ENERGY SCIENCES COALITION

July 26, 2023

As the House advances the fiscal year (FY) 2024 Energy and Water Development Appropriations bill (H.R. 4394), the Energy Sciences Coalition (ESC) has prepared an impact assessment on the House mark of $8.1 billion for the U.S. Department of Energy (DOE) Office of Science. ESC appreciates efforts to prioritize funding for DOE Office of Science given budget caps imposed by the *Fiscal Responsibility Act* and additional House-imposed funding cuts on non-defense spending. However, while the $8.1 billion for DOE Office of Science is the same as the FY 2023 enacted funding level, it would have significant negative impacts on DOE Office of Science research, operations, and infrastructure programs. **ESC continues to urge Congress to increase discretionary funding allocations and appropriate at least $8.8 billion in FY 2024 for DOE Office of Science, consistent with the FY 2024 President's budget request and the bipartisan *CHIPS and Science Act*.**

The United States cannot risk losing its leadership in science and technology, which is vital to national prosperity, economic growth, and national security. DOE Office of Science has a leading role in maintaining U.S. competitiveness and flat and declining budgets will set back efforts to reclaim that leadership. The *CHIPS and Science Act* recognized that the only way for the U.S. to win the science and technology race was to outspend and outcompete our competitors. The DOE Office of Science had a central role in that legislation because Congress recognized it is the nation's largest funder of the physical sciences supporting groundbreaking scientific discoveries, builds and maintains the nation's largest collection of world-class scientific facilities, advances key emerging technologies such as quantum and artificial intelligence, is mission-focused on advancing energy technologies needed for the nation to meet net-zero carbon emissions, and helps maintain the U.S. pipeline of science and engineering talent. The Office of Science is also unique among federal science agencies by supporting the network of 17 DOE national laboratories—a competitive advantage for the nation's research and innovation ecosystem—and directly stewards 10 of them.

The FY 2024 House Energy and Water bill proposes flat funding for DOE Office of Science. ESC appreciates efforts to advance the construction of most world-class research facilities, unique scientific instruments, and national lab modernization infrastructure projects, consistent with the FY 2024 budget request. The proposed levels of funding in the House bill are critical to keep projects on time and on budget and stay ahead of international competition. ESC also appreciates efforts to minimize disruptions to operations of existing facilities and major scientific experiments as well as maintain support for key areas of research.

When compared to the FY 2023 enacted funding level, the most significant impacts due to a flat budget include:

- **More than a $200 million or 5% cut to fundamental research**. With targeted increases to infrastructure projects and relatively flat funding for operations of existing facilities, the result would be a substantial cut to research programs throughout the Office of Science. This includes:
  - Approximately $44 million reduction in mathematical, computational, and computer science research focused on using exascale and other high performance computing facilities to address science, energy, and national security challenges, advancing the trustworthy, energy-efficient, and scalable use of artificial intelligence and machine learning, and designing the next-generation semiconductors;
  - Approximately $92 million reduction for biological and earth and environmental sciences focused on biotechnology, predictive climate and weather impacts, and the destruction of nuclear and other legacy waste;
  - Approximately $50 million reduction for nuclear physics to explore the constituent forms of matter and constitutes 95% of U.S. funding in this field of science; and
  - Approximately $26 million reduction for high energy physics focused on exploring how the universe works and unraveling Nobel Prize winning mysteries related to the properties of neutrinos, dark matter and dark energy, and the expansion of the universe.

  A cut to research not only delays groundbreaking scientific discoveries and results in the U.S. losing ground to competitors, it also harms one of our greatest assets—our scientific and engineering workforce. Research primarily funds people: national lab researchers, academics, and industry partners as well as undergraduate and graduate students and postdocs. Last year, DOE Office of Science supported research at all 17 DOE national laboratories and more than 340 research universities, including 4,900 graduate students, 3,200 postdoctoral associates, and 10,300 permanent PhDs. If the proposed cuts were enacted, hundreds of researchers and students at national labs and research universities would lose research support and could lead to layoffs.

- **Up to a one-third reduction in research awards and funding for research universities.** The House bill includes Section 308 General Provision which prohibits the Office of Science from entering into multi-year funding agreements with a value of less than $5 million. Currently, the Office of Science must provide full funding for grants and other awards with a value of $1 million or less. Raising the requirement from $1 million to $5 million would force DOE Office of Science to make substantially fewer awards or wait years to collect sufficient appropriations to move forward with a competition. Safeguards are already in place for grants and other financial assistance awards since they are all subject to future appropriations.

- **Cuts in operations and reduced access to research facilities used by more than 38,000 researchers each year.** ESC acknowledges and appreciates that the House bill tried to limit disruptions in operations of major facilities. However, the House bill would reduce operations of light sources and accelerator facilities used for particle physics and nuclear physics research. For example, light sources would operate at only 78% of optimal funding rather than the current level of 90%. The result would be hundreds of fewer users from industry, academia, and national labs to leverage these billion dollar facilities and potential layoffs of operational staff at the beamline facilities. The House bill also does not take into account increased costs over the last year for all 28 user facilities from inflation, supply chain disruptions, remote operations and increased staffing support needs as new and upgraded facilities come on line.

- **Delays and increased costs on some major research facility construction and national lab modernization projects.** While the House bill mostly funds major research facility construction and

national modernization projects at the budget request levels to maintain current cost and schedule project profiles, not all projects are fully funded, such as the Long Baseline Neutrino Facility/Deep Underground Neutrino experiment and utility and seismic upgrades at national labs. These funding shortfalls will result in cost increases and schedule delays and put at risk the ability of the U.S. to deliver no scientific breakthroughs ahead of international competition.

- **Cuts to workforce development and STEM training and education.** The House bill proposes cutting the Workforce Development for Teachers and Students program by $10 million or 24 percent. This modest program has an outsized influence in building and sustaining a pipeline of STEM talent needed to execute DOE missions and work at DOE national labs. This includes undergraduate internships, graduate thesis research opportunities, visiting faculty research appointments and annual, nationwide, middle, and high school science competitions for the National Science Bowl. The House bill would also make it harder to recruit STEM domestic talent for DOE missions by terminating the Reaching a New Energy Sciences Workforce (RENEW) and Funding for Accelerated, Inclusive Research (FAIR) programs. These programs are designed to place highly qualified applicants in STEM learning and authentic research experiences at DOE laboratories and expand training opportunities to students and faculty from Minority Serving Institutions, non-R1 academic institutions, and individuals from underrepresented, underserved groups. The U.S. faces a workforce shortage in STEM fields that address energy, environment, and national security and more, not fewer, creative initiatives are needed to encourage and prepare the workforce for STEM. In addition, Section 609 General Provision which prohibits DOE to fund any diversity, equity, and inclusion (DEI) office, program, or training further complicates efforts to recruit STEM talent. This would have an outsize influence for DOE national laboratories that leverage DEI efforts to recruit and retain young, diverse, and highly skilled talent.

In addition to these direct impacts on DOE Office of Science compared to FY 2023 activities, the lack of new funding – necessitated by the decision to mark up the House FY 2024 bills at FY 2022 levels – fails to advance new investments and initiatives proposed in the budget request and authorized in the *CHIPS and Science Act*. This puts the U.S. at risk of falling behind international competition, especially in new technology areas such as high-performance computing, artificial intelligence, biotechnology, microelectronics, fusion energy, and quantum information science. Major initiatives not funded or fully supported in the House bill include:

- **Microelectronics Science Research Centers.** The House bill does not include the $60 million proposed in the budget request to launch up to four Microelectronics Research Science Centers as authorized in the *CHIPS and Science Act*, Section 10731. This effort would complement other federal agencies, such as the National Science Foundation and the Departments of Defense and Commerce, but focus on next-generation semiconductors for DOE missions in science, energy, and national security.
- **Expanded Quantum Information Science.** While the House bill allocates at least $245 million for quantum science and technology as in prior years and provides DOE Office of Science flexibility on the use of funds, the proposed cut in overall research funding, as described above, for DOE Office of Science provides no additional resources for a cross-cutting initiative such as quantum information science. Additional resources are needed to expand use-inspired research projects that focus on initial applications, especially in sensing and metrology, communications, and computing and simulation; 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 fully support the quantum user expansion for science and technology (QUEST) program that would expand access to researchers to the nation's leading quantum infrastructure and capabilities.

- **Bold investments for fusion energy.** The budget request proposed $275 million in new funding dedicated to accelerating fusion energy, including increased funding for the Milestone-based fusion development program to support U.S.-based fusion reactor demonstration projects, expanding inertial fusion energy to take advantage of the fusion ignition milestone at the National Ignition Facility, and the creation of four new fusion R&D centers dedicated to materials, the blanket fuel cycle, enabling technologies, and advanced simulation.
- **New funding for Artificial Intelligence (AI).** The House bill does not provide new funding to accelerate the development and application of AI for science, energy, environmental, and national security missions. Recent DOE strategic plans and workshop reports have identified new AI applications that would, among other things, accelerate the design, discovery, and evaluation of new materials for clean energy technologies; advance the development of self-driving laboratories and scientific workflows; and enable the autonomous operation and optimization of complex user facilities such as light sources and high performance computers. For example, AI could help find new materials or chemical compounds that have unique properties needed for real-world applications much faster—for example, batteries that hold 10 times the storage capacity compared to today's batteries, or materials that capture more solar energy at greater efficiency.
- **Funding to support additional Energy Earthshot breakthroughs.** The House bill provides no new funding to expand the Energy Earthshot initiative, which includes national lab-led centers and innovative research university teams focused on science, cost, and performance breakthroughs in seven technology areas: hydrogen, long duration storage, carbon negative technologies, enhanced geothermal, floating offshore wind, industrial heat, and clean fuels and products.

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 the House to address ESC's concerns and as it negotiates a final package with the Senate, to strike general provisions that reduce funding for research universities and hurt recruitment and retention of the scientific and engineering workforce, and if additional resources become available, provide at least $8.8 billion for the Office of Science. This would reverse proposed cuts in research funding and fully fund internationally competitive infrastructure projects.

Thank you for your continued support for DOE Office of Science. We look forward to working with you in advancing the critical missions of this invaluable agency.

Sincerely,

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The Energy Sciences Coalition (ESC) is a broad-based coalition of organizations representing scientists, engineers and mathematicians in universities, industry and national laboratories who are committed to supporting and advancing the scientific research programs of the U.S. Department of Energy (DOE), and in particular, the DOE Office of Science.