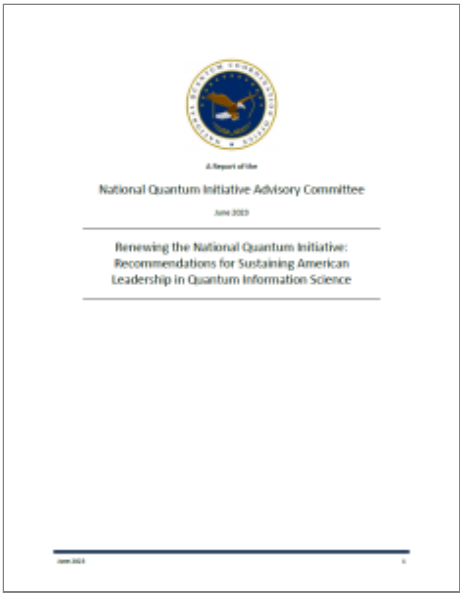
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June 2, 2023

NQIAC Report on Renewing the National Quantum Initiative



(June 2, 2023) Today, the National Quantum Initiative Advisory Committee (NQIAC) published its first independent assessment of the National Quantum Initiative (NQI) program, including recommendations for enhancements to the Program, in a report titled, Renewing the National Quantum Initiative: Recommendations for Sustaining American Leadership in Quantum Information Science.

The report identifies three findings, four overarching recommendations, and nine detailed recommendations.

Findings:

1. In its first five years, the NQI has increased the United States' capacity in quantum information science and technology (QIST) R&D.
2. The development of QIST is critical to U.S. economic and national security.
3. Key scientific, engineering, and systems integration challenges remain and must be solved for the United States to realize the full economic impacts and benefits of QIST.

Overarching Recommendations:

A. To ensure U.S. leadership in QIST, the NQI Act should be reauthorized and expanded. All authorized QIST programs in the NQI Act, the CHIPS and Science Act, and other relevant legislation should be funded at the authorized levels.

B. To ensure that the United States leads in QIST discovery, innovation, and impact, efforts should be increased to attract, educate, and develop U.S. scientists and engineers in

QIST-related fields, improve and accelerate pathways for foreign QIST talent to live and work in the United States, and increase support for research collaboration with partner nations.

C. To safeguard the security and competitiveness of U.S. advances in QIST, the United States should develop policies that thoughtfully promote and protect U.S. leadership in QIST; expand domestic center-scale and single principal investigator QIST research activities and infrastructure; and evaluate and improve the reliability of global supply chains for QIST.

D. To realize the potential of QIST for society, the NQI must accelerate the development of valuable technologies. This goal will require new programs in engineering research and systems integration that will enable a virtuous cycle of maturing and scaling of quantum systems to useful applications through multisector partnerships and engagement with end-users.

Detailed Recommendations:

- RECOMMENDATION 1: The United States should renew the NQI to support U.S. quantum information science, technology, and engineering, and signal intent to extend the NQI beyond its initial ten-year authorization.
    - Recommendation 1A: Authorization for NQI centers should be renewed for at least five years, with existing Centers charged to review and refresh their R&D goals, and all authorized funds should be appropriated.
    - Recommendation 1B: CHIPS and Science Act-authorized funding for QIST should be appropriated, and semiconductor research and manufacturing capabilities should be leveraged for QIST.
- RECOMMENDATION 2: The United States should expand the NQI to increase support for fundamental research in quantum information science and engineering.
    - Recommendation 2A: Federal agencies should be authorized to establish additional nimble and focused NQI Centers, as needed, to address newly emerging scientific questions.
    - Recommendation 2B: In addition to the NQI Centers, agency programs to fund quantum information science (QIS) research activities led by a single principal investigator or only a few principal investigators should be authorized and appropriated.
    - Recommendation 2C: The NQI should increase support for fundamental research in engineering to accelerate the development of quantum technologies for future scientific and commercial applications, including by establishing QIST Centers that focus on engineering of integrated and scaled systems for a variety of quantum platforms and technologies.
    - Recommendation 2D: Federal agencies should increase investment in R&D for quantum computer science and software engineering, including in quantum algorithms, applications, software and software development tools, and error correction.

- RECOMMENDATION 3: New Federal programs should help fund industry-led partnerships to develop and advance scaled-up, integrated quantum systems for mission- and commercial-grade technologies, and new mechanisms to fund such programs should be defined and authorized as needed.
- RECOMMENDATION 4: Agencies should expand investment in small- and mid-scale infrastructure in support of Federally-funded research that includes support for staff, equipment, maintenance, and operating costs, to ensure that facilities meet the needs of QIST projects.
- RECOMMENDATION 5: The U.S. Government should provide new dedicated funding to ensure that international cooperation statements result in productive collaborative activities between participating nations.
- RECOMMENDATION 6: The Nation must simultaneously accelerate progress in QIST and protect quantum technologies from malign actors.
    - Recommendation 6A: Governmental entities should implement only protective measures that are clear, appropriately targeted, and compatible with the goal of facilitating progress in QIST for the benefit of the Nation and the world.
    - Recommendation 6B: U.S. Government entities should frequently reassess the efficacy of protective measures as QIST advances. This review process should entail thorough consideration of the balance between managing risk and impeding progress.
    - Recommendation 6C: The U.S. Government should work with partner nations to establish shared measures for ensuring supply chain resilience and for protecting QIST. It should avoid unilateral controls when they impede the ability of U.S. industry to compete in the global marketplace.
    - Recommendation 6D: Once the new post-quantum cryptography (PQC) standards are published, the United States should proceed expeditiously with migration to PQC in the public and private sectors. The U.S. Government should provide appropriate resources to accomplish this task effectively, thoroughly, and efficiently.
- RECOMMENDATION 7: The U.S. Government should facilitate efforts to strengthen, diversify and secure QIST supply chains domestically and in collaboration with partner nations. As QIST progresses, measures to de-risk and secure international supply chains should be continually updated.
    - Recommendation 7A: The Department of Commerce, in coordination with industry, should develop and maintain a QIST supply chain risk analysis and a plan for strengthening, diversifying, and securing supply chains for key QIS technologies.
    - Recommendation 7B: The U.S. Government should follow and potentially expand the Department of Energy roadmap for addressing critical isotope and rare element needs for QIS R&D to ensure future supplies, as some isotope production requires substantial lead time.
    - Recommendation 7C: Federal agencies should actively support the development of QIST-enabling technologies to help de-risk the domestic QIST supply chain.

- RECOMMENDATION 8: Domestic talent in QIST should be expanded through educational and training programs at all levels.
    - Recommendation 8A: Federal agencies should create additional fellowships and traineeships for U.S. citizens and permanent residents pursuing QIST-related degrees with a focus on broadening participation.
    - Recommendation 8B: All previously authorized QIST education and training programs should be appropriated.
    - Recommendation 8C: The National Science Foundation should fund the development of a consolidated set of outreach programs, allowing QIST principal investigators to tap into these programs for their “broader impacts” on Federally-funded work for more cohesive and scalable impact.
    - Recommendation 8D: The National Science Foundation should lead a holistic, systematic study of quantum workforce needs, trends, and education capacity. This study should be conducted and monitored biennially for the duration of the NQI to ensure U.S. leadership in QIST and competitiveness in the burgeoning quantum industry.
- RECOMMENDATION 9: Employment of foreign talent in the U.S. QIST workforce should be facilitated and expedited through revised immigration policies and processes, thereby enhancing U.S. economic competitiveness and national security.

As legislated by the NQI Act, the NQIAC is tasked with submitting its reports to the President and appropriate committees of Congress.

Categories: NQIAC