Congressional Snapshot:
DOE Quantum Information Science Program

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Congress Prepares To Advance 5-Year Reauthorization of the National Quantum Initiative

On November 3, the House Science, Space and Technology Committee (HSST) introduced the National Quantum Initiative Reauthorization Act to maintain U.S. leadership in quantum science and technology. This is the first step in the legislative process. The legislation is expected to advance through HSST with bipartisan support in the next few weeks, but the timing of when the full House would vote on the legislation is not clear. The Senate has also been considering quantum legislation, with a few bills introduced focused on quantum applications, but has not yet worked on a comprehensive package. The introduction of this bill is likely to accelerate efforts on the Senate side. If the House and Senate can advance this legislation before the end of the year, there is an opening to include it in the National Defense Authorization Act and have it become law.

The legislation builds on the original legislation signed into law five years ago in December 2018. The new bill continues support of existing programs for another five years (fiscal year 2024 through fiscal year 2028) as well as expanding current or establishing new programs at the National Science Foundation, the National Institute of Standards and Technology, the National Aeronautics and Space Administration (NASA), and the Department of Energy (DOE). This update focuses on DOE programs and activities.

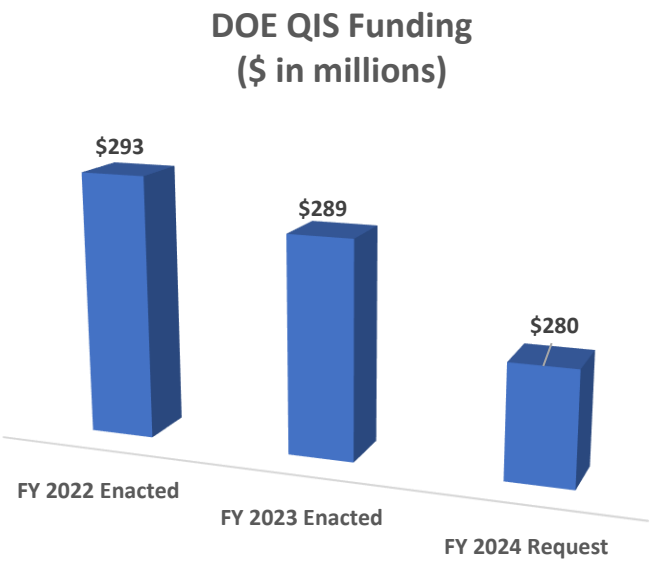
Key DOE Quantum Science and Technology Programs

- **EXPANDED** — Quantum Information Science Research Program
- **RENEWED and EXPANDED** — National Quantum Information Science Research Centers
- **EXPANDED** — Quantum User Expansion for Science and Technology (QUEST)
- **EXPANDED** — Quantum Network Infrastructure Research and Development Program
- **NEW** — Quantum Instrumentation and Foundry Program

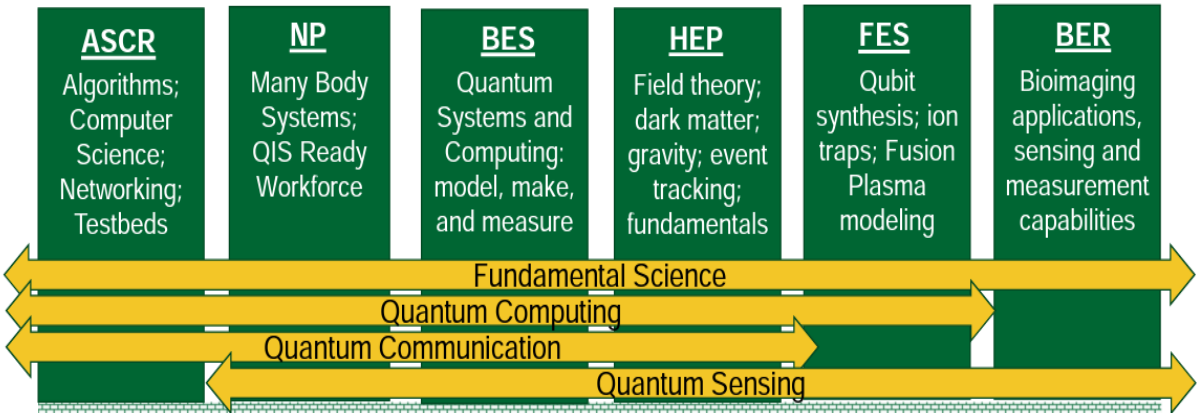
Program	Description
Quantum information science research program *Core research program* *Expand to science, technology, and engineering* *First use cases and applications* *Quantum High Performance Computing Strategic Plan* *Private industry engagement*	The bill authorizes $650 million over five years to continue a cross-cutting DOE research program in quantum information science—an authorized funding increase of $10 million more per year over five years. The bill clarifies that the research program includes different scales of funding and support—from smaller scale, innovative, single Principal Investigator awards, to small groups, to large-scale National Quantum Centers—and should involve partnerships between research universities, national labs, and industry. The new legislation would also broaden the scope beyond fundamental research and expand it to include science, technology and engineering research, development, and demonstration activities. The new legislation would also expand the scope of activities to include first use cases and early applications, such as in materials discovery, cybersecurity, financial modeling, energy storage, traffic optimization, and improved weather climate forecasting. The new legislation also instructs DOE, one year after the bill is passed, to develop a Quantum High Performance Computing Strategic Plan. The 10-year plan should include efforts to design, commercialize, and procure hybrid, high-performance computing systems capable of integrating current computing architectures with quantum systems powered by artificial intelligence and machine learning. The new legislation also expands DOE engagement with private industry to support the quantum technology industry and build out supply chains.
National Quantum Information Science Research Centers	The bill authorizes $875 million for the five existing DOE National Quantum Centers. The bill would renew for another five years the existing Centers and increase their budgets from $25 million per year each to $35 million per year each. The bill would also expand their program activities to include not just quantum science but also technology and engineering solutions and accelerating quantum workforce development programs as well as support for new programs listed below.
Quantum Instrumentation and Foundry Program	The bill authorizes $125 million over five years to launch a new quantum instrumentation and foundry program. The purpose would be to support research, development, design, and procurement of unique instrumentation, equipment, national lab infrastructure and manufacturing capabilities for quantum materials, devices, and other relevant quantum technologies. This would also include quantum foundries and efforts to build up a U.S. supply chain.
Quantum Network Infrastructure Research and Development Program	This program was recently authorized in the *CHIPS and Science Act* and re-stated in this more comprehensive re-authorization. The bill authorizes $500 million over the next five years to build out a quantum internet and expand funding for quantum networking and communications research. This is consistent with DOE's strategy, "America's Blueprint for the Quantum Internet." The bill further expands on the original provisions in the *CHIPS and Science Act* by expanding coordination with the National Aeronautics and Space Administration (NASA), especially for space- and satellite-based networking opportunities; requiring DOE to leverage a broader and more diverse set of quantum technologies and commercially available hardware and software for networking; and more explicitly stating the need to develop education and training pathways in quantum networking.
Quantum User Expansion for Science and Technology (QUEST)	This program was also recently authorized in the *CHIPS and Science Act* and re-stated in this more comprehensive re-authorization. The bill proposes at least $166 million over the next five years to establish public-private partnerships for quantum resource use by giving U.S. researchers access to quantum computing hardware and quantum computing clouds at national laboratories, research universities, and private industry. The bill further expands on the original provisions in the *CHIPS and Science Act* by requiring the development of near-term quantum applications to demonstrate the promise of helping to solve national grand challenges; expanding program goals to include development of algorithms, software tools, simulations, and applications for quantum systems using cloud-based quantum computers; and including training and education opportunities, especially to develop and use prototype and early-stage devices.

Funding Outlook

The new quantum legislation is likely to stimulate new investments at DOE in the future. In FY 2024, DOE is not planning any new significant funding calls related to quantum information science (QIS). Additional congressional guidance and direction is likely to increase investments in the future and better support ongoing activities as well as launch new efforts especially in quantum computing and quantum networking and communications. In the last few years, DOE has reduced funding for QIS and Congress has supported DOE's budget requests.



DOE is updating its future research priorities, which will define future opportunities. In July, DOE hosted a Basic Research Needs in Quantum Computing and Networking workshop to identify priority research directions in quantum computing and networking. The report is expected to be released by the end of the year. In the meantime, the DOE Office of Science will continue to support a broad-based QIS program across all six of its major programs:



Source: DOE Office of Science