



A Public Meeting of the

National Quantum Initiative Advisory Committee (NQIAC)

March 24, 2023

Written Public Comments

Written public comments are given in the order of date received

As specified in the Federal Register Notice, because the NQIAC operates under the Federal Advisory Committee Act (FACA), all public comments and/or presentations will be treated as public documents and will be made available for public inspection, including being posted on the NQIAC website.

Wong, Tom G. EOP/OSTP

From: Cogliani, Leland [REDACTED]
Sent: Thursday, March 16, 2023 12:50 PM
To: NQIAC@quantum.gov
Cc: Julie Groeninger [REDACTED]
Subject: Written Comments for NQIAC March 24 Meeting
Attachments: ESC National Quantum Initiative Act Reauthorization Recommendations February 2023.pdf

Please find attached policy, programmatic, and funding recommendations for Department of Energy Quantum Information Science activities. These recommendations were recently sent to Congress as it considers reauthorization of the National Quantum Initiative Act. However, these recommendations are also relevant to the National Quantum Initiative Advisory Committee as it reviews trends and developments in quantum information science and provides its own set of recommendations to the President and federal agencies.

Let me know if I can provide any additional information.

Sincerely,

Leland

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ENERGY SCIENCES COALITION

National Quantum Initiative Act Reauthorization Recommendations to Congress on Department of Energy Provisions

March 14, 2023

The Energy Sciences Coalition (ESC) thanks Congress for making U.S. leadership in quantum science and technology a top priority. In particular, ESC would like to thank the Members of the House Science, Space, and Technology and Senate Energy and Natural Resources Committees for authorizing the *National Quantum Initiative Act* (NQIA) (Public Law 115-368) and the House and Senate Appropriations Committees for funding quantum information science programs over the last five years. The U.S. has a quantum advantage and continued investments will be needed to translate scientific innovation into technology applications with broad impacts for national security, telecommunications, health, finance, and energy as well as develop the needed quantum-trained workforce.

As Congress looks to reauthorize the NQIA to build on its current success, ESC recommends the following policy proposals for the Department of Energy (DOE) provisions in the legislation:

- **Maintain core research program and 5 National Quantum Information Science Research Centers.** A reauthorization should maintain current provisions that support a cross-cutting, core research program in a broad range of quantum information science research and development areas and fund innovative work at research universities and DOE national laboratories. Quantum information science is still a nascent field and requires continued fundamental research investments to take full advantage of promising applications. Support for the five National Quantum Information Science Research Centers should also continue. They were launched only three years ago, but have already establish multi-institutional and multi-disciplinary partnerships made up of 1,200 experts, including 600 students and postdocs, across 80 academic, industry, national lab, and other national science institutions. The centers bring together unique capabilities, expertise, and facilities to advance quantum computing, communications, networking, sensing, and materials with broad applications. To address scientific challenges, help commercialize future technologies, and attract and train the best talent, the current centers should be extended for at least another five year award period, for a total of 10 years as currently authorized. (Sections 401 and 402)

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.

- **Expand the core research program to include first use cases and application development for quantum information science.** With continued progress in scientific and technological innovation, DOE should 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. A new focus on initial exploratory application development and use case readiness will help translate scientific discovery into useful technologies while also informing future scientific roadmaps to overcome new challenges and roadblocks. Examples of initial applications and grand challenge topics could include materials discovery, designing better batteries and cleaner fertilizer, addressing cybersecurity challenges, drug development, financial modeling, solar capture, traffic optimization, and improved weather and climate forecasting. This will require greater coordination across the Department of Energy, especially with DOE's applied energy offices and the Office of Technology Transitions.
- **Consolidate quantum networking and quantum user program provisions from the *CHIPS and Science Act*.** The *CHIPS and Science Act* amended the NQIA and added two new DOE programs—the quantum network infrastructure research and development program and the quantum user expansion for science and technology (QUEST) program. ESC strongly supports these provisions and looks to Congress to implement and fund them. The reauthorization is an opportunity to consolidate the DOE provisions from the two bills into one comprehensive authorization. (Sections 403 and 404)
- **Expand quantum computing, networking, and communications initiatives.** Consistent with recommendations from the Future of High Performance Computing Capabilities Report of the Advanced Scientific Computing Advisory Committee and subsequent DOE-sponsored workshops, the quantum computing initiative should include a \$100 million program on quantum-centric supercomputing that can bridge exascale computing with future quantum computing architectures and applications. The quantum networking and communications initiative should also be expanded to include partnerships with other federal agencies and in particular a new \$500 million with the National Aeronautics and Space Administration for a quantum satellite program that couples advances with fiber optic and other ground-based approaches to stay ahead of international competition.
- **Increase funding authorization for the 5 DOE National Quantum Information Science Research Centers.** To fully leverage the expertise and capabilities of the centers, ESC recommends increasing the funding authorization for each center from \$25 million per year to \$35 million per year. Competing and launching the centers, forming collaborations and partnerships, and designing and procuring specialized equipment was a major undertaking and current funding levels have not kept pace with inflation. The next phase of funding should focus on further expanding research programs, additional access to DOE user facilities for advanced materials analysis and device fabrication, accelerating scale up and production of devices and new quantum technologies to speed up technology transfer and commercialization opportunities, and expand training programs for the quantum workforce. The centers are funding constrained and could significantly increase the scope of activities with additional support.
- **Create a new quantum science and technology instrumentation and infrastructure program.** ESC recommends a new \$250 million instrumentation and infrastructure program over five years, or \$50 million per year, to help build quantum foundries, specialized equipment and lab spaces, and state-of-the-art instruments at the five centers, in partnership

with industry and research universities. Unique infrastructure is needed to support quantum science and technology efforts and address U.S. supply chain and manufacturing capabilities. No dedicated program or funding source currently exists to support these unique infrastructure needs.

- **Establish a dedicated traineeship in quantum information science to help train the workforce.** ESC recommends a new \$25 million traineeship in quantum information science, with \$5 million per year over five years, to provide classroom training and research opportunities to undergraduate and graduate students working toward bachelor's, master's or Ph.D. degrees. Research projects would partner students with DOE national labs to help student develop hands-on research experiences and build quantum curricula at research universities. Consistent with the intent and goals of the *CHIPS and Science Act*, these efforts should include expanding participation of underrepresented groups and institutions in STEM, including non-R1 academic institutions, and strengthening partnerships with Minority Serving Institutions.
- **Increase authorization funding levels to maintain U.S. competitiveness.** The reauthorization is an opportunity to update authorized funding levels for a comprehensive DOE program based on new *CHIPS and Science Act* programs and ESC program recommendations. ESC recommends at least \$675 million each year over five years from FY 2024 through FY 2028. This includes:
 - \$300 million per year to support current enacted funding levels for the core research program and the five quantum centers;
 - \$50 million more per year to expand research and partnership support at the 5 quantum centers;
 - \$100 million per year for the *CHIPS and Science Act* authorized quantum networking program;
 - \$20 million per year for a quantum-centric supercomputing program;
 - \$100 million per year for a quantum satellite program, in partnership with NASA;
 - \$50 million per year to fully fund the *CHIPS and Science Act* QUEST program;
 - \$50 million per year for the new instrumentation and infrastructure program; and
 - \$5 million per year for a quantum traineeship.

Thank you for advancing this critically important initiative.

Sincerely,

Leland Cogliani
Co-chair

[REDACTED]
[REDACTED]

Julie Groeninger
Co-chair

[REDACTED]
[REDACTED]

ESC Membership

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