scientific facilities, support groundbreaking scientific discoveries, advance energy technologies needed for the nation to meet net-zero carbon emissions, develop emerging technologies, and grow a highly skilled and diverse science and technology workforce that is essential for the United States to compete globally.

As the nation's primary sponsor of physical sciences research, the DOE Office of Science plays a vital role in the American scientific ecosystem – a proven model for success in discovery and innovation. The Office of Science sponsors research programs vital to American prosperity and security at research universities and national laboratories and helps maintain the U.S. pipeline of science and engineering talent. The Office of Science is also unique among federal science agencies, supporting the network of 17 DOE national laboratories—a competitive advantage for the nation's research and innovation ecosystem—and directly stewarding ten of them. The Office of Science also builds and operates 28 of the most sophisticated, world-class scientific user facilities used by universities, industry and other federal agencies.

Bold new investments in fundamental research are needed to stay ahead of international competition, maintain U.S. competitiveness, and create American jobs of the future in key energy sectors as well as new technology areas such as high-performance computing, artificial intelligence, biotechnology, microelectronics, and quantum information science. In particular, scientific breakthroughs and energy technology innovation are still necessary to decarbonize the U.S. economy and mitigate the worst effects of climate change. Office of Science-supported fundamental research forms the foundation for future energy technologies. The current imperative—energy systems that meet our energy security, economic, and environmental challenges—requires increasing investments in all areas of fundamental research to advance all energy systems, including energy storage, negative emission technologies, advanced nuclear, hydrogen, fusion, renewables such as wind and solar, carbon capture, storage and utilization, and next-generation fuels. The Office of Science is also a leader in advancing emerging technologies and combining more than one to solve the nation's most pressing challenges.

ESC's \$9.5 billion funding recommendation is needed to:

- grow core research at national laboratories and research universities across all six major Office of Science program areas. This includes investments in the physical sciences, biological sciences, advanced materials, geosciences, computing and engineering to help develop future energy technologies and fully utilize new and updated world-class facilities and cutting-edge

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instrumentation, especially with ambitious goals to achieve economy-wide net-zero emissions no later than 2050;

- advance new, strategic investments in innovative high-risk, high-reward research areas, such as quantum science and technology; artificial intelligence and scientific machine learning; genomics, biotechnology, and other convergence science; microelectronics; next-generation communications; accelerator and laser systems; and optical detectors, and
- prepare the next generation of American scientific and engineering talent through competitively awarded grants and expand existing workforce and education programs, such as the DOE Office of Science Graduate Fellowship and Computational Sciences Graduate Fellowship, while also creating new programs to address the nation’s growing workforce needs in STEM and energy industries as well as meaningfully tackling issues of broadening participation and diversity, equity, and inclusion;
- accelerate the construction and upgrades of world-class scientific user facilities and maximize operations to support the more than 36,000 researchers from academia, industry and federal agencies who rely on these facilities for their science and engineering pursuits; and
- maintain and grow multi-disciplinary centers focused on addressing scientific grand challenges, such as Energy Frontier Research Centers, Energy Earthshot Research Centers, Bioenergy Research Centers, Energy Innovation Hubs, National Quantum Information Science Research Centers, and microelectronics research centers.

ESC also supports funding for the cross-cutting research initiatives and programs within DOE outlined in the *CHIPS and Science Act*, including:

- **No less than \$315 million for Quantum Information Science:** The U.S. remains a world leader in quantum information science but additional resources are needed to expand and launch new programs and support use-inspired research projects that focus on initial applications, especially in sensing and metrology, communications, and computing and simulation, focused on solving grand challenge problems. This funding recommendations includes:
  - At least \$120 million for foundational and use-inspired research and \$125 million for the five DOE national quantum centers, consistent with enacted funding levels;
  - At least \$50 million for the quantum networking program authorized in the *CHIPS and Science Act* to launch and expand quantum internet, networking, and communications testbeds and research efforts consistent with DOE’s “America’s Blueprint for the Quantum Internet” strategy; and
  - At least \$20 million for the quantum user expansion for science and technology (QUEST) program as authorized in the *CHIPS and Science Act* to expand access to researchers to the nation’s leading quantum infrastructure and capabilities. (Section 10104)
- **No less than \$200 million for Microelectronics Research and Development:** DOE Office of Science plays a unique role in developing next-generation semiconductors and microelectronics and its efforts would be complementary to other federal agencies, such as the National Science Foundation and the Departments of Defense and Commerce. This funding recommendation includes \$100 million for broad-based foundational research and development activities and \$100 million to fund up to four Microelectronics Research Science Centers as authorized in the *CHIPS and Science Act*. (Section 10731)
- **No less than \$200 million for Artificial Intelligence research and development.** DOE and its network of 17 national laboratories play a unique leadership role among federal science agencies in advancing innovation and the responsible use of AI. A focused DOE AI Initiative should be guided by the vision outlined in the 2023 *Advanced Research Directions on AI for Science, Energy, and Security*. AI can play a major role in finding important scientific and technological solutions for DOE missions, such as the search for new quantum materials for quantum

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computing, sensing, and networking applications; new nuclear and fusion reactor designs; and improved climate models to improve resiliency and mitigate the worst effects of extreme weather events. While driving innovation, DOE can also advance the responsible development of AI focused on challenges related to AI technology, such as explainability, validation, security, and privacy (Section 10771);

- **At least \$50 million to launch a Midscale Instrumentation and Research Equipment Program:** This program would advance the development and deployment of world-class research instrumentation and equipment for user facilities, provide a greater range of platform technologies for researchers in academia, national labs and industry, and help train the next generation of engineers. (Section 10112)

To help guide these investments, ESC strongly recommends following the advice of the six DOE Office of Science federal advisory committees on research priorities and infrastructure investments. Since their inception, the Office of Science advisory committees have provided valuable, independent advice on complex scientific and technical issues and they have been essential for engaging the scientific community in open and transparent processes related to user facility planning, assessment, ranking and prioritization. They also help establish consensus across the scientific community on research priorities and goals. Recent examples include international benchmarking studies for all six Office of Science programs for research and associated facilities needed to stay ahead of international competition and the fusion energy and plasma science long-range plan with recommended steps to deliver fusion energy to the grid.

The United States must maintain its leadership in science, technology and innovation, and the DOE Office of Science plays a pivotal and leading role in addressing this country's energy, national security, and environmental challenges. For these reasons, we urge Congress to provide \$9.5 billion for the Office of Science in FY 2025. We look forward to working with you in advancing the critical missions of this invaluable agency.

Sincerely,

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## ESC Membership

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