ENERGY SCIENCES COALITION

Department of Energy Quantum and Artificial Intelligence Legislation Support Letter

November 18, 2024

On behalf of over 100 member organizations that make up the Energy Sciences Coalition (ESC), we thank Congress for advancing critical and bold legislation to advance Department of Energy (DOE) initiatives in quantum science and technology[1] and Artificial Intelligence (AI)[2]. **ESC urges Congress to pass final DOE legislation in quantum and AI by the end the year to stay ahead of international competition and maintain U.S. innovative and competitive advantage.**

China and other strategic competitors are investing heavily in emerging technologies, especially quantum and AI. The United States still has a competitive advantage in both of these critical technological fields but it requires continued strong investment and focused initiatives in science innovation, technology development, workforce development, and advancing the most promising applications. DOE plays a central role among federal science agencies in driving innovation in quantum and AI for unique science, energy, and national security applications. ESC thanks Congress for recognizing DOE's unique contribution and advancing legislation that supports and further expands DOE's role in developing and deploying these key technologies.

As Congress reconciles differences between the House and Senate quantum and AI bills, ESC wants to take the opportunity to highlight again key elements that should be included in final legislation, consistent with prior ESC statements. In particular, ESC support DOE quantum and AI legislation that maintains and further expands the DOE Office of Science's leadership role in quantum science and technology and AI for U.S. competitiveness, leverages the unique expertise and world-leading research facilities at DOE national laboratories and DOE-funded research universities, helps to train the next-generation workforce, and builds public-private partnerships to accelerate innovation and future adoption of these cutting-edge technologies. Below are more specific recommendations by technology area.

[1] *National Quantum Initiative Reauthorization Act* (H.R. 6213) and the *DOE Quantum Leadership Act* (S. 4932)
[2] *DOE Artificial Intelligence Act* (H.R. 9671 and S. 4664)

Quantum Information Science

ESC supports efforts by Congress to pass national quantum initiative reauthorization legislation, which includes not only DOE but other critical science agencies such as the National Science Foundation (NSF), the National Institute for Standards and Technology, and the National Aeronautics and Space Administration. Regarding DOE, ESC supporst key provisions, including:

- maintaining a foundational research program in quantum information science (QIS);
- expanding the foundational QIS research program to include first use cases and application development;
- renewing and increasing funding authorization for the 5 DOE National Quantum Information Science Research Centers;
- consolidating quantum networking and quantum user program provisions from the *CHIPS and Science Act* to ensure a comprehensive QIS program;
- expanding quantum computing, networking, and communications initiatives;
- creating a new quantum science and technology instrumentation and infrastructure program;
- creating an early-state quantum high performance computing research and development program to fund testbeds and prototypes to help inform a 10-year Quantum High Performance Computing Strategic Plan;
- developing a dedicated quantum traineeship program to build the quantum workforce;
- directing a quantum supply chain study to identify critical quantum science, engineering, and technology supply chain needs to develop and maintain a robust domestic manufacturing base; and
- strengthening coordination between DOE STEM and workforce development activities at the DOE quantum centers and national laboratories with the new proposed NSF Education and Workforce Hub.

Artificial Intelligence and Machine Learning

ESC supports efforts by Congress to fully develop and utilize unique DOE capabilities, such as the world's fastest supercomputers and vast amount of data from DOE's 17 national laboratories and 35 user facilities, to drive AI innovation and address societal grand challenges. DOE has already demonstrated significant impact with early-stage investments and is poised for even greater impact. For example, DOE is using AI for grid resilience and security; designing advanced materials that can resist very high temperatures and extremely hot plasmas for fusion reactors; safe and reliable long-term carbon dioxide storage, geothermal energy, nuclear waste isolation, and petroleum extraction; improved climate modeling prediction based on better understanding of cloud behavior and associated droughts and floods; and, in partnership with the National Institutes of Health, automating complex data analysis for new insights into cancer and developing improved treatment options, just to name a few. Congressional legislation would help unlock DOE's potential to tackle and help solve major national security, energy, environment, telecommunications, health and finance challenges facing the nation.

For any final DOE AI legislation, ESC supports key provisions including:

- **the Frontiers in Artificial Intelligence for Science, Security, and Technology (FASST) initiative.** This cross-cutting, whole-of-DOE effort would bring together the world's leading scientists and engineers from all 17 DOE national labs, research universities, and other research organizations to drive AI innovation for unique science, energy, and national security missions and more broadly maintain U.S. leadership in AI. This program would support fundamental math and computer science, the development and deployment of safe and trustworthy AI models and systems, early-stage engineering and prototyping of AI hardware and software technologies, and development of next-generation computing platforms and infrastructure. This program is needed to accelerate the pace of scientific discovery and technological innovation in a responsible and secure manner.
- **AI Research and Development Centers.** ESC supports the creation of at least 8 AI innovation centers focused on advancing unique AI applications for DOE science, energy, and national security missions. ESC recommends that the Centers should be led by teams of universities, DOE national labs, industry, and other research organizations that bring together unique DOE research expertise, infrastructure, and STEM education and workforce training to have significant impact. DOE has successfully used these large-scale centers to integrate, test, and deploy new technologies and complements the innovative work advanced by individual researchers and small research groups.
- **AI computing infrastructure and integrated data management.** ESC recommends significant investments in AI computing infrastructure, such as AI accelerators for hardware and software development. Custom-designed AI hardware and software for DOE computing infrastructure will push the boundaries of technology development and applications and help drive innovation in the private sector. ESC also recommends investments in integrated data management leveraging DOE's vast unclassified and classified data sets to make it available to researchers, industry, state and local governments, communities, and other users to accelerate the pace of innovation and application development and help with decision-making. DOE should also partner with other federal agencies, including the Department of Commerce to evaluate and mitigate national and global security risks associated with AI systems and the National Science Foundation to coordinate the development of the National AI Research Resource (NAIRR) and other accessible AI data infrastructure.
- **AI risk evaluation and mitigation program.** ESC supports a risk evaluation and mitigation program which would require DOE to identify and find solutions to mitigate safety and security risks related to the use of AI. This is particularly important for DOE's nuclear and other national security missions, protection of critical energy infrastructure, assessing capabilities of adversaries, and overall general understanding of potential consequences of deploying AI tools.
- **STEM education and workforce development.** ESC recommends boosting targeted investments at DOE in AI STEM education and workforce development. This could include allocating at least 10 percent—about $240 million per year—of AI research and

development funding to support DOE STEM education and workforce development programs in AI. This targeted investment in training programs, research opportunities, and support for new degree and certificate programs in AI-related disciplines at research universities and community colleges is needed to meet growing demand for a and attaining AI-relevant skills. highly skilled and AI-literate workforce. ESC also supports efforts to expand the number of AI researchers from underrepresented groups interested in pursuing and attaining AI-relevant skills.

- **Sufficient authorized funding levels to maintain U.S. competitiveness**. ESC recommends at least $1 billion a year for a DOE AI Initiative that includes the program elements highlighted above, including investments at the DOE Office of Science, the National Nuclear Security Administration, and the applied energy offices. This level of investment would build on DOE's current planned investment in FY 2025 of $455 million.

Collectively, these provisions will help the U.S. maintain a quantum and AI advantage and develop applications that could have broad impacts in national security, energy, telecommunications, health, and finance. Thank you for advancing these critically important bills and finding a path to pass them into law by the end of the year.

Sincerely,

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ESC Membership

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