Testimony of

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Advancing American Leadership in Quantum Technology

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Chairman Lucas, Ranking Member Lofgren, and Members of the Committee, thank you for the opportunity to testify this morning. I am Celia Merzbacher, Executive Director of the Quantum Economic Development Consortium (QED-C®), which is managed by SRI International, a nonprofit research institute based in Menlo Park, California.

Introduction

Quantum information science and technology (QIST) is based on the properties of matter governed by quantum mechanics. Quantum properties, such as superposition and entanglement, open the door for novel ways to gather, transmit and analyze data. Advances in the ability to measure and manipulate these properties is leading to applications in sensing, networking and communications, cybersecurity, and computing and have broad economic and societal potential, as well as national security implications.

Quantum sensing applications are among the most advanced and near term. Quantum sensors that can measure extremely small variations in magnetic fields or the pull of gravity could be used, for example, to detect submarines undersea or mineral deposits underground. They could be used for novel bioimaging of electrical activity in the brain and are being developed for sensitive detection of certain types of cancer and other diseases. Quantum sensing technologies also are being developed to answer scientific questions about the nature of dark matter and in fundamental studies of the universe.

Quantum technologies for networking and communication are less mature than those for quantum sensing. Communication among quantum systems over relatively short distances (up to tens of kilometers) has been demonstrated. However, technologies used in conventional telecommunication systems for long-distance communication are not suited to transmission of quantum information. New types of interconnects, repeaters, etc. are needed in order to realize the benefits of quantum networks, such as improved cybersecurity and more accurate and reliable worldwide clock synchronization which underpins financial systems and other critical infrastructure.

The most anticipated quantum technology application is quantum computing, which has the potential to solve certain problems that are beyond the capability of current classical computers. Examples of such computational problems include molecular modeling and simulation, optimization, and machine learning. These problems are fundamental to many practical applications, including drug discovery, development of advanced materials (e.g., for batteries), energy efficient chemical processing, transportation logistics, electric grid management including integration of electric vehicles and distributed sources of electricity, and financial portfolio optimization. A 2022 QED-C analysis found 100 reports on uses of quantum computers for various problems in a variety of sectors.[1] And a recent study found that many Canadian businesses expect quantum computing to be mainstream by 2030.[2]

While QIST has the potential for enormous economic value, there also are national security implications. A sufficiently powerful quantum computer will be able to break some of the most commonly used encryption techniques. Such a quantum computer would therefore pose a threat to existing IT systems and the security of data that are stored and transmitted, for example, as part of online banking and e-commerce or sharing of medical information between doctors and patients or insurers. Steps are being

[1] QED-C analysis of quantum computing algorithm development, QED-C (2022)

[2] https://www.itworldcanada.com/article/canadian-organizations-expect-quantum-computing-to-be-mainstream-by-2030-kpmg/539928

taken to address this threat. QED-C released a guide to a quantum safe organization in 2021, which provides IT security officers with accessible and actionable information.[3] NIST is leading a program to identify new quantum-resistant cryptographic standards and expects to announce those standards next year.[4] The national security memorandum on promoting US leadership in quantum computing while mitigating risks to vulnerable cryptographic systems (NSM-10)[5] outlines the need to both promote quantum computing capabilities for beneficial uses while protecting existing systems from possible threats posed by the technology. The Quantum Computing Cybersecurity Preparedness Act[6] directs federal agencies to take certain steps to prepare for and adopt, once announced, post-quantum cryptographic, or PQC, standards. And the Cybersecurity & Infrastructure Security Agency, or CISA, has provided guidance to owners and operators of critical infrastructure systems on preparing for PQC[7].

NQI: The US national quantum program

The National Quantum Initiative (NQI) builds upon decades of federal investment in quantum research. The NQI provides overarching strategy and coordination across the agencies with a stake in quantum as an area of research or for addressing their mission. It also aims to promote engagement with entities outside of the federal enterprise, including the private sector and international stakeholders.

The purpose of the 2018 National Quantum Initiative Act (PL 115-368) is to ensure American leadership in QIST, in part by "promoting collaboration among the Federal Government, Federal laboratories, industry, and universities". Agencies are called upon to partner with industry to leverage knowledge and resources and to include industry as collaborators in the NQI centers. My testimony focuses in particular on the NQI activities aimed at speeding practical application and economic developmen5t of QIST.

QED-C: The Quantum Consortium®

The NQI Act called for NIST to establish a "consortium of stakeholders". The Quantum Economic Development Consortium (QED-C) is that consortium, with the mission to enable and grow the quantum industry and associated supply chain. QED-C is a novel public-private partnership created with funding from NIST and increasingly supported by the broader quantum community. We also have received funding from the Air Force Research Lab for work related to the Air Force mission and quantum strategy. Today QED-C has more than 230 non-government members from across the quantum ecosystem—approx. 170 are companies and about three quarters of those are small- to mid-sized businesses or startups.[8] More than 50 government agencies have also engaged in QED-C activities.

To achieve its mission, QED-C is working to identify barriers that are common across the community and to take steps to address those barriers. Toward this goal, QED-C seeks to identify use cases and markets for quantum technologies—which may be for government or commercial customers—and pathways toward realizing those use cases. Examples of QED-C assessments include:

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[3] Guide to a Quantum-Safe Organization, QED-C (2021)
[4] See NIST's Post Quantum Cryptography website for current information.
[5] National Security Memorandum on promoting united states leadership in quantum computing while mitigating risks to vulnerable cryptographic systems, White House (May 4, 2022)
[6] Quantum Computing Cybersecurity Preparedness Act (enacted Dec 21, 2022)
[7] Preparing Critical Infrastructure for Post-Quantum Cryptography, CISA (2022)
[8] See current QED-C members online.

- Annual quantum computing market assessments. The 2022 report, based on surveys of the quantum computing industry worldwide, estimates the market was over $600 million in 2022 and is expected to grow to $1.2 billion in 2025, a growth rate of over 25% annually.[9]
- Use cases of quantum sensors, which include assured positioning, navigation, and timing (PNT), communications, and remote sensing (e.g., using magnetometry).[10]
- Use cases of quantum computers for managing the electric grid such as fault prediction; energy market optimization; planning for grid reliability and resilience; and simulation of materials for batteries, solar cells, etc.[11]

The consortium also identifies needs and gaps and strategies for addressing them. With active engagement and support from the members, QED-C has identified gaps in critical enabling technologies, standards and benchmarks, workforce, and has identified potential solutions to policy concerns and opportunities, such as for export controls.

QED-C has assessed needs and gaps in the following enabling technologies and has shared the results with members and government agencies.[12]

- Cryogenic technologies
- Quantum-enabling laser technologies
- Control and readout electronics
- Materials for superconducting qubits
- Packaging for quantum sensors
- Single photon sources and detectors
- Photonic integrated circuits

Addressing these gaps should be a focus of the next phase of the NQI.

Quantum is global.

Other governments also recognize the economic and national security implications of quantum technology and are launching their own national initiatives. Germany recently announced it will invest 3 billion euros. The UK announced the next phase of its national program, which provides £2.5 billion over 10 years[13]. India[14], Canada[15] and Australia[16] each released national quantum strategies within the last few months with significant spending plans, many of which include a focus on commercialization of quantum technologies along with talent development and advancement of the science. The billion-euro EU quantum flagship program was launched in 2018 and continues to support pan-European activities. The high-level goals of the various national strategies are similar: bring together researchers across disciplines and sectors, translate research into applications, support commercialization, and grow a

[9] 2022 Quantum computing market assessment and forecast
[10] Quantum Sensing Use Cases (2022)
[11] QuEnergy: Exploring the role of quantum computing for the electric grid (2022)
[12] A complete list of QED-C reports is available online.
[13] https://techmonitor.ai/hardware/quantum/national-quantum-strategy-uk-government-budget-2023
[14] https://indianexpress.com/article/explained/explained-sci-tech/quantum-computers-and-india-8575969/
[15] https://ised-isde.canada.ca/site/national-quantum-strategy/en/canadas-national-quantum-strategy
[16] https://www.industry.gov.au/publications/national-quantum-strategy

skilled workforce.[17] For example, Australia has announced their intentions to use quantum computing for transportation network optimization.[18] And in the United Kingdom, there is a call for applications to be developed in 18 months for a variety of industries including manufacturing, financial services, and life sciences.[19] The recently proposed legislation for a quantum "sandbox" for near-term applications has a similar objective and would help bridge the lab-to-market gap. [20]

Although its national quantum program is less clear from publicly available information, China is making strides in quantum technology R&D, reportedly investing on the order of $14 – 15 billion (including significant funding for research facilities and infrastructure). Based on an analysis of highly cited research publications, the United States leads the world in quantum computing, but China leads in the areas of quantum communication, quantum sensors, and post-quantum cryptography.[21] In particular, China has focused on quantum communications and cybersecurity and based on citations, dominates research output and excellence in these areas.

Although research papers do not necessarily translate into technological leadership, a concentration of research capacity, knowledge and people provides a strong foundation. And China's well-funded and deliberate research program is matched by strides in technology development, securing intellectual property protection, and engagement in standards setting organizations. These are all hallmarks of a growing Chinese quantum industry.

The role of the private sector

In addition to government investments, around the world the private sector is making big bets. Well-known large tech companies have significant internal R&D activities, while a growing number of smaller, pure-play quantum companies and suppliers to the quantum system developers are creating technologies and products with public and private funding. Existing players continue to report progress, however, growth in venture capital (VC) investments appears to have slowed in the past two years.[22]

There may be several reasons for the slower growth in VC spending in quantum technologies, from the slow-down in the tech sector broadly to fewer opportunities of interest after the initial flurry of investments. The VC saying that "hardware is hard" may make it difficult for hardware-based startups to secure investment. Identifying use cases for near-term technology along with objective benchmarking, such as the benchmarks being developed by QED-C,[23] can help to inform investors and boost their confidence. Although the quantum sector is still nascent, its potential is steadily coming into focus and VC interest should increase in the future as capabilities, applications and markets become clear. In the meantime, the government can help de-risk ideas by acting as a seed investor through greater utilization of programs such as the small business innovation research (SBIR) and small business technology

[17] A quantum revolution: Report on global policies for quantum technology, CIFAR (2021)
[18] https://www.transport.nsw.gov.au/data-and-research/quantum-technology
[19] https://www.ukri.org/what-we-offer/browse-our-areas-of-investment-and-support/commercialising-quantum-technologies-challenge/
[20] Quantum Sandbox for Near-Term Applications Act of 2023
[21] ASPI's Critical Technology Tracker: the global race for future power, Australia Strategy Policy Institute (2023)
[22] Quantum Technology Monitor
[23] https://quantumconsortium.org/qed-c-releases-new-paper-highlighting-major-enhancements-to-its-benchmarking-suite/

transfer (STTR) programs. Also, DOE's Loan Program could be used to support scaling and commercialization of technologies. However, these may not be enough.

Promote and protect.

The dual-use nature of quantum technologies calls for measures to accelerate development for economic and societal benefits while taking appropriate steps to protect access by adversaries. Quantum technologies are in various states of maturity—from commercially available to early-stage R&D. To win the quantum race, we need to "run faster" through strong, yet targeted investments within the NQI. These include investments in research and development across disciplines and in education and workforce development to create an adequate talent pool.

At the same time, developers of quantum technologies, particularly quantum computing technologies, recognize that mechanisms are being considered that would slow access by adversaries to capabilities that could be used against the interests of the United States and like-minded countries. The quantum computing market is still nascent and relatively small. Moreover, developers of quantum technologies are understandably protective of their hard-won intellectual property. This has resulted in caution when it comes to cross-border engagement and business. While academic research collaborations across borders are abundant[24], based on a survey of QED-C members, there are virtually no sales of quantum computing technologies to China at present.

QED-C recognizes the need for policies to promote quantum technology developments within the United States, as well as the need for policies that protect against unfair competition or malicious use of developing quantum technologies. Export controls are one approach, but they should be used judiciously in light of the following factors.

- Quantum innovation is taking place in countries worldwide—both friendly and adversarial.
- Supply chains for key quantum components are also global.
- Qualified talent is a commodity in particularly short supply. The United States should reduce barriers to attracting and retaining the best and brightest.
- A single chokepoint technology does not exist. Multiple platform technologies are being developed for quantum computers, each with its own enabling or chokepoint technologies (e.g., specific lasers, dilution refrigerators, electronics, optics, etc.).
- It is impossible at this point to know which technologies will ultimately be the basis for a sufficiently powerful quantum computer.

For the US quantum industry to grow and flourish, policies should be developed that reinforce positive outcomes rather than restrict negative outcomes. In particular, if used, export control restrictions should be limited and should be imposed multilaterally. Collectively, QED-C members offer the following recommendations when implementing export controls.

1. Imposition of deemed export controls would have a chilling impact on the ability of quantum companies to hire qualified talent.

[24] According to RAND, about half of U.S. quantum science publications have a coauthor from a foreign institution, and U.S. researchers coauthor more papers with China than with any other country. From *Promoting Strong International Collaboration in Quantum Technology Research and Development*.

2. End use and end user controls are more likely to be effective and not counterproductive versus list-based controls.
3. Export controls need to be imposed multilaterally with like-minded countries. It won't work to restrict access by adversaries to technologies manufactured in the United States when innovation is taking place in many other countries.
4. Maintain regular communication with industrial stakeholders to obtain input and feedback on proposed measures and to keep informed about the state of competitiveness and maturity of technologies and use cases.

Assessment of the NQI

Strengths

Thanks to the NQI, which is building on decades of federal investments in basic quantum research, the United States is a leader in many areas. The research needed is multidisciplinary, including physics, materials, computer science and increasingly engineering. The centers launched by NSF and DOE bring together top-notch multidisciplinary teams and are focused on key areas, predominantly in quantum computing. These investments are creating and growing research capacity, especially at the DOE laboratories. Funding for academic research is producing a growing stream of graduates who are ready for QIST careers in the public and private sectors. The facilities and people supported during the first five years have been a great start and should be sustained and even increased in strategic areas.

As called for in the NQI Act, the National Quantum Coordination Office, located within the Office of Science and Technology Policy in the Executive Office of the President, provides valuable coordination functions—across agencies, but also with the private sector. QED-C and its members see the NQCO as a central point of contact regarding the federal quantum policies, programs, and priorities. QED-C leadership communicates with the NQCO regularly on topics of mutual interest. However, the office is relatively small, which limits its ability to undertake activities that require more time and resources. QED-C and its members welcome broader two-way communication between the NQCO and the quantum industry as a whole.

The NQI Advisory Committee called for by the Act was recently reconfigured and comprises high level experts in both quantum and in managing large research enterprises. Such high-level advisory groups are a valuable resource, particularly with respect to areas that need improvement. It is notable that among the industry representatives, only one is from a small company and none are part of the supply chain for quantum systems.

Weaknesses

To date, the NQI has focused heavily on funding basic scientific research and less on advanced research and development (R&D) and commercialization of technologies for practical and economic benefits. In addition, the NQI has not focused on enabling technologies or supply chain needs, as may have been appropriate for the stage of the industry when the original bill was drafted. However, as the industry matures it has become increasingly clear that sourcing specialized enabling technologies is a significant bottleneck for quantum companies, and the government could help develop and strengthen the supply chain for technologies that are needed across the industry.

Meanwhile, the UK, Netherlands, Australia, Japan, Canada and others are putting in place programs to start and grow quantum businesses across the value chain. Many of these countries have strong collaborations between industry and government-funded research institutions that the United States should consider as models. A key metric by which the NQI centers launched by NSF and DOE should be assessed should be their engagement with industry.

There is a need for skilled quantum workers at every level and with a range of knowledge and skills. With increased investments in university research, the number of graduates with advanced degrees and relevant experience, knowledge, and skills is growing. However, demand for quantum-ready workers continues to outpace supply, especially in engineering fields and increasingly for specialized technicians. At the same time, the increase in demand for STEM workers in the semiconductor industry is likely to make the shortage of engineers and technicians who consider careers in the quantum ecosystem even worse.

A study supported by QED-C shows that the majority of jobs in the quantum industry do not require a PhD or significant quantum-specific skills.[25] Instead, an undergraduate or master's degree in a traditional discipline, with an introduction to quantum as part of the curriculum, leaves graduates well-prepared for positions in the emerging industry. As industry shifts from R&D to production, there is a growing demand for engineers who are experienced in product development and for technicians with hands-on experience using photonic, vacuum, and cryogenic equipment. It should be noted that the skills required by "quantum makers", that is businesses that are developing quantum-based products, are different from those required by "quantum takers", i.e., the end users. Over time, the takers will outnumber the makers, creating a demand for people who can understand the domain of the business (pharma, finance, energy, etc.) and the potential of quantum technologies to provide solutions. The quantum education system needs to adapt to the needs of both components of the growing industry.

Opportunities for improving the NQI.

The following trends point to needs and opportunities where government can play a role, including in reducing technological risks and supporting the development of practical applications of quantum technologies.

- A growing understanding of use cases.[26]
- An increased focus on enabling technology gaps, including supply chain weaknesses[27].
- Given progress in the last five years, it is reasonable to anticipate there will be applications with clear business value will be developed within the next 5 years.
- Increased spending by other governments, many of whom have signed statements of intent to collaborate with the United States to advance quantum technologies, especially toward developing applications and creating economic value.
- Slower growth in private investments due to economic pressures and early stage of technology readiness.
- Persistent challenges in hiring qualified talent in many disciplines and levels.

[25] Assessing the needs of the quantum industry

[26] For example, QED-C published reports on use cases of quantum computing for managing the electric grid and of quantum sensors.

[27] For example, QED-C has prepared reports on single photon sources and detectors for quantum systems, control electronics and packaging for quantum sensors. A complete list is available online.

The following are areas that Congress has the opportunity to address in the reauthorization of the NQI.

Expand R&D to address gaps on the pathway to a robust quantum economy.

- The QED-C reports on use cases and technology gaps are based on community assessments and can serve as guides for investments at the NQI agencies.
- Industry could benefit by more collaboration with researchers in academia and at national laboratories. And academic faculty and students and national laboratory researchers could benefit from interactions with industry. Small companies in particular don't have the capacity to do longer term R&D. NQI should increase meaningful partnerships between industry and academia—e.g., within the new NSF TIP directorate.
- Fund QUEST. The Quantum User Expansion for Science and Technology (QUEST) program was authorized in the CHIPS and Science Act. It will enhance research, educate students, and support development of useful quantum computers by U.S. companies by providing access to commercial quantum computing resources. The program aims to expand the use of U.S. quantum computers in diverse fields of research including by researcher from end users in the private sector, for example in biomedicine, industrial systems, materials science, etc. Connecting researchers directly with providers promotes interactions that can accelerate progress in the development of useful systems. In addition, student users will learn how to program and use quantum computers, gaining valuable skills that they will take with them into their next job. QUEST is an example of the government being an "early adopter" by paying the cost of using currently available, privately owned quantum computers. It is platform agnostic and open to the various types of quantum computers being developed. Buying cloud-based services makes sense because the available systems are rapidly improving. The program is a win for academic, government and industry researchers, students, and the quantum computing industry.
- Increase investments in strategically important long-term R&D topics so the US is positioned to take full economic advantage of the quantum industry as it matures. The NQI should be inclusive of the wide variety of quantum technologies as each one may have different capabilities to solve different problem sets.

Provide for upskilling and reskilling the existing workforce.

In addition to educating graduate, undergraduate and pre-college students, NQI should develop programs to provide education to members of the current workforce who are interested in pivoting into careers in quantum. Such programs could leverage or expand existing programs that meet certain criteria offered by community colleges and other educational institutions and professional societies, in partnership with quantum companies. Programs aimed at educating end users in additiona to developer are especially needed in order to promote practical uses. A model for such a program is the Quantum Algorithms Institute in British Columbia, Canada.[28]

Take full advantage of NIST.

In the Department of Commerce, NIST has a mission to support US industry and is home to world-leading expertise in technologies that are critical for the quantum industry. Four NIST researchers have

[28] Quantum Algorithms Institute homepage

won Nobel prizes for work related to quantum. As part of the NQI reauthorization, NIST's role in support of commercialization of quantum technologies should be expanded to leverage the following.

- NIST capabilities that can be focused on advancing quantum technologies. We note that NIST capabilities are increasingly hampered by the condition of its outdated infrastructure and facilities, as recently reported by the National Academies of Science, Engineering and Medicine.[29]
- NIST expertise in metrology can support benchmarking efforts, such as those underway at QED-C. Metrology is the foundation of measuring performance and progress.
- NIST's role in international metrology and standards activities, as outlined in the recent National Standards Strategy for Critical and Emerging Technologies[30]. NIST should reduce barriers for quantum businesses to participate in quantum standards development activities.
- Manufacturing USA, which is based at NIST and aims to strengthen advanced manufacturing through creation of advanced manufacturing institutes. An institute in quantum technology manufacturing would accelerate the ability to scale up and commercialize early-stage technologies. The institute should work closely with any prototyping hub for quantum technologies established by the Microelectronics Commons program, alunched by the CHIPS and Science Act in the Department of Defense.[31]
- The CHIPS R&D Program, also established by the CHIPS and Science Act, is managed by NIST. In the future, microelectronics technology for computation is expected to include quantum processors, likely in a hybrid classical-quantum architecture. The CHIPS R&D Program should integrate quantum into its plan now to intersect and co-develop with NQI the hybrid computers of the future.
- NIST's top notch talent pipeline. Growing the NIST quantum effort, especially in quantum engineering, should be accompanied by a growing number of NIST post-docs working in quantum. NIST post-docs have experience working on leading-edge quantum technologies. A substantial number of former NIST post-docs have started companies and taken leading positions in existing quantum companies, acting as a multiplier to the US quantum economy.

Broaden engagement and coordination among agencies and with industry.

As quantum technologies continue to advance and applications emerge, interagency coordination between research agencies and those with problems and responsibilities that may be addressed by quantum technologies needs to increase. Mission agencies should work with QED-C to identify priority areas where quantum could provide solutions. Since the NQI was enacted, multiple quantum computers are available via the cloud, software and middleware layers are more advanced, and platforms for developing applications are being made available. Areas that are ripe for exploring quantum solutions include weather modeling, transportation systems management, emergency response, biomedical tools, logistics, and more.

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[29] Technical Assessment of the Capital Facility Needs of the National Institute of Standards and Technology, National Academies of Science, Engineering and Medicine (2023)
[30] National Standards Strategy for Critical and Emerging Technologies, White House (2023)
[31] The Microelectronics Commons program in the CHIPS and Science Act aims to establish prototyping capabilities in six technology areas, including quantum technologies. Proposals are currently being reviewed. The request for solutions and other information are available online.

NQI should look at ways to stimulate US government agencies to become skilled early adopters of the technologies. Like the National Strategic Computing Initiative (NSCI)[32] there should be "Deployment Agencies" tasked and adequately funded to participate in a co-design process aimed at meeting the requirements of their respective missions. The DOE Grid Modernization Initiative is an example of this approach and a good start. The National Aeronautics and Space Administration (NASA) and Department of Homeland Security (DHS) are also well positioned to be Deployment Agencies, thereby supporting the development of technologies for their needs and to complement the foundational research supported by and at DOE, DOD, NIST and NSF.

Support exploration of nearer-term applications while also focusing on exploration of long-term applications.

An effective way to identify a set of potential near-term quantum computing applications of value to government is through a discovery process that involves cooperation among all stakeholders. The federal government should establish a public-private partnership, or leverage an existing entity, whose mission is to find possible near-term quantum computing applications by facilitating interaction and cooperation among quantum computing hardware and software experts, application domain experts, user communities, and policy and market experts. Participation should be inclusive of all technologies to best understand their distinctions, capabilities, and abilities to support public sector needs. The partnership could be organized thematically around a significant area of public interest, such as climate and sustainability or public health. The partnership's goals would be to evaluate possible application areas in depth and identify strategies to accelerate progress toward real-world applications. A similar approach is called for in legislation mentioned earlier in this testimony for a quantum sandbox for near-term applications.

Another approach is government-sponsored challenges, which in particular areas have demonstrated their effectiveness in accelerating the development of technology, typically in areas related to government missions. An iterative approach to competition allows the government to revise timelines and objectives in response to participant progress and improved understanding of what is technologically possible, an approach suited to QC use case development. The U.S. federal government should consider organizing a QC challenge. The targeted challenge should focus on an area with (a) clear government mission relevance, (b) active interest by the private sector, and (c) a critical mass of current QC research. A recent QED-C report identifies several areas in which near-term applications are most likely.[33] Financial fraud detection stands out given the level of interest on the part of private-sector financial services firms in quantum computing for fraud detection and the enormous amount of real-world data available with which to experiment and develop quantum machine learning anomaly and fraud detection tools.

Near term applications are important for maintaining momentum in the quantum computing industry, whereas long-term applications for general purpose, fault tolerant quantum computers are important for achieving even more economic and societal benefits.

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[32] Executive Order Creating a National Strategic Computing Initiative (2015)

[33] Public-Private Partnerships in Quantum Computing

Collaborate with international partners.

Countries around the world that share values with the United States are launching and expanding quantum technology programs. Many are home to research centers of excellence and a growing number of startups and businesses are entering the quantum supply chain. It is in the national interest to collaborate at not only the research level, but on the business level as well. Opening markets, developing appropriate standards, and stimulating competition and partnerships will help to enable and grow a robust quantum industry that reaches and benefits all corners of the world.

Conclusion

The combined economic, societal, and national security impacts of QIST make it a critical emerging technology and a field in which ***the United States must be a global leader***. The nation is in a strong position but cannot afford to be complacent. The National Quantum Initiative is a centerpiece of the national quantum enterprise that will be essential to American leadership in quantum technologies. At this moment, your committee is in a unique position to ensure the NQI supports all parts of the innovation ecosystem—from basic research to commercialization. Together, we can accelerate progress and win the quantum race.